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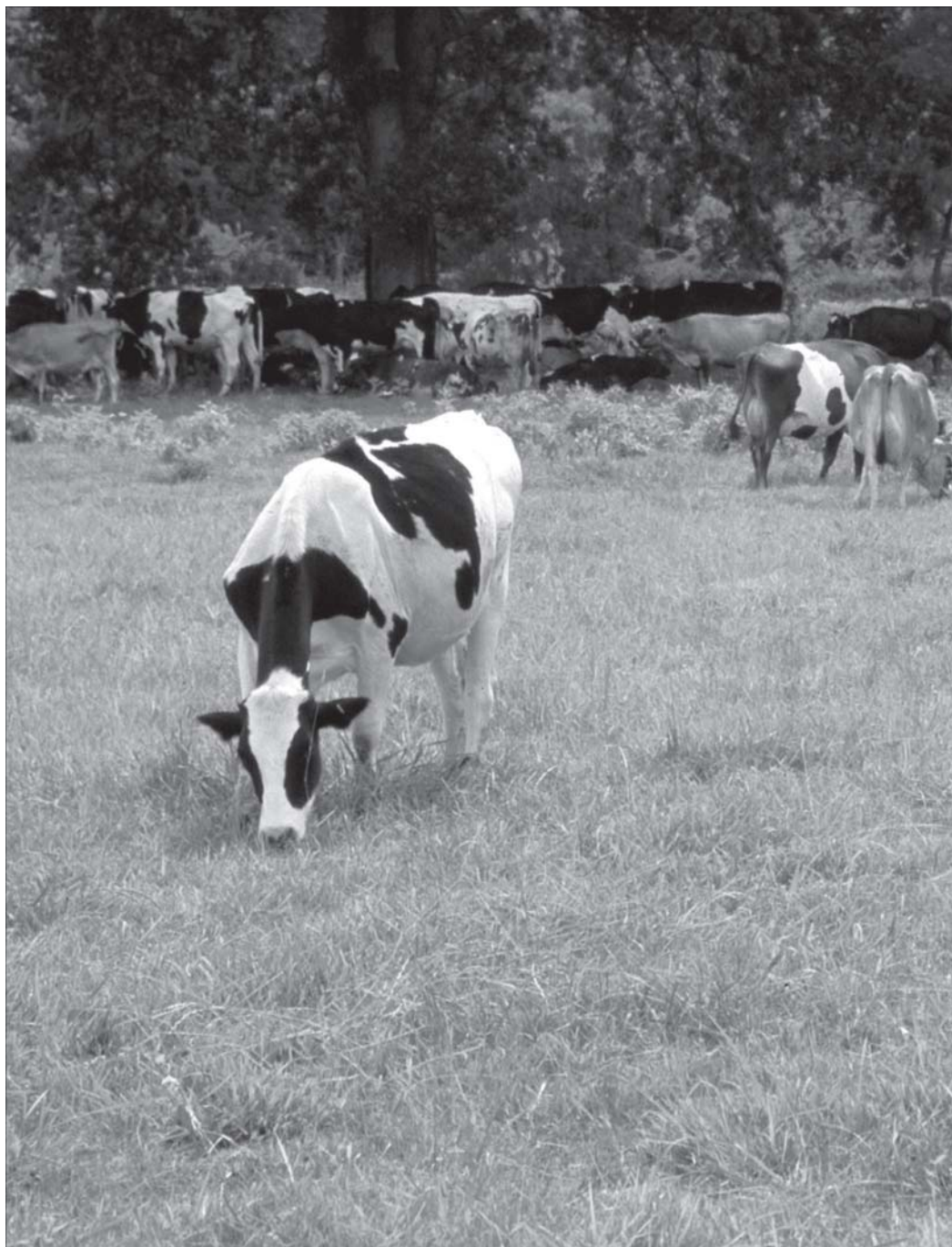
National  
Animal Health  
Monitoring  
System

October 2007



# Dairy 2007

## Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007



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## Introduction

The National Animal Health Monitoring System (NAHMS) is a nonregulatory program of the United States Department of Agriculture's (USDA) Animal and Plant Health Inspection Service. NAHMS is designed to help meet the Nation's animal-health information needs and has collected data on dairy health and management practices through three previous studies.

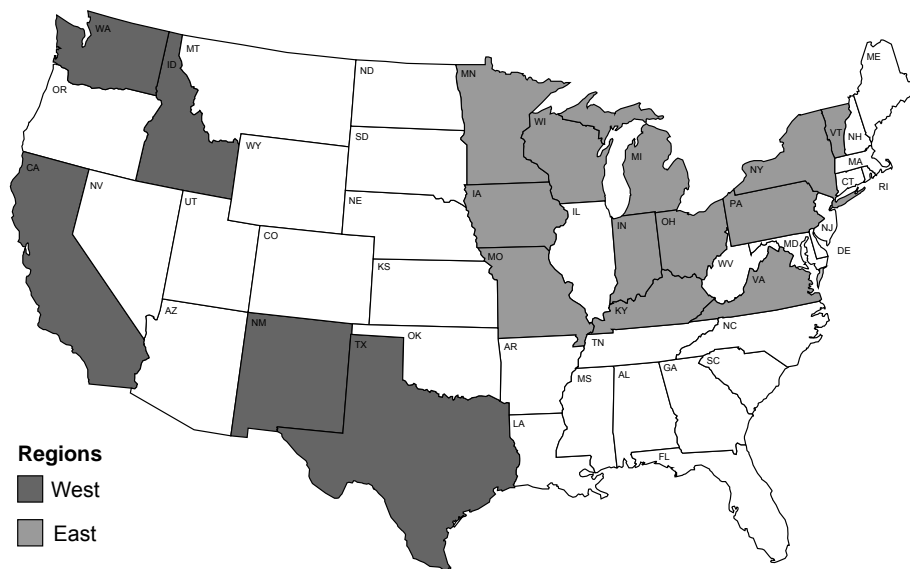
The NAHMS 1991-92 National Dairy Heifer Evaluation Project (NDHEP) provided the dairy industry's first national information on the health and management of dairy cattle in the United States. Just months after the study's first results were released in 1993, cases of acute bovine viral diarrhea (BVD) surfaced in the United States following a 1993 outbreak in Canada. NDHEP information on producer vaccination and biosecurity practices helped officials address the risk of disease spread and target educational efforts on vaccination protocols. An outbreak of human illness was reported in 1993 in the Pacific Northwest, this time related to *Escherichia coli* 0157:H7. NDHEP data on the bacteria's prevalence in dairy cattle helped officials define public risks as well as research needs. This baseline picture of the industry also helped identify additional research and educational efforts in various production areas, such as feed management and weaning age.

Information from the NAHMS Dairy '96 Study helped the U.S. dairy industry identify educational needs and prioritize research efforts on such timely topics as antibiotic usage and Johne's disease, as well as digital dermatitis, bovine leukosis virus, and potential food-borne pathogens, including *E. coli*, *Salmonella*, and *Campylobacter*.

A major focus of the Dairy 2002 Study was to describe management strategies that prevent and reduce Johne's disease and to determine management factors associated with *Mycoplasma* and *Listeria* in bulk-tank milk. Additionally, levels of participation in quality assurance programs, the incidence of digital dermatitis, a profile of animal waste handling systems used on U.S. dairy operations, and industry changes since the NDHEP in 1991 and Dairy '96 were examined.

The Dairy 2007 Study was conducted in 17 of the Nation's major dairy States (see map) and provides participants, stakeholders, and the industry as a whole with valuable information representing 79.5 percent of U.S. dairy operations and 82.5 percent of U.S. dairy cows. Part 1: Reference of Dairy Cattle Health and Management Practices in the United States, 2007 is the first in a series of reports containing national information from the NAHMS Dairy 2007 Study. This report contains information collected from 2,194 dairy operations.

### Dairy 2007 Participating States



The methods used and number of respondents in the study can be found in Section II and Appendix I of this report, respectively.

Further information on NAHMS studies and reports is available at:  
<http://nahms.aphis.usda.gov>.

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## Terms Used In This Report

**Bovine viral diarrhea–persistent infection (BVD–PI):** Cattle infected with BVD in utero. These animals continuously shed large quantities of the virus via nasal discharge, saliva, semen, urine, feces, tears, and milk, thereby serving as a source of persistently–infected (PI) cattle.

**Cow:** Female dairy bovine that has calved at least once.

**Cow average:** The average value for all cows (milking and dry); the reported value for each operation multiplied by the number of cows on that operation is summed over all operations and divided by the number of cows on all operations. This way, results are adjusted for the number of cows on each operation. For instance, on p. 21, the rolling herd average milk production (lb/cow) is multiplied by the number of cows for each operation. This product is then summed over all operations and divided by the sum of cows over all operations. The result is the average milk production for all cows.

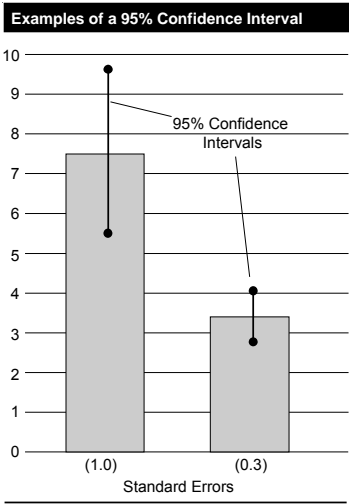
**Dairy Herd Improvement Association (DHIA):** An organization with programs and objectives intended to improve the production and profitability of dairy farming. DHIA also aids farmers in keeping milk production and management records.

**Heifer:** Female dairy bovine that has not yet calved.

**Herd size:** Herd size is based on January 1, 2007, cow inventory. Small herds are those with fewer than 100 cows; medium herds are those with 100 to 499 cows; and large herds are those with 500 or more cows.

**Operation:** Premises with at least one dairy cow on January 1, 2007.

**Operation average:** The average value for all operations; a single value for each operation is summed over all operations reporting divided by the number of operations reporting. For example, operation average age of heifers at first calving (shown on p. 23) is calculated by summing reported average age over all operations divided by the number of operations.



**Population estimates:** Estimates in this report are provided with a measure of precision called the standard error. A 95-percent confidence interval can be created with bounds equal to the estimate, plus or minus two standard errors. If the only error is sampling error, the confidence intervals created in this manner will contain the true population mean 95 out of 100 times. In the example to the left, an estimate of 7.5 with a standard error of 1.0 results in limits of 5.5 to 9.5 (two times the standard error above and below the estimate). The second estimate of 3.4 shows a standard error of 0.3 and results in limits of 2.8 and 4.0. Alternatively, the 90-percent confidence interval would be created by multiplying the standard error by 1.65 instead of 2. Most estimates in this report are rounded to the nearest tenth. If rounded to 0, the standard error was reported (0.0). If there were no reports of the event, no standard error was reported (—).

**Sample profile:** Information that describes characteristics of the operations from which Dairy 2007 data were collected.

**Regions:**

**West:** California, Idaho, New Mexico, Texas, and Washington

**East:** Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Vermont, Virginia, and Wisconsin

**Rolling Herd Average (RHA):** Average milk production per cow (lb/cow) in the herd during the previous 12 months.

## Section I: Population Estimates

### A. Dairy Herd Information and Management Practices

#### 1. Operation types

Producers were asked to identify their operations by type, i.e., conventional, grazing, combination, and organic. On conventional operations, the majority of forage was harvested and “delivered” to cows; on grazing operations, the majority of forage was “harvested” by cows; combination operations used both conventional and grazing practices; and organic operations met USDA organic standards. The majority of operations (63.9 percent) were conventional operations, and the majority of cows (82.2 percent) were on these operations. Grazing and organic operations accounted for only 3.1 and 1.7 percent of operations, respectively, and together represented less than 3.0 percent of cows.

a. Percentage of operations (and percentage of cows on these operations) by operation type:

<b>Operation Type</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Cows</b>	<b>Standard Error</b>
Conventional	63.9	(1.4)	82.2	(0.9)
Grazing	3.1	(0.6)	1.7	(0.4)
Combination of conventional and grazing	31.1	(1.3)	14.9	(0.8)
Organic	1.7	(0.4)	1.2	(0.3)
Other	0.2	(0.1)	0.0	(0.0)
Total	100.0		100.0	

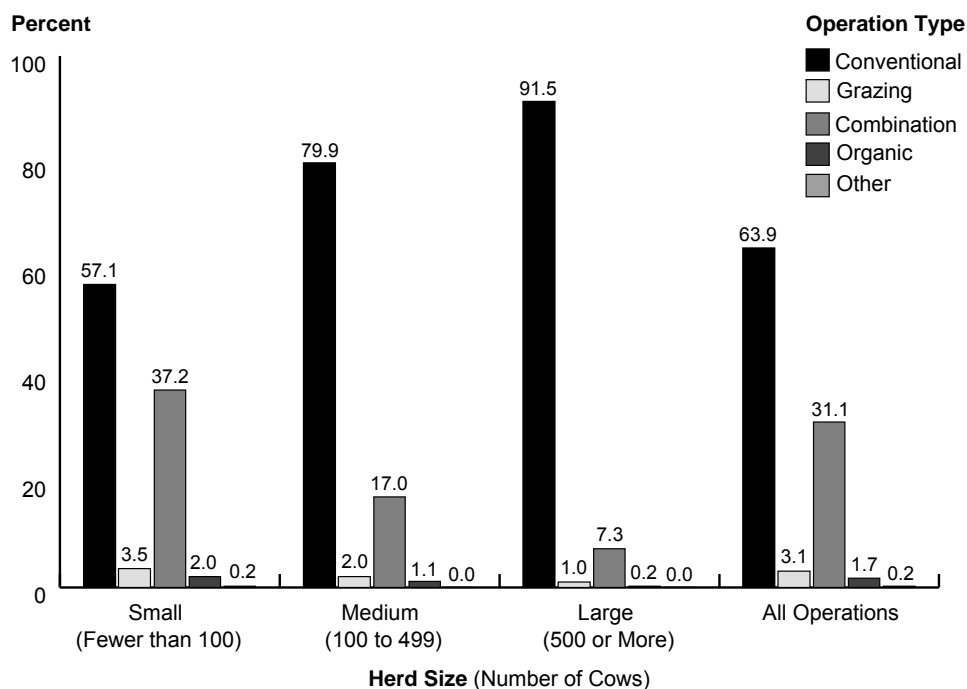


The percentage of conventional operations increased as herd size increased, while the percentage of combination operations decreased as herd size increased.

b. Percentage of operations by operation type and by herd size:

Percent Operations						
Operation Type	Herd Size (Number of Cows)					
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Conventional	57.1	(1.8)	79.9	(1.7)	91.5	(1.4)
Grazing	3.5	(0.7)	2.0	(0.7)	1.0	(0.4)
Combination of conventional and grazing	37.2	(1.7)	17.0	(1.6)	7.3	(1.3)
Organic	2.0	(0.6)	1.1	(0.3)	0.2	(0.1)
Other	0.2	(0.1)	0.0	(0.0)	0.0	(0.0)
Total	100.0		100.0		100.0	

Percentage of Operations by Operation Type and by Herd Size



The West region had a higher percentage of conventional operations than the East region (72.4 and 63.2 percent, respectively). Conversely, the East region had a higher percentage of combination operations than the West region (32.4 and 15.8 percent, respectively). The percentages of grazing and organic operations were similar in the West and East regions.

c. Percentage of operations by operation type and by region:

Percent Operations				
Region				
West			East	
Operation Type	Percent	Std. Error	Percent	Std. Error
Conventional	72.4	(2.9)	63.2	(1.4)
Grazing	8.0	(2.4)	2.7	(0.6)
Combination	15.8	(2.0)	32.4	(1.4)
Organic	3.8	(1.3)	1.5	(0.4)
Other	0.0	(0.0)	0.2	(0.1)
Total	100.0		100.0	

Conventional operations and the cows on these operations had the highest RHA milk production (20,253 and 22,182 lb/cow, respectively). RHA milk production was similar for grazing, organic, and other operations.

d. Operation average (and cow average) RHA milk production (lb/cow), by operation type:

RHA Milk Production				
Operation Type	Operation Average (lb/cow)	Standard Error	Cow Average (lb/cow)	Standard Error
Conventional	20,253	(135)	22,182	(126)
Grazing	15,146	(608)	15,903	(457)
Combination	17,587	(213)	18,696	(217)
Organic	15,266	(714)	16,369	(728)
All*	19,175	(112)	21,483	(115)

\* "Other" operation types included in "all" operation types.

## 2. Record-keeping systems

Dairy record-keeping systems are commonly used to track milk production, reproduction, and the health of cows. The use of hand-written records decreased as herd size increased, while the use of on-farm computer records increased as herd size increased. The highest percentage of small and medium operations (77.9 and 67.2 percent, respectively) used hand-written records, while the highest percentage of large operations (82.7 percent) used on-farm computer records. Almost all operations (95.1 percent) had some form of record-keeping system to track individual animals. Operations could have used more than one system. The majority of operations (73.5 percent) used hand-written records to track animals, while almost half (45.9 percent) used the Dairy Herd Improvement Association (DHIA) record-keeping system. Although only 19.4 percent of operations used on-farm computer record-keeping systems, 56.9 percent of cows were on these operations.

a. Percentage of operations by type of individual animal record-keeping systems used for the operation, by herd size:

Percent Operations								
Herd Size (Number of Dairy Cows)								
System	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Hand written, such as a ledger or notebook	77.9	(1.5)	67.2	(2.1)	38.1	(2.8)	73.5	(1.2)
DHIA	42.4	(1.7)	56.5	(2.3)	50.5	(2.9)	45.9	(1.4)
Off-farm computer record system other than DHIA	2.7	(0.5)	10.9	(1.4)	10.0	(1.5)	4.9	(0.5)
On-farm computer record system	9.3	(1.0)	37.8	(2.2)	82.7	(2.1)	19.4	(0.9)
Other system	4.0	(0.7)	5.9	(1.2)	3.2	(1.0)	4.4	(0.6)
Any record- keeping system	94.2	(0.9)	97.0	(0.9)	99.8	(0.1)	95.1	(0.7)

b. Percentage of cows by type of individual animal record-keeping systems used for the operation:

<b>System</b>	<b>Percent Cows</b>	<b>Standard Error</b>
Hand written, such as a ledger or notebook	54.0	(1.5)
DHIA	48.7	(1.5)
Off-farm computer record system other than DHIA	9.0	(0.9)
On-farm computer record system	56.9	(1.2)
Other system	4.0	(0.6)
Any record-keeping system	98.4	(0.2)

For operations using on- or off-farm computer data record systems, 34.9 percent used Dairy Comp 305 as their primary system, accounting for 60.3 percent of cows. "Other" computer programs were used on 30.8 percent of operations but accounted for only 13.6 percent of cows. Dairy Quest and Dairy Plan were the most common other computer programs.

c. For operations using on- or off-farm computer data record systems, percentage of operations (and percentage of cows on these operations) by primary computer record system used:

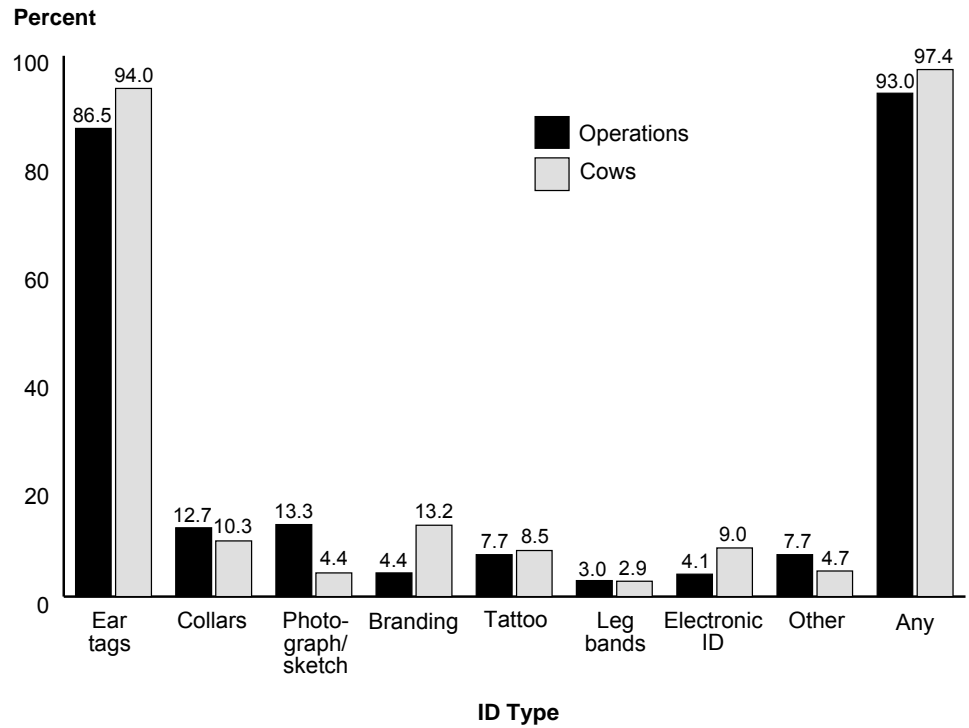
<b>Primary System</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Cows</b>	<b>Standard Error</b>
Dairy Comp 305	34.9	(2.3)	60.3	(2.0)
PC Dart	19.3	(1.9)	10.2	(0.9)
DHI Plus	15.0	(1.7)	15.9	(1.7)
Other	30.8	(2.4)	13.6	(1.3)
Total	100.0		100.0	

### 3. Individual animal identification

Individual animal identification (ID) is crucial for managing the health and performance of cattle. Approximately 9 of 10 operations (93.0 percent) used some form of individual animal ID, and almost all cows (97.4 percent) had some form of individual animal ID. Most operations (86.5 percent) used ear tags on cows as a form of individual ID, and most cows (94.0 percent) had individual ear tags. Branding as a type of individual ID was used on only 4.4 percent of operations; however, 13.2 percent of cows were branded, suggesting that branding was more common on larger operations. Various methods of electronic ID were used on 4.1 percent of operations, accounting for 9.0 percent of cows.

a. Percentage of operations (and percentage of cows), by type of individual animal ID used on at least some cows:

ID Type	Percent Operations	Standard Error	Percent Cows	Standard Error
Ear tags (all kinds)	86.5	(1.0)	94.0	(0.5)
Collars	12.7	(0.9)	10.3	(0.9)
Photograph or sketch	13.3	(1.0)	4.4	(0.4)
Branding (all methods)	4.4	(0.5)	13.2	(1.1)
Tattoo (other than tattoo for brucellosis)	7.7	(0.6)	8.5	(0.9)
Leg bands	3.0	(0.4)	2.9	(0.5)
Electronic (pedometers, bar code, RFD, etc.)	4.1	(0.5)	9.0	(0.9)
Other	7.7	(0.8)	4.7	(0.6)
Any identification	93.0	(0.8)	97.4	(0.4)

**Percentage of Operations (and Percentage of Cows) by Type of Individual Animal ID Used on at Least Some Cows**

On operations that used individual animal ID, evaluating milk production and evaluating genetic improvements were the two most common primary reasons for using ID (38.1 and 30.4 percent of operations, respectively). Approximately 2 of 10 operations (21.1 percent) listed “other” as a primary reason, with many of these operations noting that all choices given were primary reasons for using individual animal ID.

b. For operations that used individual animal ID, percentage of operations by primary reason ID was used:

Primary Reason	Percent Operations	Standard Error
Evaluating milk production	38.1	(1.4)
Evaluating animal health	8.8	(0.8)
Disease or residue traceback	1.6	(0.4)
Evaluating genetic improvements	30.4	(1.4)
Other	21.1	(1.2)
Total	100.0	

#### 4. Herd identification

More than one-third of operations (36.4 percent)—representing 54.0 percent of cows—used some form of unique herd ID. The highest percentage of operations (34.5 percent) used ear tags for herd ID, and the highest percentage of cows (41.0 percent) had ear tags as a form of herd ID. Branding as a type of herd ID was used on 3.1 percent of operations and 18.7 percent of cows.



Percentage of operations (and percentage of cows) by type of **herd** identification used on at least some cows:

ID Type	Percent Operations	Standard Error	Percent Cows	Standard Error
Ear tags (all kinds)	34.5	(1.3)	41.0	(1.5)
Collars	2.8	(0.4)	2.9	(0.5)
Branding (all methods)	3.1	(0.3)	18.7	(1.4)
Tattoo (other than tattoo for brucellosis)	2.5	(0.4)	4.6	(0.8)
Electronic (pedometers, bar code, RFD, etc.)	1.8	(0.3)	3.9	(0.6)
Other	2.0	(0.4)	1.7	(0.4)
Any identification	36.4	(1.3)	54.0	(1.5)

### 5. National Animal Identification System (NAIS) and U.S. Animal Identification Number (AIN)

NAIS is a voluntary program that facilitates the collection of information about all livestock operations, regardless of livestock species. This information is stored in a database for use during animal disease events. NAIS is designed to allow animal tracking during disease outbreaks so that sick or exposed animals can be located quickly to help contain the disease. Although the program was designed by USDA, each State is responsible for its implementation. A unique premises ID is assigned by each State's Department of Agriculture to all operations enrolled in NAIS.

Almost half of operations (46.7 percent) had a unique premises ID. A lower percentage of large operations (32.8 percent) had a unique premises ID compared to medium and small operations (48.3 and 47.2 percent, respectively).

a. Percentage of operations with a unique premises ID assigned by their State Department of Agriculture as part of NAIS, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
47.2	(1.5)	48.3	(2.1)	32.8	(2.5)	46.7	(1.1)

A lower percentage of operations in the West region (16.5 percent) had a unique premises ID compared to operations in the East region (49.1 percent).

b. Percentage of operations with a unique premises ID assigned by their State Department of Agriculture as part of NAIS, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
16.5	(1.8)	49.1	(1.2)

Operations enrolled in NAIS cannot obtain individual animal identification without a unique premises ID. Once a premises ID is obtained, an operation has the option of obtaining officially recognized individual animal ID, as outlined in AIN guidelines. Only 7.8 percent of all operations had implemented individual animal ID. A higher percentage of large operations (12.5 percent) implemented an individual animal ID system or technology utilizing AIN guidelines compared to small operations (7.0 percent).

c. Percentage of operations that had implemented an individual animal ID system or technology that utilizes AIN guidelines, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
7.0	(0.9)	9.6	(1.3)	12.5	(1.8)	7.8	(0.7)



Photo by Dr. Jason Lombard

For operations assigned a unique premises ID, 16.8 percent had implemented individual animal ID. A higher percentage of large operations (38.2 percent) with a unique premises ID had implemented an individual animal ID system utilizing AIN guidelines compared to small operations (14.8 percent).

d. For operations that had a unique premises ID assigned, percentage of operations that had implemented an individual animal ID system that utilizes AIN guidelines, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
14.8	(1.8)	19.8	(2.6)	38.2	(4.9)	16.8	(1.5)

## 6. Breed of cows

Holsteins continue to be the predominant dairy breed in the United States. Approximately 95 percent of operations housed at least one Holstein cow, and Holsteins represented 90.1 percent of all cows. Although 18.1 percent of operations reported having Jerseys on-hand, only 5.3 percent of all cows were Jerseys. "Other" breeds, which generally included cross-breed cattle, were reported on 21.4 percent of operations.

a. Percentage of operations (and percentage of cows) by breed:

<b>Breed</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Cows</b>	<b>Standard Error</b>
Holstein	95.1	(0.6)	90.1	(0.7)
Jersey	18.1	(1.1)	5.3	(0.6)
Ayrshire	3.4	(0.5)	0.3	(0.1)
Brown Swiss	7.6	(0.7)	0.6	(0.1)
Guernsey	3.0	(0.5)	0.4	(0.1)
Other	21.4	(1.2)	3.3	(0.4)
Total			100.0	

Primary breed for each operation was defined as the most prevalent dairy breed reported on the January 1, 2007, cattle inventory. Holsteins were the primary dairy breed on more than 9 of 10 operations (92.2 percent) operations.

b. Percentage of operations by primary breed:

<b>Breed</b>	<b>Percent Operations</b>	<b>Standard Error</b>
Holstein	92.2	(0.7)
Jersey	3.5	(0.4)
Ayrshire	0.3	(0.1)
Brown Swiss	0.9	(0.3)
Guernsey	0.9	(0.3)
Other	2.2	(0.5)
Total	100.0	

## 7. Cow registration

A higher percentage of cows on small and medium operations (16.8 and 18.7 percent, respectively) were registered with a breed association compared to cows on large operations (8.9 percent). Overall, 13.6 percent of cows were registered.

a. Percentage of cows registered with a breed association, by herd size:

Percent Cows							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
16.8	(1.2)	18.7	(1.5)	8.9	(1.3)	13.6	(0.8)



Photo by Judy Rodriguez

All cows were registered with a breed association on 8.9 percent of operations, while 71.7 percent of operations had no cows registered. The percentages of operations with less than 10 percent of their cows registered with a breed association were similar across herd sizes. A higher percentage of small and medium operations (14.2 and 15.6 percent, respectively) had 75 percent or more of their cows registered compared to large operations (6.5 percent).

b. Percentage of operations by registration level (percentage of cows registered with a breed association) and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Percent of Dairy Cows Registered</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
0	73.6	(1.6)	65.5	(2.2)	70.9	(2.7)	71.7	(1.3)
0.1 to 9.9	5.2	(0.8)	6.4	(1.2)	7.7	(1.5)	5.6	(0.6)
10.0 to 49.9	5.2	(0.8)	9.8	(1.5)	11.5	(1.8)	6.5	(0.7)
50.0 to 74.9	1.8	(0.4)	2.7	(0.8)	3.4	(1.3)	2.1	(0.4)
75.0 to 99.9	4.8	(0.7)	7.1	(1.2)	2.9	(1.2)	5.2	(0.6)
100	9.4	(1.1)	8.5	(1.2)	3.6	(1.0)	8.9	(0.8)
Total	100.0		100.0		100.0		100.0	

## 8. Quality assurance programs

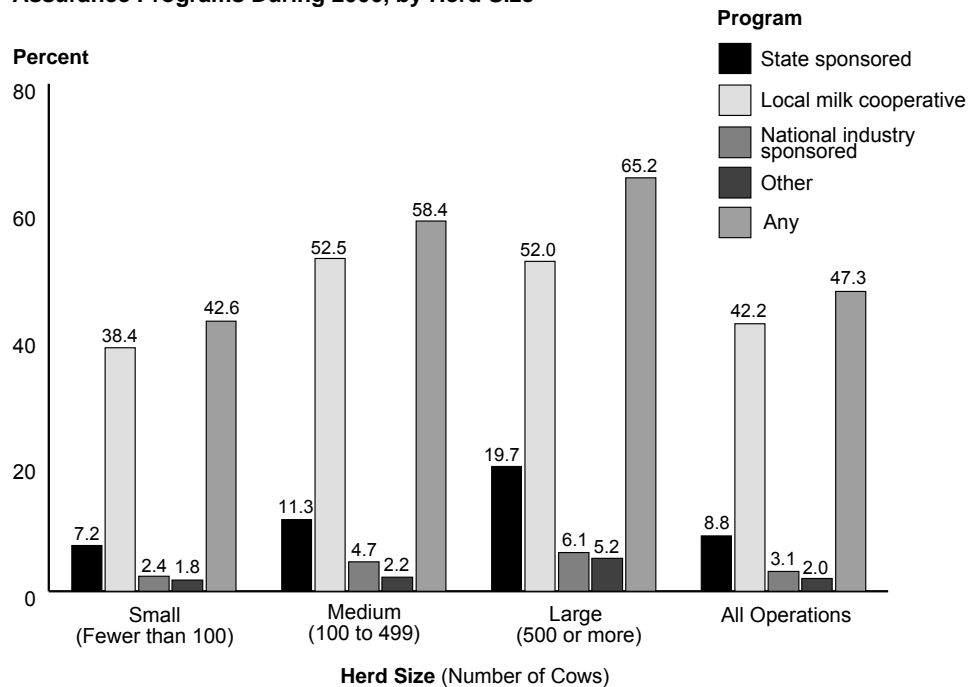
Quality assurance programs are designed to educate producers and provide them with guidelines to ensure the highest quality products. Nearly half of operations (47.3 percent) participated in any quality assurance program during 2006. The highest percentage of operations (42.2 percent) participated in a local milk cooperative/processor-sponsored assurance program. A higher percentage of medium and large operations (58.4 and 65.2 percent, respectively) participated in any quality assurance program compared to small operations (42.6 percent).

a. Percentage of operations that participated in the following types of quality assurance programs during 2006, by herd size:

Quality Assurance Program	Percent Operations							
	Herd Size (Number of Cows)							
	Small		Medium		Large		All	
	(Fewer than 100)		(100-499)		(500 or More)		Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
State sponsored	7.2	(0.9)	11.3	(1.3)	19.7	(2.6)	8.8	(0.7)
Local milk cooperative/processor sponsored	38.4	(1.8)	52.5	(2.3)	52.0	(2.9)	42.2	(1.4)
National industry sponsored	2.4	(0.5)	4.7	(1.1)	6.1	(1.2)	3.1	(0.4)
Other	1.8	(0.4)	2.2	(0.6)	5.2	(1.4)	2.0	(0.3)
Any of the above	42.6	(1.8)	58.4	(2.3)	65.2	(2.5)	47.3	(1.4)



**Percentage of Operations that Participated in the Following Types of Quality Assurance Programs During 2006, by Herd Size**



The percentages of operations that participated in individual programs were similar between regions, but a higher percentage of operations in the West region (59.5 percent) participated in any program compared to operations in the East region (46.3 percent).

b. Percentage of operations that participated in the following types of quality assurance programs during 2006, by region:

Quality Assurance Program	Percent Operations			
	West		East	
	Pct.	Std. Error	Pct.	Std. Error
State sponsored	11.8	(1.9)	8.5	(0.8)
Local milk cooperative/processor sponsored	50.4	(3.0)	41.6	(1.5)
National industry sponsored	6.1	(1.6)	2.8	(0.5)
Other	3.9	(1.1)	1.9	(0.4)
Any of the above	59.5	(2.9)	46.3	(1.5)

## B. Productivity

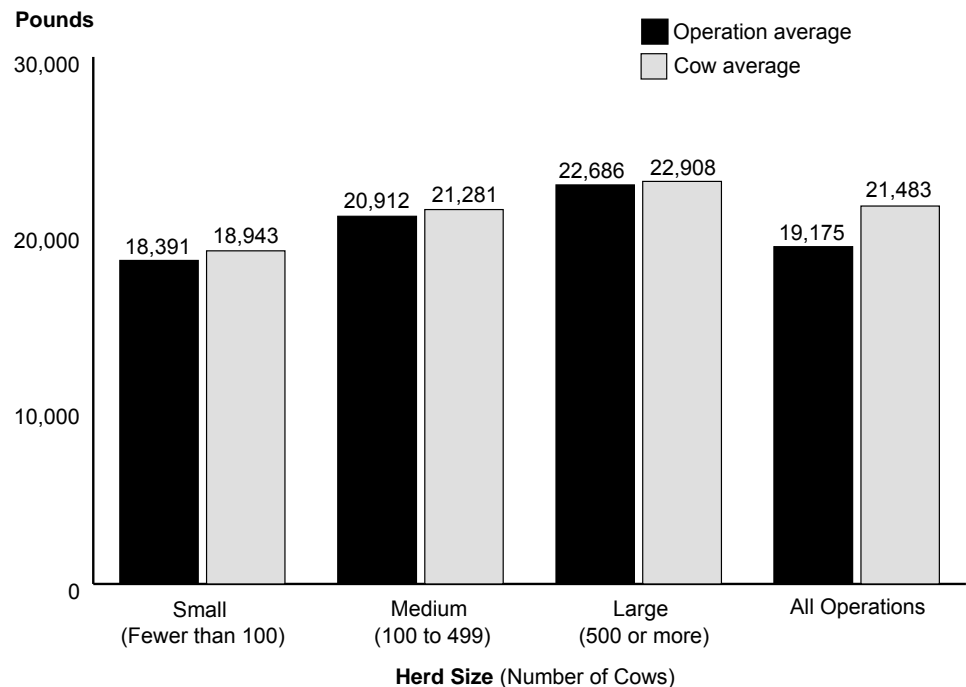
### 1. RHA milk production

RHA milk production is the amount of milk (lb/cow) produced by the average cow during the last 12 months. Producers were asked to report the RHA for their operation. The average of this reported number across all operations—referred to as the operation average—was 19,175 lb/cow.

a. Operation average (and cow average) RHA milk production (lb/cow), by herd size:

Average								
Herd Size (Number of Cows)								
Measure	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Lb/Cow	Std. Error	Lb/Cow	Std. Error	Lb/Cow	Std. Error	Lb/Cow	Std. Error
Operation	18,391	(142)	20,912	(171)	22,686	(215)	19,175	(112)
Cow	18,943	(135)	21,281	(170)	22,908	(202)	21,483	(115)

Operation Average (and Cow Average) RHA Milk Production (Lb/Cow), by Herd Size



More than one-quarter of operations (26.9 percent) had an RHA milk production of 22,000 lb/cow or more.

b. Percentage of operations by RHA milk production (lb/cow):

<b>Pounds/Cow</b>	<b>Percent Operations</b>	<b>Standard Error</b>
Fewer than 14,000	8.3	(0.8)
14,000 to 15,999	11.7	(1.0)
16,000 to 17,999	14.8	(1.0)
18,000 to 19,999	21.0	(1.2)
20,000 to 21,999	17.3	(1.0)
22,000 or more	26.9	(1.2)
Total	100.0	

Operations that used computer record-keeping systems—either on- or off-farm—had higher RHA milk production than operations that did not use a computer system. Operations with on-farm computer systems had higher operation and cow average RHAs (21,425 and 22,785 lb/cow, respectively) compared to operations using off-farm computers or no computers.

c. Operation average (and cow average) RHA milk production (lb/cow), by computer usage:

<b>Computer Usage</b>	<b>Operation Average (lb/cow)</b>	<b>Standard Error</b>	<b>Cow Average (lb/cow)</b>	<b>Standard Error</b>
Off-farm	20,522	(176)	21,267	(175)
On-farm	21,425	(205)	22,785	(171)
No computer	17,094	(168)	17,992	(166)

Holsteins are known for producing the most milk per cow of all dairy breeds. Operations comprised of primarily Holsteins (more than 50 percent of dairy cows were Holsteins) had higher RHA milk production than operations with primary breeds other than Holstein. Operations with primarily Holsteins had an operation and cow average RHA milk production of approximately 4,000 lb/cow higher than operations where Holsteins were not the primary breed.

d. Operation average (and cow average) RHA milk production (lb/cow), by primary breed (over 50.0 percent of herd was Holstein):

<b>Breed</b>	<b>Operation Average (lb/cow)</b>	<b>Standard Error</b>	<b>Cow Average (lb/cow)</b>	<b>Standard Error</b>
Primarily Holstein	19,482	(115)	21,807	(114)
Not primarily Holstein	15,637	(381)	17,137	(418)

## 2. Age at first calving

Age at first calving is important in determining the lifetime productivity of heifers. In general, the earlier heifers calve after reaching the recommended height and weight, the more productive they are throughout their lifetime. The recommended age at first calving is 22 to 24 months. Overall, the average age at first calving was 25.2 months. Large operations reported the earliest average age for heifers at first calving at 24.0 months.

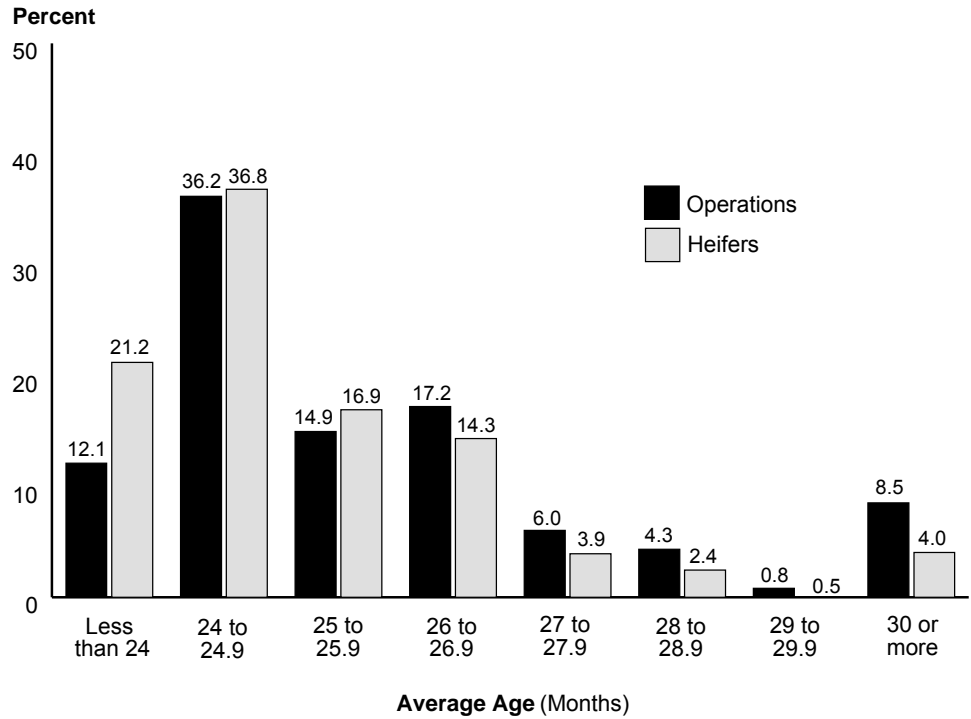
a. Operation average age of heifers at first calving, by herd size:

<b>Operation Average Age (Months)</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>
25.4	(0.1)	24.8	(0.1)	24.0	(0.1)	25.2	(0.1)

Although 48.3 percent of operations reported an average age at first calving of less than 25 months, these operations accounted for 58.0 percent of heifers. Almost 1 in 10 operations (8.5 percent) reported an average age at first calving of 30 or more months, but these operations accounted for only 4.0 percent of heifers.

b. Percentage of operations (and percentage of heifers on these operations) by average age of heifers at first calving:

<b>Average Age (Months)</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Heifers</b>	<b>Standard Error</b>
Less than 24	12.1	(0.9)	21.2	(1.4)
24 to 24.9	36.2	(1.4)	36.8	(1.7)
25 to 25.9	14.9	(1.0)	16.9	(1.3)
26 to 26.9	17.2	(1.1)	14.3	(1.1)
27 to 27.9	6.0	(0.7)	3.9	(0.5)
28 to 28.9	4.3	(0.6)	2.4	(0.3)
29 to 29.9	0.8	(0.2)	0.5	(0.1)
30 or more	8.5	(0.9)	4.0	(0.4)
Total	100.0		100.0	

**Percentage of Operations (and Percentage of Heifers on These Operations),  
by Average Age of Heifers at First Calving**

### 3. Days dry

The dry period is a time for the cow and her mammary glands to rejuvenate and prepare for the next lactation. Traditionally, a 60-day dry period has been recommended, but recent research evaluating the optimal dry period length suggests that 40 days may improve cow health and be more profitable. An advantage of a 40-day dry period is that cows can be fed a consistent high-energy diet through the dry period, which has been shown to improve energy balance and decrease fat mobilization during the first month of the subsequent lactation.

The operation average dry period on medium operations (56.3 days) was about three days shorter than the average on large operations (59.6 days). The overall average days dry was 57.8 days.

a. Operation average days dry during 2006, by herd size:

Operation Average Days Dry							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error
58.2	(0.4)	56.3	(0.4)	59.6	(0.7)	57.8	(0.3)



The majority of operations (51.8 percent) reported average days dry of 60 to 69 days. A total of 2.5 percent of operations reported average days dry of fewer than 40 days, and 14.1 percent reported average days dry of 40 to 49 days.

b. Percentage of operations by average number of days dry:

Average Days Dry	Percent Operations	Standard Error
Less than 40	2.5	(0.4)
40 to 49	14.1	(1.0)
50 to 59	21.1	(1.1)
60 to 69	51.8	(1.4)
70 or more	10.5	(0.9)
Total	100.0	

#### 4. Calving interval

Calving interval is the time from one calving to the next and is dependent on how quickly a cow conceives after calving. The longer a cow is open (not pregnant), the longer the calving interval. Ideally, with a 12-month calving interval, a cow would become pregnant approximately 90 days after calving. For all operations, the average calving interval was 13.2 months. No differences were observed in calving intervals across herd sizes.

a. Operation average calving interval for cows during 2006, by herd size:

Operation Average (Months)							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error
13.2	(0.0)	13.3	(0.1)	13.3	(0.1)	13.2	(0.0)

Almost one-third of operations (29.4 percent) reported a calving interval of 12 months or less. A similar percentage of operations reported a calving interval of 13 or 14 months (30.1 and 28.8 percent of operations, respectively). Approximately 1 in 9 operations (11.7 percent) reported a calving interval of 15 or more months.

b. Percentage of operations by calving interval for cows:

<b>Calving Interval (Months)</b>	<b>Percent Operations</b>	<b>Standard Error</b>
Less than 12	5.5	(0.7)
12	23.9	(1.3)
13	30.1	(1.3)
14	28.8	(1.3)
15	8.5	(0.8)
16 or more	3.2	(0.5)
Total	100.0	

## C. Heifer Management

### 1. Source of heifer inventory

Nearly all operations (96.5 percent) had at least some heifers that were born and raised on the operation. Almost 9 of 10 heifers (87.4 percent) were born and raised on the operation. Although 4.7 percent of operations had heifers born on the operation but raised elsewhere, these operations accounted for 11.5 percent of all heifers.

Percentage of operations and percentage of heifers, by source of heifers:

<b>Heifer Source</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Heifers*</b>	<b>Standard Error</b>
Born and raised on operation	96.5	(0.4)	87.4	(1.2)
Born on operation raised off operation	4.7	(0.5)	11.5	(1.2)
Born off operation	6.6	(0.8)	1.1	(0.2)
Total			100.0	

\*As a percentage of January 1, 2007, heifer inventory.

## 2. Heifers raised off the operation

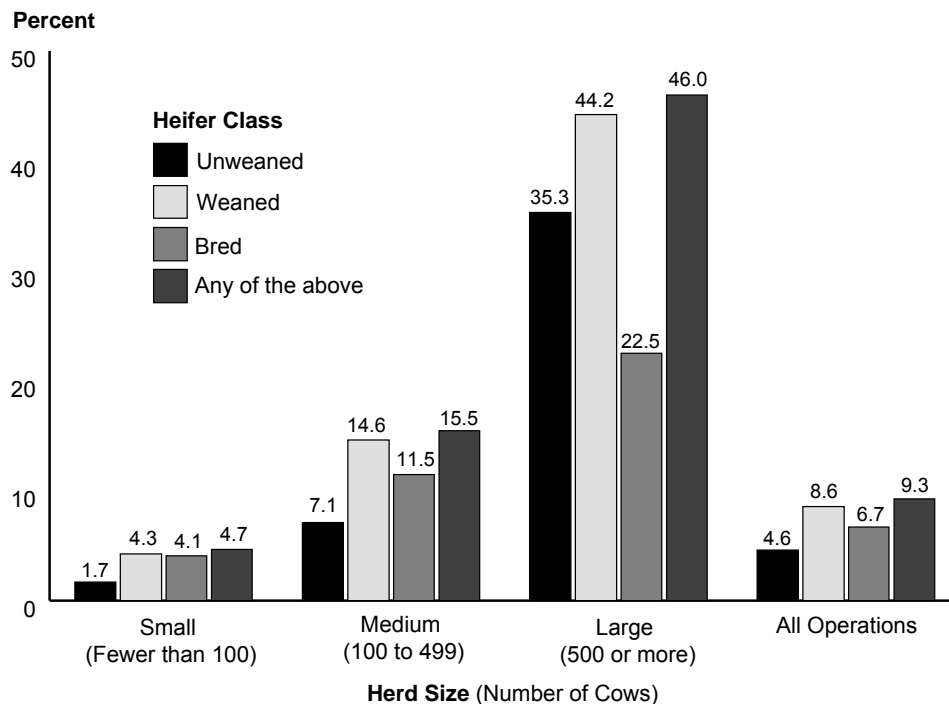
Raising heifers at a separate site (calf ranches) from the milking string has many potential advantages. Calf-ranch personnel are usually dedicated to working only with calves, which can result in increased attention to the feeding and health of calves and also decreased exposure to adult cow disease. If calves are not commingled with older animals or animals from other operations, their exposure to disease agents such as *Mycobacterium avium* subspecies *paratuberculosis*—the causative agent of Johne’s disease—is reduced. Raising heifers off-site also reduces the amount of manure produced at single sites and/or may allow producers to maintain larger milking herds on the same acreage.

Fewer than 1 of 10 operations (9.3 percent) raised any heifers off the operation. The percentage of operations that raised heifers off-site increased as herd size increased for all heifer classes. Less than 5 percent of small operations raised any heifers off-site, compared to 15.5 percent of medium operations and 46.0 percent of large operations. Almost one-third of large operations (35.3 percent) raised unweaned calves off-site, compared to 7.1 percent of medium operations and 1.7 percent of small operations. Similar herd-size differences in the percentages of operations that raised heifers off-site were observed among all heifer classes.

a. Percentage of operations that raised any heifers off-site, by heifer class and by herd size:

Percent Operations								
Heifer Class	Herd Size (Number of Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Unweaned	1.7	(0.5)	7.1	(1.2)	35.3	(2.9)	4.6	(0.5)
Weaned	4.3	(0.7)	14.6	(1.6)	44.2	(2.9)	8.6	(0.7)
Bred	4.1	(0.7)	11.5	(1.5)	22.5	(2.3)	6.7	(0.6)
Any of the above	4.7	(0.7)	15.5	(1.7)	46.0	(2.9)	9.3	(0.7)

### Percentage of Operations That Raised Any Heifers Off-Site, by Heifer Class and by Herd Size



For operations that raised any heifers off the operation, unweaned, weaned, and bred heifers were sent off-site at an operation average age of 4.9, 189.8, and 413.8 days, respectively. The average age at which any calves left to be raised off-site was 110.3 days.

b. For operations that raised any heifers off-site, operation average age of heifers when leaving operation, by heifer class:

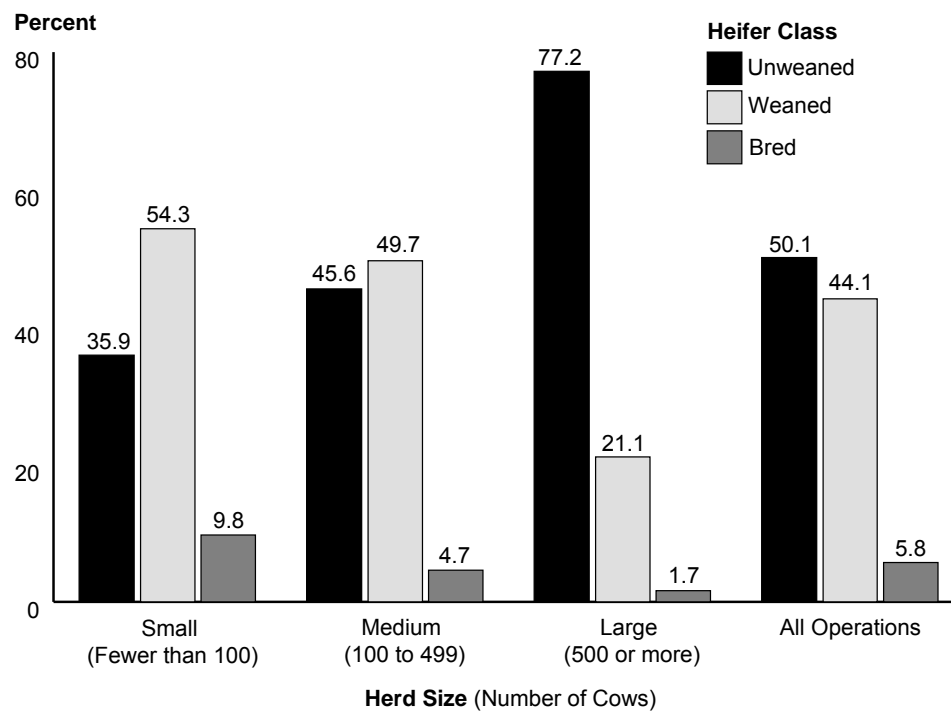
Operation Average Age (Days)							
Heifer Class							
Unweaned		Weaned		Bred		All Operations	
Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error
4.9	(0.7)	189.8	(15.7)	413.8	(25.3)	110.3	(11.2)

Producers were asked to identify the primary class of heifers sent off-site. Almost half of all operations that sent any heifers off-site to be raised sent unweaned or weaned calves (50.1 and 44.1 percent of operations, respectively). Only 5.8 percent of operations sent bred heifers off-site to be raised. Small operations most commonly sent weaned heifers off-site (54.3 percent); medium operations sent similar percentages of unweaned and weaned calves off-site (45.6 and 49.7 percent, respectively); and large operations most frequently sent unweaned heifers off-site (77.2 percent).

c. For operations that raised any heifers off-site, percentage of operations by primary heifer class sent off-site and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Heifer Class	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Unweaned	35.9	(7.7)	45.6	(5.8)	77.2	(3.3)	50.1	(3.8)
Weaned	54.3	(7.9)	49.7	(5.9)	21.1	(3.2)	44.1	(3.8)
Bred	9.8	(4.0)	4.7	(2.4)	1.7	(0.6)	5.8	(1.7)
Total	100.0		100.0		100.0		100.0	

**For Operations That Raised Any Heifers Off-Site, Percentage of Operations by Primary Heifer Class Sent Off-Site and by Herd Size**



Approximately 8 of 10 operations (81.1 percent) that sent heifers off-site to be raised retained ownership of the heifers sent. A total of 9.4 percent of operations sold the heifers sent off-site and repurchased the same animals, and 9.5 percent of operations sold the animals sent and replaced them with different animals.

d. For operations that sent heifers off-site to be raised, percentage of operations by ownership of the majority of heifers and by herd size:

<b>Percent Operations</b>								
<b>Ownership</b>	<b>Herd Size (Number of Cows)</b>							
	<b>Small</b>		<b>Medium</b>		<b>Large</b>		<b>All</b>	
	<b>(Fewer than 100)</b>		<b>(100-499)</b>		<b>(500 or More)</b>		<b>Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Ownership retained	72.3	(7.5)	83.8	(4.1)	89.6	(2.1)	81.1	(3.3)
Same animals sold and then repurchased	11.1	(6.1)	10.0	(3.2)	6.0	(1.6)	9.4	(2.6)
Animals sold outright, replaced with different animals	16.6	(5.6)	6.2	(2.8)	4.4	(1.4)	9.5	(2.4)
Total	100.0		100.0		100.0		100.0	

For operations that sent heifers off-site to be raised, the highest percentage of small and medium operations transported heifers less than 20 miles to the off-site rearing facility, while the highest percentage of large operations transported heifers between 5 and 50 miles. A total of 10.6 percent of operations transported heifers 50 miles or more.

e. For operations that sent heifers off-site to be raised, percentage of operations by number of miles heifers were transported to the off-site rearing facility, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Miles	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Fewer than 5.0	43.5	(8.4)	26.0	(5.4)	10.1	(2.8)	27.6	(3.7)
5.0 to 19.9	35.3	(8.7)	47.5	(6.1)	37.7	(4.4)	40.8	(3.9)
20.0 to 49.9	12.8	(5.2)	18.8	(4.7)	34.5	(4.7)	21.0	(3.0)
50 or more	8.4	(4.3)	7.7	(2.7)	17.7	(2.7)	10.6	(2.0)
Total	100.0		100.0		100.0		100.0	

Very few operations (4.1 percent) transported heifers out of State for rearing.

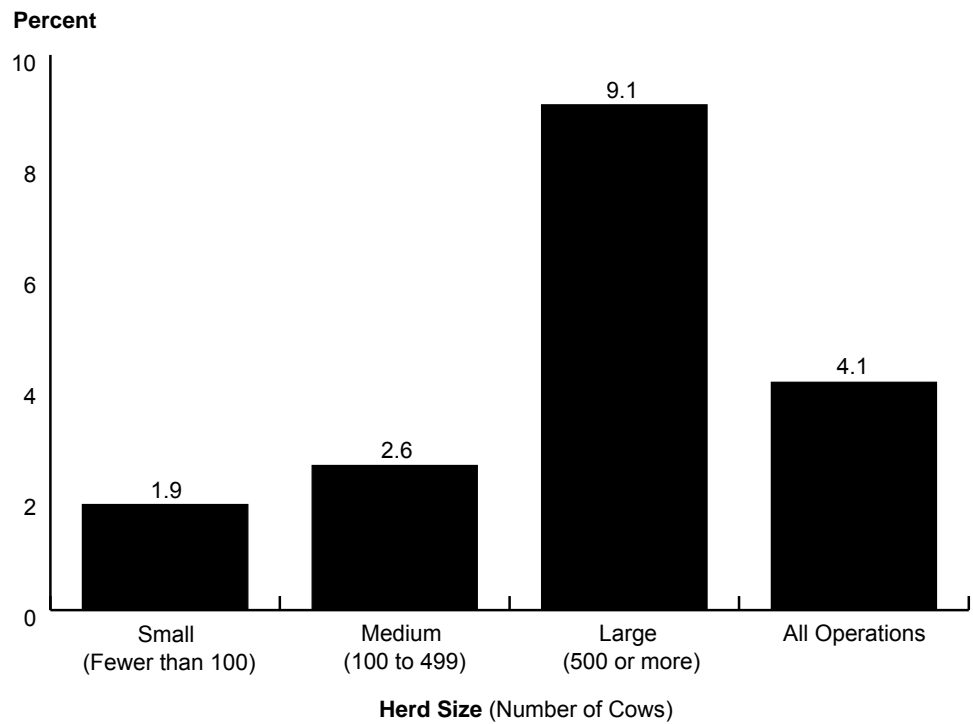
f. For operations that sent heifers off-site to be raised, percentage of operations where heifers were ever transported out of State for off-site rearing, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
1.9	(1.8)	2.6	(1.5)	9.1	(1.8)	4.1	(1.0)



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**For Operations that Sent Heifers Off-Site to be Raised, Percentage of Operations Where Heifers were Ever Transported Out of State for Off-Site Rearing, by Herd Size**



Producers were asked to choose the description that best described their primary off-site rearing facility. Ideally, heifer-raising facilities would only house animals from a single operation. More than one-quarter of operations (27.7 percent) sent heifers to a single rearing facility where heifers did not have contact with cattle from other operations, but the majority (51.3 percent) sent heifers to a single rearing facility where heifers had contact with cattle from other operations.

g. For operations that sent heifers off-site to be raised, percentage of operations by primary off-site rearing facility:

<b>Off-Site Rearing Facility</b>	<b>Percent Operations</b>	<b>Standard Error</b>
Heifers sent to a single rearing facility and did not have contact with cattle from other operations	27.7	(3.3)
Heifers sent to multiple rearing facilities and did not have contact with cattle from other operations	8.5	(2.1)
Heifers sent to a single rearing facility and had contact (commingled) with cattle from other operations	51.3	(4.0)
Heifers sent to multiple rearing facilities and had contact (commingled) with cattle from other operations	12.5	(3.0)
<b>Total</b>	<b>100.0</b>	

On average, weaned and bred heifers returned to the operation from the rearing facility at 7.0 and 21.6 months of age, respectively. The operation average age of any heifers returning was 17.3 months.

h. For operations that sent heifers off-site to be raised, operation average age that replacements returned to the operation, by heifer class:

<b>Operation Average Age (Months)</b>							
<b>Heifer Class*</b>							
<b>Weaned</b>		<b>Bred</b>		<b>Other**</b>		<b>All Operations</b>	
<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>
7.0	(0.6)	21.6	(0.3)	28.6	(1.0)	17.3	(0.6)

\*No operations reported unweaned heifers returning from an off-site rearing facility.

\*\*Heifers that had calved.

Producers were asked to identify the primary class of heifer replacements usually arriving or returning to the operation. Approximately two of three operations (67.6 percent) that sent any heifers off-site brought bred heifers back to the operation from the rearing facility. Approximately one in three operations (30.3 percent) brought back weaned heifers, while just 2.1 percent brought back “other” heifers (heifers that had calved). A higher percentage of large operations (53.4 percent) brought back weaned heifers compared to medium and small operations (27.3 and 15.1, respectively). A higher percentage of small and medium operations (79.1 and 72.2 percent, respectively) brought back bred heifers compared to large operations (46.6 percent).

i. For operations that sent heifers off-site to be raised, percentage of operations by primary class of heifers arriving or returning to the operation, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Heifer Class*	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Weaned	15.1	(6.0)	27.3	(5.1)	53.4	(4.7)	30.3	(3.4)
Bred	79.1	(6.7)	72.2	(5.2)	46.6	(4.7)	67.6	(3.5)
Other**	5.8	(3.4)	0.5	(0.5)	0.0	(0.0)	2.1	(1.2)
Total	100.0		100.0		100.0		100.0	

\*No operations reported unweaned heifers returning from an off-site rearing facility.

\*\*Heifers that had calved.

### 3. Colostrum management

Removing a newborn calf from the calving area and providing quality colostrum immediately after birth are recommended practices to maximize calf health. Isolating calves from adult cows reduces the potential for disease transmission, and providing quality colostrum within 1 hour after birth helps ensure that calves have antibodies to withstand disease challenges.

Administering colostrum to calves allows providers to determine colostrum quality and monitor when and how much calves receive. Calves that get colostrum only during nursing may not receive the proper quality or amount of colostrum in a timely manner. In addition, if the calving area is not properly maintained, calves are likely to ingest manure from the environment while searching for teats and suckling colostrum. Recommendations for colostrum feeding can be found in “A Guide to Colostrum and Colostrum Management for Dairy Calves” published by the Bovine Alliance on Management and Nutrition (BAMN). Calves should receive 3 quarts of high quality colostrum within 1 hour of birth and an additional 3 quarts in 12 hours, or 4 quarts administered by esophageal feeder within 1 hour of birth.

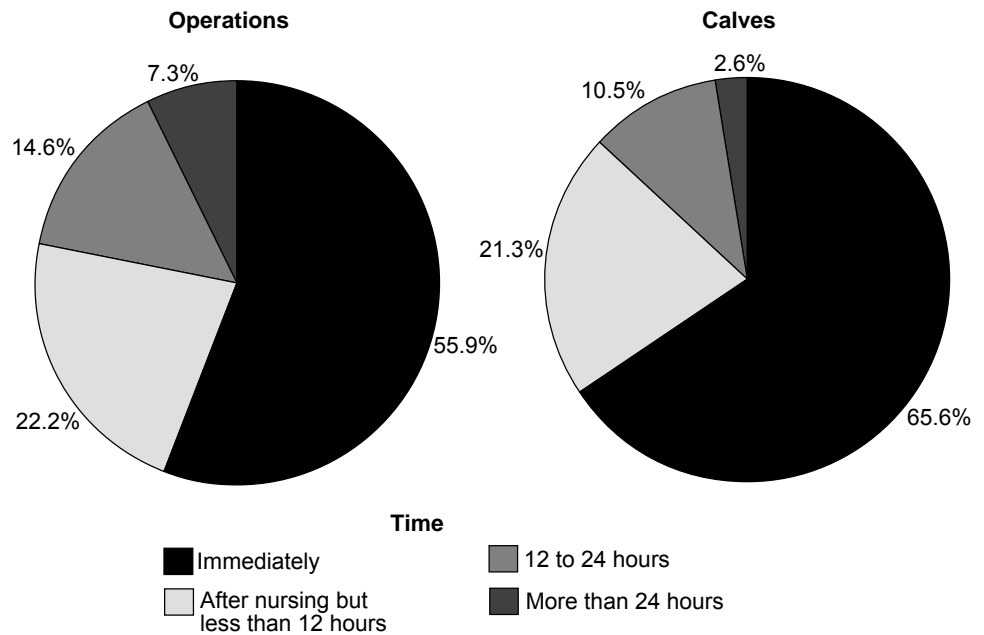
More than half the operations (55.9 percent) removed newborn heifer calves immediately after calving. These operations accounted for 65.6 percent of all heifer calves. One in five operations (22.2 percent)—accounting for 21.3 percent of newborn calves—removed calves after they nursed their dams but prior to 12 hours of age. Fewer than 1 in 10 operations (7.3 percent)—representing 2.6 percent of calves—allowed calves to stay with their dams for more than 24 hours.

a. Percentage of operations (and percentage of heifers born on these operations during 2006 and alive at 48 hours) by time following birth that calves were normally separated from their dams:

<b>Time</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Heifer Calves*</b>	<b>Standard Error</b>
Immediately (no nursing)	55.9	(1.4)	65.6	(1.5)
After nursing but less than 12 hours	22.2	(1.2)	21.3	(1.3)
12 to 24 hours	14.6	(1.0)	10.5	(0.9)
More than 24 hours	7.3	(0.8)	2.6	(0.3)
Total	100.0		100.0	

\*Born during 2006 and alive at 48 hours.

**Percentage of Operations (and Percentage of Heifer Calves Born on These Operations During 2006 and Alive at 48 Hours) by Time Following Birth that Calves Were Normally Separated from Their Dams**



On average, calves received hand-fed colostrum 3.3 hours following birth.

b. For operations that immediately removed calves from their dams and hand-fed colostrum, operation average number of hours after birth that calves got their first colostrum feeding, by herd size:

Operation Average Hours							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Hours	Std. Error	Hours	Std. Error	Hours	Std. Error	Hours	Std. Error
3.4	(0.1)	3.3	(0.1)	2.8	(0.2)	3.3	(0.1)



Photo by Dr. Jason Lombard

The majority of operations (59.2 percent) hand-fed colostrum to calves from a bucket or bottle. These operations accounted for 59.6 percent of heifer calves. About one-third of operations (36.3 percent) allowed calves to ingest colostrum during first nursing of the dam. A total of 4.3 percent of operations accounting for 13.7 percent of calves used an esophageal feeder to administer colostrum.

c. Percentage of operations (and percentage of heifers born on these operations during 2006 and alive at 48 hours) by method normally used for calves' first feeding of colostrum: (Table revised 2-13-2008)

<b>Colostrum Delivery Method</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Heifer Calves*</b>	<b>Standard Error</b>
During first nursing of dam	36.3	(1.4)	26.5	(1.3)
Hand-fed from bucket or bottle	59.2	(1.4)	59.6	(1.6)
Hand-fed using esophageal feeder	4.3	(0.5)	13.7	(1.2)
Did not get colostrum	0.2	(0.1)	0.2	(0.1)
<b>Total</b>	<b>100.0</b>		<b>100.0</b>	

\*Born during 2006 and alive at 48 hours.

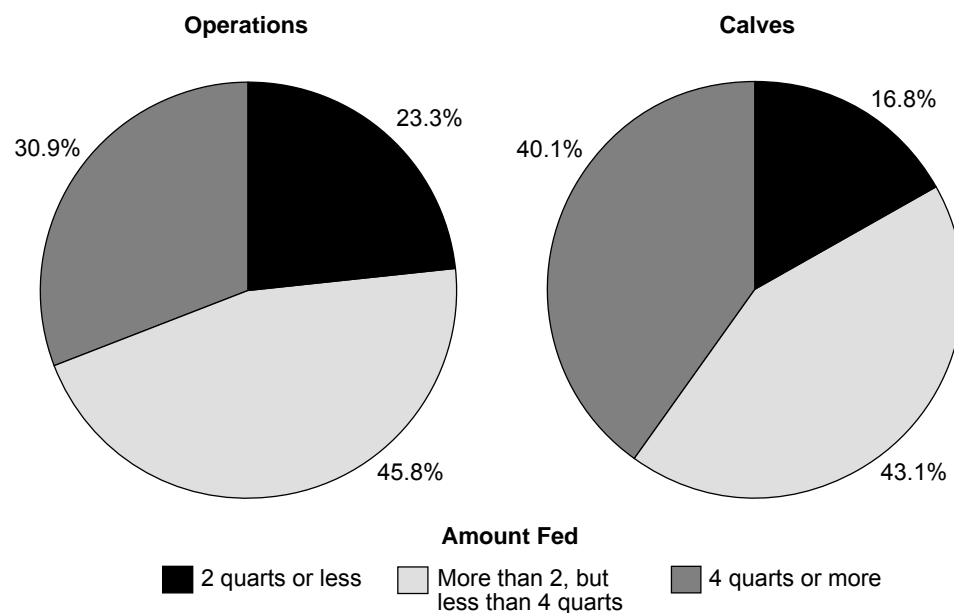
For operations that normally hand-fed colostrum, a total of 45.8 percent of operations representing 43.1 percent of heifer calves fed calves more than 2 but less than 4 quarts of colostrum during the first 24 hours of life. About 4 in 10 calves (40.1 percent) received 4 quarts or more, while 16.8 percent of calves received 2 quarts or less during the first 24 hours.

d. For operations that normally hand-fed colostrum, percentage of operations (and percentage of heifers born on these operations during 2006 and alive at 48 hours) by amount of colostrum normally fed during the first 24 hours:

Amount	Percent Operations	Standard Error	Percent Heifer Calves*	Standard Error
2 quarts or less	23.3	(1.6)	16.8	(1.4)
More than 2 but less than 4 quarts	45.8	(1.9)	43.1	(2.1)
4 quarts or more	30.9	(1.7)	40.1	(2.0)
Total	100.0		100.0	

\*Born during 2006 and alive at 48 hours.

**For Operations that Normally Hand-Fed Colostrum, Percentage of Operations (and Percentage of Heifer Calves Born and Alive at 48 Hours on These Operations During 2006) by Amount of Colostrum Normally Fed During the First 24 Hours**



About one in eight operations that hand-fed colostrum (13.0 percent) estimated the immunoglobulin levels of the colostrum or evaluated its quality before feeding. The percentage of operations that evaluated colostrum more than doubled from one herd size to the next, ranging from 7.6 percent of small operations to 45.2 percent of large operations.

e. For operations that normally hand-fed colostrum, percentage of operations that estimated the immunoglobulin levels of the colostrum or evaluated its quality, by herd size:

<b>Percent Operations</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
7.6	(1.3)	19.8	(2.3)	45.2	(3.2)	13.0	(1.1)

The most commonly used methods of evaluating colostrum were a colostrometer and visual appearance (43.7 and 41.6 percent of operations, respectively).

f. For operations that estimated immunoglobulin levels in colostrum or evaluated its quality, percentage of operations by primary method used for measuring immunoglobulin:

<b>Primary Method</b>	<b>Percent Operations</b>	<b>Standard Error</b>
Colostrometer	43.7	(4.2)
Visual appearance	41.6	(4.3)
Volume of first milking colostrum (pounds)	9.7	(2.8)
Other	5.0	(2.7)
Total	100.0	

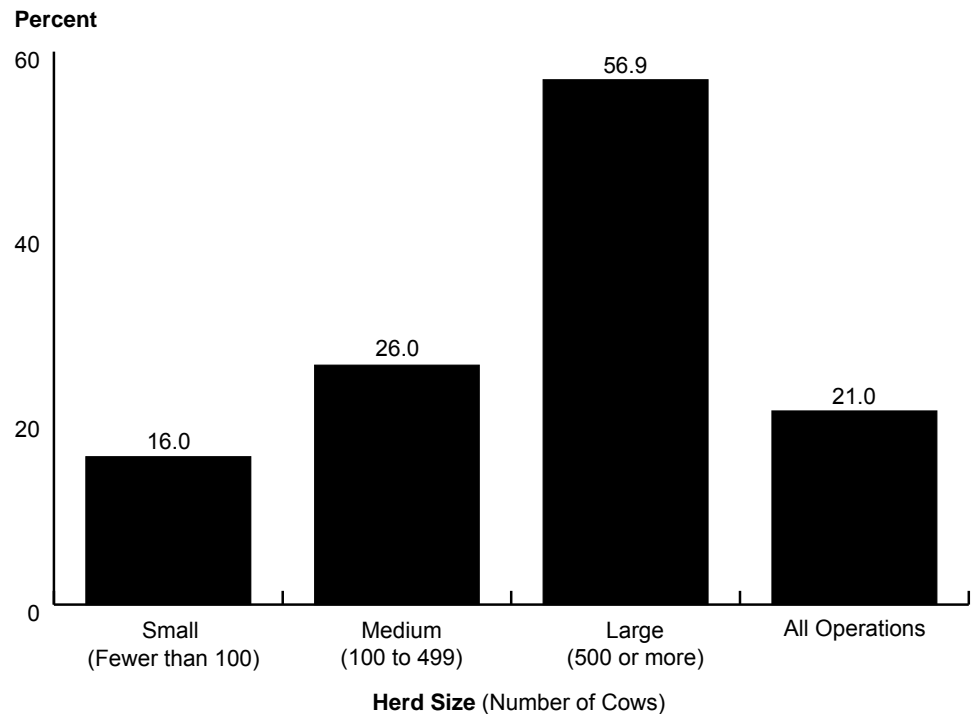


Pooling colostrum may increase calves' exposure to pathogens. About one in five operations (21.0 percent) pooled colostrum. As herd size increased so did the percentage of operations that pooled colostrum, ranging from 16.0 percent of small operations to 56.9 percent of large operations.

g. For operations that normally hand-fed colostrum, percentage of operations that pooled colostrum from more than one cow, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
16.0	(1.7)	26.0	(2.4)	56.9	(3.1)	21.0	(1.3)

**For Operations that Normally Hand-Fed Colostrum, Percentage of Operations that Pooled Colostrum from More Than One Cow, by Herd Size**



Proper collection, handling, storage, and administration of colostrum are important in reducing the potential for exposing calves to pathogens. The method of storing colostrum prior to feeding can dramatically impact its quality and pathogen load. Studies have shown that storing colostrum at warm ambient temperatures results in a rapid increase of bacterial growth. Refrigerating colostrum results in intermediate rates of bacterial proliferation compared to using a preservative and refrigeration to store colostrum.

The majority of small operations (64.8 percent) did not store colostrum, while only 11.8 percent of large operations did not store colostrum. The highest percentage of large operations either stored colostrum in a refrigerator (50.5 percent) or freezer (34.7 percent).

h. For operations that normally hand-fed colostrum, percentage of operations by primary method of storing colostrum and by herd size:

<b>Percent Operations</b>								
<b>Primary Method*</b>	<b>Herd Size (Number of Cows)</b>							
	<b>Small</b>		<b>Medium</b>		<b>Large</b>		<b>All</b>	
	<b>(Fewer than 100)</b>		<b>(100-499)</b>		<b>(500 or More)</b>		<b>Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Stored without refrigeration	4.4	(1.0)	2.8	(0.9)	3.0	(0.9)	3.9	(0.7)
Stored in refrigerator	6.0	(1.1)	15.2	(1.9)	50.5	(3.5)	11.1	(0.9)
Stored in freezer	24.8	(2.1)	36.2	(2.8)	34.7	(3.0)	28.2	(1.6)
Not stored	64.8	(2.3)	45.8	(3.0)	11.8	(2.8)	56.8	(1.8)
Total	100.0		100.0		100.0		100.0	

\*No operations reported "other" as a primary method for storing colostrum.

Pasteurizing colostrum is one method of reducing the potential for transmitting disease to calves. A high-temperature, short-time (HTST) system is one method of pasteurizing colostrum. However, HTST pasteurizers cause colostrum to gel and significantly reduce the amount of antibodies present, particularly immunoglobulin G (IgG). A batch pasteurizer uses a relatively low temperature and a longer heating time (60°C for 60-120 minutes). Batch pasteurizers do not cause colostrum to gel or significantly reduce IgG concentrations. It is important to note that pasteurization decreases pathogens found in colostrum but does not improve the quality of colostrum in terms of increased maternal antibodies. Although pasteurization is commonly used for milk and can be used for colostrum, the technical issues inherent in pasteurization may be one reason that dairies have been slow to adopt this management practice.

Less than 1 percent of operations that hand-fed colostrum (0.8 percent) pasteurized the colostrum before feeding it to calves. A higher percentage of large operations (6.4 percent) pasteurized colostrum compared to medium and small operations (0.9 and 0.2 percent, respectively).

i. For operations that normally hand-fed colostrum, percentage of operations that pasteurized colostrum, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
0.2	(0.2)	0.9	(0.4)	6.4	(1.6)	0.8	(0.2)

Measuring IgG levels or total serum proteins in calves within the first 3 days of life is a relatively simple method for evaluating colostrum management programs. Overall, 2.1 percent of operations routinely measured passive transfer via serum proteins. A higher percentage of large operations (14.5 percent) routinely evaluated passive transfer compared to medium and small operations (2.4 and 1.1 percent, respectively).

j. Percentage of operations that routinely monitored serum proteins (as a measure of passive transfer) in heifers within the first 3 days of life, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
1.1	(0.4)	2.4	(0.6)	14.5	(1.7)	2.1	(0.3)

#### 4. Heifer nutrition

A variety of liquid diets are commonly offered to unweaned calves. Recent literature suggests that feeding medicated milk replacer increases weaning weights and decreases morbidity and mortality. However, the most important factor in reducing morbidity and mortality was high levels of passive transfer provided through colostrum.

Properly pasteurizing and handling waste (nonsaleable) milk or saleable milk reduces pathogen loads without affecting milk quality. However, managing a pasteurization system that consistently provides high-quality nutrition to the calf with decreased pathogens is an intensive process and requires daily monitoring of equipment and the feeding system.

A higher percentage of large operations (26.4 percent) fed nonmedicated milk replacer than medium and small operations (14.2 and 11.4 percent, respectively). Alternatively, small and medium operations (55.2 and 68.2 percent, respectively) were more likely to feed medicated milk replacer than large operations (43.6 percent). Overall, medicated milk replacer was fed on more than half of all operations (57.5 percent). A higher percentage of large operations (28.7 percent) fed pasteurized waste milk compared to medium and small operations (3.0 and 1.0 percent, respectively). Small operations (32.2 percent) were more likely to feed unpasteurized whole (saleable) milk than medium and large operations (17.4 and 12.1 percent, respectively). Similar percentages of operations fed unpasteurized waste milk and unpasteurized whole (saleable) milk (30.6 and 28.0 percent, respectively).

a. Percentage of operations that fed a liquid diet to heifers at any time prior to weaning during 2006, by type of diet and by herd size:

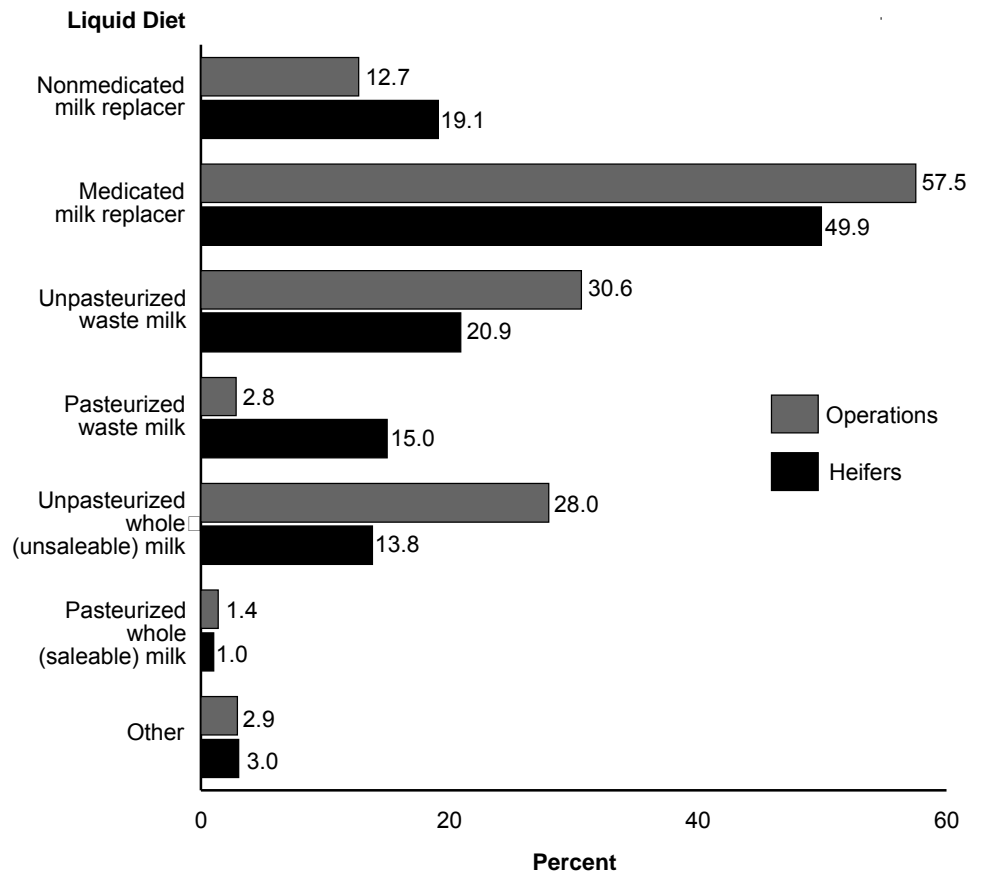
	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
<b>Liquid Diet</b>								
Nonmedicated milk replacer	11.4	(1.2)	14.2	(1.7)	26.4	(2.4)	12.7	(0.9)
Medicated milk replacer	55.2	(1.8)	68.2	(2.1)	43.6	(3.1)	57.5	(1.4)
Unpasteurized waste milk	32.2	(1.7)	25.7	(2.0)	27.6	(2.8)	30.6	(1.3)
Pasteurized waste milk	1.0	(0.3)	3.0	(0.9)	28.7	(2.7)	2.8	(0.3)
Unpasteurized whole (saleable) milk	32.2	(1.7)	17.4	(1.7)	12.1	(1.9)	28.0	(1.3)
Pasteurized whole (saleable) milk	1.3	(0.4)	1.6	(0.8)	2.0	(0.7)	1.4	(0.3)
Other	2.6	(0.6)	3.5	(0.9)	4.9	(1.8)	2.9	(0.5)

The percentage of heifers that received liquid diets was similar to the percentage of operations that fed a liquid diet. Almost half of all heifers (49.9 percent) received medicated milk replacer at some point prior to weaning.

b. Percentage of heifers that received a liquid diet any time prior to weaning during 2006, by type of diet and by herd size:

<b>Percent Heifers</b>								
	<b>Herd Size (Number of Cows)</b>							
	<b>Small</b>		<b>Medium</b>		<b>Large</b>		<b>All</b>	
	<b>(Fewer than 100)</b>		<b>(100-499)</b>		<b>(500 or More)</b>		<b>Operations</b>	
<b>Liquid Diet</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Nonmedicated milk replacer	10.4	(1.1)	13.7	(1.7)	27.9	(2.6)	19.1	(1.3)
Medicated milk replacer	57.9	(1.8)	63.0	(2.2)	36.4	(3.0)	49.9	(1.5)
Unpasteurized waste milk	23.2	(1.5)	20.3	(1.8)	19.9	(2.5)	20.9	(1.3)
Pasteurized waste milk	1.2	(0.3)	2.6	(0.6)	31.5	(2.6)	15.0	(1.2)
Unpasteurized whole (saleable) milk	25.5	(1.6)	13.3	(1.5)	6.9	(1.3)	13.8	(0.8)
Pasteurized whole (saleable) milk	0.9	(0.3)	0.6	(0.3)	1.4	(0.6)	1.0	(0.3)
Other	1.6	(0.4)	3.1	(0.9)	3.7	(1.3)	3.0	(0.6)

**Percentage of Operations that Fed a Liquid Diet to Heifers at Any Time Prior to Weaning During 2006, and Percentage of Heifers that Received a Liquid Diet Any Time Prior to Weaning, by Type of Liquid Diet**



The most common medication in milk replacer at the operation level was oxytetracycline in combination with neomycin (49.5 percent of operations). Oxytetracycline and/or decoquinat were fed on nearly one in five operations (21.9 and 18.8 percent, respectively).

c. Percentage of operations that fed a medicated milk replacer to heifers during 2006, by medication used:

Medication	Percent Operations	Standard Error
Chlortetracycline (CTC)	12.1	(1.1)
Oxytetracycline (OTC)	21.9	(1.5)
Oxytetracycline in combination with Neomycin (Oxy NEO)	49.5	(1.9)
Decoquinat	18.8	(1.4)
Lasalocid	7.2	(0.9)
Other	5.4	(0.9)
Any medication	57.5	(1.4)



Calf-feeding equipment should be cleaned between calves to prevent the spread of disease from one calf to another. Approximately one in four operations (24.4 percent) cleaned calf-feeding equipment between calves. A higher percentage of large and medium operations (39.1 and 30.9 percent, respectively) cleaned equipment between calves compared to small operations (21.4 percent). The majority of operations (58.5 percent) cleaned equipment daily, and there was no difference in percentages across herd sizes. Small and medium operations were more likely to clean equipment weekly (7.0 and 5.2 percent, respectively) than large operations (1.3 percent). “Other” frequency accounted for 7.5 percent of operations, and a high percentage of these operations reported cleaning equipment twice daily, but not between calves.

d. Percentage of operations by frequency milk feeding equipment\* was cleaned and disinfected, and by herd size:

<b>Percent Operations</b>								
<b>Frequency</b>	<b>Herd Size (Number of Cows)</b>							
	<b>Small</b>		<b>Medium</b>		<b>Large</b>		<b>All</b>	
	<b>(Fewer than 100)</b>		<b>(100-499)</b>		<b>(500 or More)</b>		<b>Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Between calves	21.4	(1.5)	30.9	(2.2)	39.1	(2.7)	24.4	(1.2)
Daily	59.8	(1.8)	55.9	(2.3)	51.8	(2.8)	58.5	(1.4)
Weekly	7.0	(1.0)	5.2	(0.9)	1.3	(0.9)	6.4	(0.8)
Monthly	3.8	(0.7)	1.4	(0.6)	2.2	(1.0)	3.2	(0.5)
Other	8.0	(1.0)	6.6	(1.1)	5.6	(1.3)	7.5	(0.8)
Total	100.0		100.0		100.0		100.0	

\*Bottles, buckets, nipples.

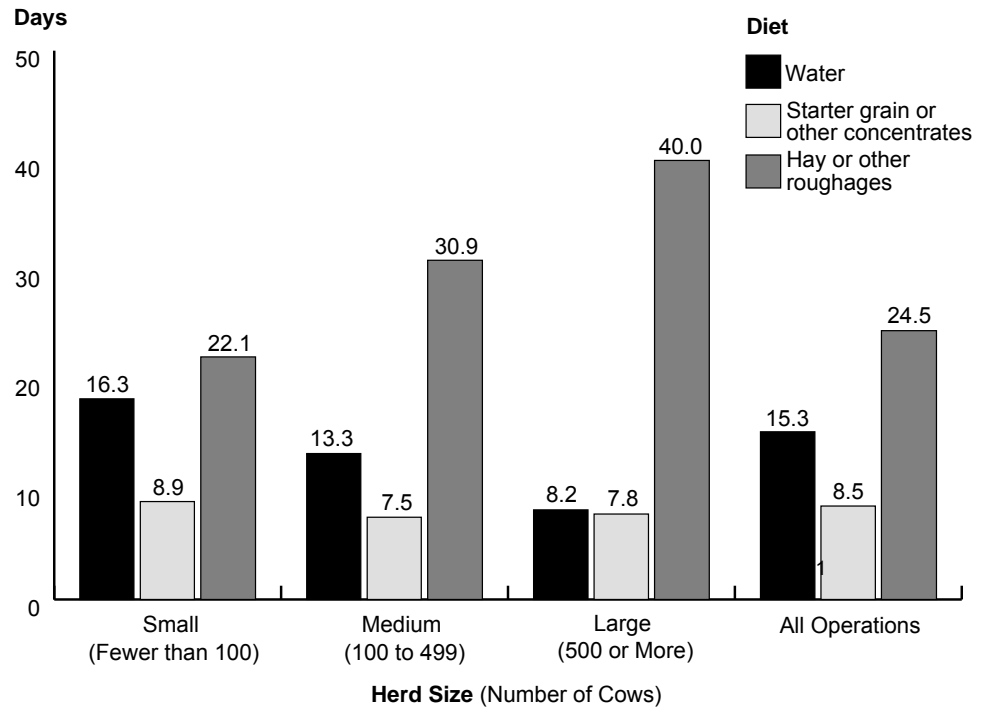
Current recommendations for providing water, starter, and hay to calves can be found in “A Guide to Dairy Calf Feeding and Management,” published by the BAMN. This publication recommends that calves have fresh water available from 1 day of age. Starter should be introduced at 4 days of age, and calves should be consuming 1.5 to 2.0 pounds per day prior to weaning. Hay should not be fed prior to weaning since—compared to calves fed a high quality, properly balanced starter—it may slow rumen development and growth.

Across all operations, water was offered to calves at 15.3 days of age. Large operations offered water earlier (8.2 days) than medium and small operations (13.3 and 16.3 days, respectively). Starter was routinely offered at 8.5 days of age, and there were no differences in average days across herd sizes. Hay was offered at increasing days of age as herd size increased, with the average age operations offered hay at 24.5 days old.

e. Operation average age (days) of unweaned heifers when heifers were routinely offered the following diets, by herd size:

<b>Operation Average Age (Days)</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Diet</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>
Water	16.3	(0.7)	13.3	(0.8)	8.2	(0.9)	15.3	(0.6)
Starter grain or other concentrate	8.9	(0.3)	7.5	(0.4)	7.8	(0.7)	8.5	(0.3)
Hay or other roughage	22.1	(0.7)	30.9	(1.1)	40.0	(1.9)	24.5	(0.6)

**Operation Average Age (Days) of Unweaned Heifers When Heifers were Routinely Offered the Following Diets, by Herd Size**



### 5. Weaning age

The recommended weaning age for heifers is 6 to 8 weeks and should occur when calves are consuming 1.5 to 2.0 pounds of starter daily. The operation average age at weaning was 8.2 weeks, with large operations weaning calves at an older age (9.1 weeks) than medium and small operations (7.9 and 8.2 weeks, respectively).

a. Operation average age of heifers at weaning, by herd size:

Operation Average Age (Weeks)							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error
8.2	(0.1)	7.9	(0.1)	9.1	(0.2)	8.2	(0.1)

Approximately one-third of operations (33.2 percent) weaned heifers at 8 weeks, while another 20.5 percent weaned heifers at 6 weeks. Less than 5 percent of operations (4.8 percent) weaned heifers at 4 weeks of age.

b. Percentage of operations by operation average weaning age of heifers:

<b>Operation Average Weaning Age (Weeks)</b>	<b>Percent Operations</b>	<b>Standard Error</b>
4	4.8	(0.6)
5	5.6	(0.6)
6	20.5	(1.2)
7	10.3	(0.8)
8	33.2	(1.4)
9	4.5	(0.6)
10	5.9	(0.6)
11	1.1	(0.3)
12	8.9	(0.9)
13 or more	5.2	(0.7)
Total	100.0	

## 6. Preventive practices

Preventive practices were commonly used for heifers: 94.6 percent of operations administered at least one preventive practice to heifers, and 94.6 percent of heifers were on these operations. Nearly 7 of 10 operations (69.4 percent) dewormed heifers, and similar percentages of operations provided vitamin A-D-E or selenium in feed (74.4 and 69.3 percent, respectively).

Percentage of operations (and percentage of heifers on these operations) by preventive practices normally used for heifers:

<b>Preventive Practice</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Heifers*</b>	<b>Standard Error</b>
Dewormers	69.4	(1.3)	55.2	(1.5)
Coccidiostats in feed	46.5	(1.4)	56.5	(1.6)
Vitamins A-D-E injection	10.4	(0.7)	17.4	(1.3)
Vitamins A-D-E in feed	74.4	(1.2)	71.9	(1.5)
Selenium injection	13.2	(0.9)	17.2	(1.2)
Selenium in feed	69.3	(1.3)	65.4	(1.6)
Ionophores in feed (e.g., Rumensin®, Bovatec®)	45.2	(1.4)	58.1	(1.6)
Probiotics	20.0	(1.1)	27.7	(1.6)
Anionic salts in feed	20.9	(1.1)	28.1	(1.5)
Other	4.6	(0.7)	2.5	(0.4)
Any preventive	94.6	(0.7)	94.6	(0.9)

\*As a percentage of January 1, 2007, heifer inventory.



Photo by Dr. Jason Lombard

## **7. Vaccination practices**

More than 60 percent of operations vaccinated heifers against bovine viral diarrhea (BVD), infectious bovine rhinotracheitis (IBR), parainfluenza Type 3 (PI3), bovine respiratory syncytial virus (BRSV), and leptospirosis. With the exception of IBR, PI3, BRSV, *Haemophilus somnus*, and *Mycobacterium avium* subspecies *paratuberculosis*, a higher percentage of large operations vaccinated against the listed diseases compared to medium or small operations. Less than half of operations (41.6 percent) normally vaccinated heifers against brucellosis. For heifers, a lower percentage of small operations vaccinated against each of the listed diseases than medium or large operations.

a. Percentage of operations that normally vaccinated heifers against the following diseases, by herd size:

Percent Operations								
Disease	Herd Size (Number of Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Bovine viral diarrhea (BVD)	69.0	(1.7)	84.5	(1.7)	94.1	(1.4)	73.7	(1.3)
Infectious bovine rhinotracheitis (IBR)	65.7	(1.7)	81.7	(1.8)	88.4	(1.8)	70.4	(1.3)
Parainfluenza Type 3 (PI3)	57.1	(1.8)	70.2	(2.1)	76.2	(2.4)	61.0	(1.4)
Bovine respiratory syncytial virus (BRSV)	60.6	(1.8)	75.4	(2.0)	80.8	(2.2)	64.9	(1.4)
<i>Haemophilus somnus</i>	31.1	(1.7)	42.4	(2.3)	43.0	(2.6)	34.2	(1.3)
Leptospirosis	63.2	(1.7)	78.1	(1.9)	86.7	(1.9)	67.7	(1.3)
<i>Salmonella</i>	15.5	(1.3)	34.4	(2.2)	52.5	(3.0)	21.5	(1.1)
<i>E. coli</i> mastitis	17.6	(1.4)	36.6	(2.2)	61.8	(3.0)	24.1	(1.1)
Clostridia	28.3	(1.6)	48.8	(2.2)	63.4	(2.9)	34.6	(1.3)
Brucellosis	37.4	(1.7)	49.5	(2.2)	66.7	(2.5)	41.6	(1.3)
<i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> (Johne's disease)	3.4	(0.7)	8.7	(1.3)	10.6	(2.1)	5.0	(0.6)
<i>Neospora</i>	3.8	(0.7)	11.3	(1.6)	20.5	(2.4)	6.3	(0.6)
Other	6.9	(0.9)	6.3	(1.0)	7.8	(1.4)	6.8	(0.7)
Any disease	79.3	(1.5)	92.0	(1.3)	97.1	(0.8)	83.0	(1.1)

Operations in the West region were more likely to vaccinate heifers for the majority of the listed diseases than operations in the East region. Almost twice the percentage of operations in the West region vaccinated against *Salmonella*, *E. coli* mastitis, clostridia, brucellosis, and *Neospora* compared to operations in the East region.

b. Percentage of operations that normally vaccinated heifers for the following diseases, by region:

Disease	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Bovine viral diarrhea (BVD)	85.6	(2.3)	72.8	(1.4)
Infectious bovine rhinotracheitis (IBR)	78.4	(2.7)	69.8	(1.4)
Parainfluenza Type 3 (PI3)	67.0	(3.0)	60.5	(1.5)
Bovine respiratory syncytial virus (BRSV)	72.3	(2.9)	64.4	(1.5)
<i>Haemophilus somnus</i>	36.6	(3.0)	34.1	(1.4)
Leptospirosis	78.8	(2.4)	66.9	(1.4)
<i>Salmonella</i>	41.5	(2.9)	20.0	(1.1)
<i>E. coli</i> mastitis	48.3	(2.9)	22.1	(1.2)
Clostridia	65.3	(3.0)	32.2	(1.3)
Brucellosis	87.0	(1.8)	38.0	(1.4)
<i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> (Johne's disease)	8.3	(1.7)	4.7	(0.6)
<i>Neospora</i>	17.9	(2.5)	5.4	(0.6)
Other	7.5	(1.8)	6.8	(0.7)
Any disease	97.8	(0.7)	81.2	(1.2)



c. For operations that gave BVD vaccinations to heifers, percentage of operations by type of BVD vaccine given:

Type of Vaccine	Percent Operations	Standard Error
Killed	43.1	(1.6)
Modified live	62.2	(1.5)

### 8. BVD testing

Animals persistently infected (PI) with BVD become infected while in utero and shed large quantities of BVD virus following birth. This high shedding can infect susceptible animals and create the next generation of PI animals. The most efficient method of determining if the dam and her calf are PI with BVD is to test the calf. Since a PI cow will always produce a PI calf, the dam is negative if the calf tests negative. Few operations (4.0 percent) routinely tested heifer replacements for PI with BVD. The percentage of operations that did test increased as herd size increased.

a. Percentage of operations that routinely tested heifer replacements to determine if animals were PI with BVD, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
1.9	(0.5)	6.7	(1.1)	21.2	(2.4)	4.0	(0.4)

Of operations that tested heifers, the majority (66.8 percent) used individual ear-notch tests, while 21.1 percent tested individual serum samples.

b. For operations that routinely tested heifer replacements to determine if animals were PI with BVD, percentage of operations by testing method used:

Testing Method	Percent Operations	Standard Error
Individual ear notch	66.8	(5.7)
Pooled ear notch	11.4	(4.0)
Individual serum sample	21.1	(5.4)
Pooled serum sample	6.0	(3.0)
Other	6.5	(2.4)

## D. Heifer Health

### 1. Births, stillbirths, and dystocia

Delivery of a calf is an important event for both the health of the cow and the calf. Current literature suggests that the number of stillborn calves appears to be increasing, with bull calves more likely to be born dead than heifer calves. Additionally, calves born to older cows are less likely to be stillborn or require assistance during calving, compared to first-calf heifers.

During 2006, almost 9 of 10 cows and heifers (86.0 percent) delivered a calf that was alive at 48 hours. Of the calves born during 2006, 93.5 percent were alive at 48 hours, while 6.5 percent were either born dead or died prior to 48 hours of age. Almost one in five calves (17.2 percent) needed assistance during delivery. Essentially, half the calves born and alive at 48 hours (50.8 percent) were heifer calves.

a. Calves born during 2006 and alive at 48 hours, as a percentage of the January 1, 2007, cow inventory:

Percent	Standard Error
86.0	(0.6)

b. Calves born alive and dead, as a percentage of calves born during 2006:

<b>Calf Status</b>	<b>Percent Calves</b>	<b>Standard Error</b>
Born and alive at 48 hours	93.5	(0.1)
Stillborn (born dead or died within 48 hours of birth)	6.5	(0.1)
Total	100.0	

c. Calves that required any assistance during birth (dystocia), as a percentage of calves born during 2006:

<b>Percent</b>	<b>Standard Error</b>
17.2	(0.6)

d. Heifer calves as a percentage of all calves born during 2006 and alive at 48 hours:

<b>Percent</b>	<b>Standard Error</b>
50.8	(0.3)

E. Cow Management

1. Source of cow replacements

Cow replacements born and raised on the operation entered the milking string during 2006 on the majority of operations (89.8 percent). Replacements accounted for over one-third of cow inventory (38.4 percent). Almost all operations (97.0 percent) had some replacements enter the milking string during 2006.

Percentage of operations (and percentage of cow inventory) by source of cow replacements that entered the milking string in 2006:

Replacement Source	Percent Operations	Standard Error	Percent Cows*	Standard Error
Born and raised on operation	89.8	(0.8)	27.8	(0.8)
Born on operation raised off operation	6.8	(0.6)	8.0	(0.7)
Born off operation	14.1	(1.0)	2.6	(0.2)
Any replacements	97.0	(0.5)	38.4	(0.8)

\*Number of replacements that entered the milking string during 2006, as a percentage of the January 1, 2007, cow inventory



Photo by Judy Rodriguez

## 2. Housing facilities

Animal housing designs play an important role in maximizing animal health, especially with the diverse climates across the United States. Housing for unweaned calves should provide a dry area with shelter that does not allow contact with other calves or older animals, especially. Hutches or individual animal pens usually are recommended for unweaned calves. Weaned heifers are more commonly grouped with animals of similar age. Lactating and dry cows are typically housed in facilities somewhat determined by local climate.

The majority of operations (74.9 percent) housed unweaned heifers in individual animal pens or hutches at some point during 2006. Approximately half the operations housed weaned heifers on pasture and/or in inside or outside multiple-animal areas (49.2, 55.6, and 44.6 percent of operations, respectively). Lactating cows were frequently housed in tie stall/stanchion barns, pasture, and freestalls (62.6, 49.4, and 41.1 percent of operations, respectively). Dry cows commonly had access to pasture on 60.1 percent of operations and to drylot/multiple-animal outside areas on 40.0 percent of operations.

a. Percentage of operations by type of housing used for any length of time during 2006, and by cattle class:

Percent Operations								
Housing Type	Cattle Class							
	Unweaned Heifers		Weaned Heifers		Lactating Cows		Dry Cows (Nonlactating)	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Tie stall/stanchion	12.1	(1.0)	12.2	(1.0)	62.6	(1.0)	32.7	(1.3)
Freestall	5.6	(0.7)	20.9	(1.2)	41.1	(1.2)	30.9	(1.2)
Individual pen/hutch	74.9	(1.3)	15.6	(1.1)	3.2	(0.5)	4.4	(0.6)
Drylot/multiple animal outside area	5.2	(0.7)	44.6	(1.4)	26.8	(1.2)	40.0	(1.3)
Multiple animal inside area	23.6	(1.3)	55.6	(1.5)	14.7	(1.0)	27.3	(1.2)
Pasture	6.3	(0.7)	49.2	(1.5)	49.4	(1.4)	60.1	(1.4)
Other	1.5	(0.3)	1.8	(0.4)	0.4	(0.1)	1.1	(0.2)

The most common primary housing types were individual-animal pens/hutches for unweaned heifers, multiple-animal inside areas for weaned heifers, and tie stall/stanchion barns for lactating cows. The percentages of dry cow primary housing were similar for tie stall/stanchion, freestall, drylot/multiple-animal outside housing, and pasture.

b. Percentage of operations by primary housing facility/outside area used during 2006, and by cattle class:

Percent Operations								
Cattle Class								
Housing Type	Unweaned Heifers		Weaned Heifers		Lactating Cows		Dry Cows (Nonlactating)	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Tie stall/stanchion	8.9	(0.8)	5.9	(0.7)	49.2	(1.3)	23.3	(1.3)
Freestall	2.7	(0.5)	12.1	(0.9)	32.6	(1.1)	22.8	(1.1)
Individual pen/hutch	67.9	(1.3)	5.3	(0.7)	0.1	(0.1)	1.0	(0.3)
Drylot/multiple animal outside area	0.6	(0.2)	22.9	(1.1)	4.6	(0.5)	18.7	(1.0)
Multiple animal inside area	14.2	(1.1)	34.6	(1.4)	3.4	(0.6)	12.9	(0.9)
Pasture	0.6	(0.2)	10.8	(0.9)	9.9	(0.8)	20.5	(1.1)
Not housed on operation	4.7	(0.5)	7.7	(0.7)	0.0	(--)	0.2	(0.1)
Other	0.4	(0.2)	0.7	(0.2)	0.2	(0.1)	0.6	(0.2)
Total	100.0		100.0		100.0		100.0	

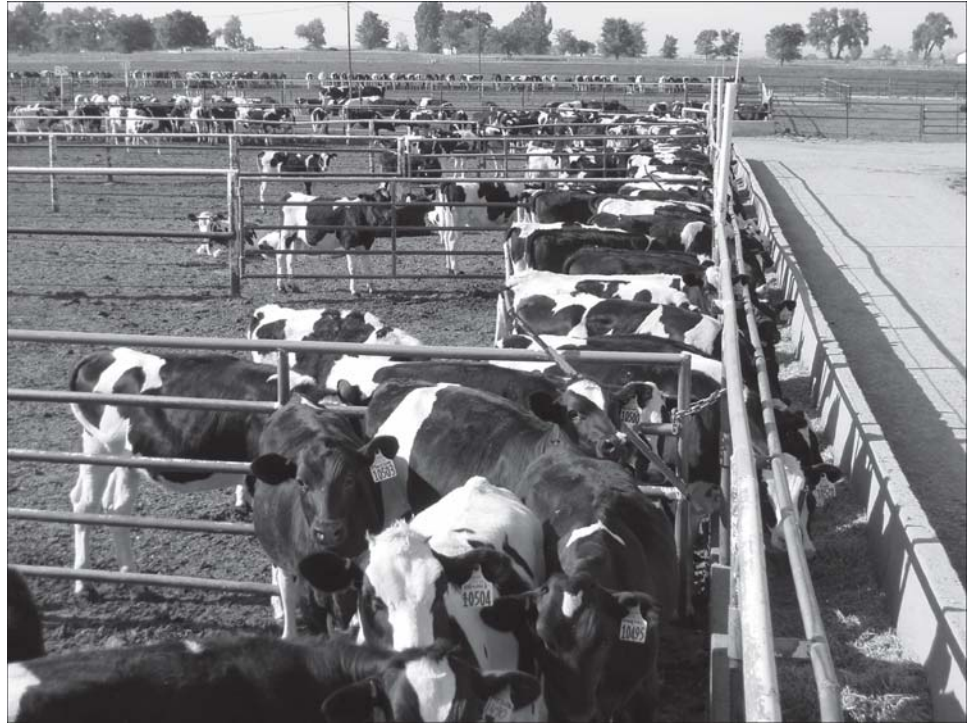


Photo by Dr. Jason Lombard

Separating dry cows from lactating cows allows the producer to formulate different diets to meet the specific needs of each group. Limiting potassium intake and providing anionic salts to dry cows are two preventive practices for milk fever that can be implemented when dry cows are housed separately from lactating cows. Dry cow or maternity housing was separate from lactating cow housing on 60.0 percent of operations, and the percentage of operations that used separate housing increased as herd size increased.

c. Percentage of operations where maternity housing was separate from housing used for lactating cows, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
51.5	(1.7)	80.8	(1.8)	90.4	(2.0)	60.0	(1.3)

### 3. Milking facilities

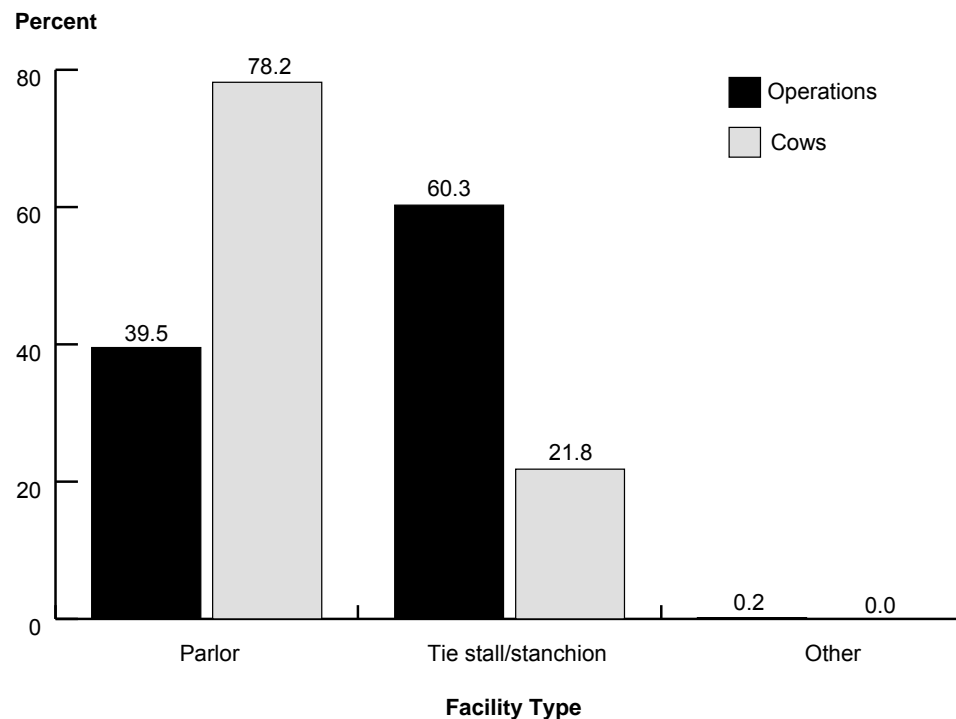
The majority of operations (60.3 percent) had a tie stall/stanchion milking facility. Although just 39.5 percent of operations used parlors, 78.2 percent of cows were on operations that milked in parlors.

a. Percentage of operations (and percentage of cows on these operations) by primary milking facility used in 2006:

Facility Type	Percent Operations	Standard Error	Percent Cows*	Standard Error
Parlor	39.5	(1.0)	78.2	(0.6)
Tie stall/stanchion	60.3	(1.0)	21.8	(0.6)
Other	0.2	(0.1)	0.0	(0.0)
Total	100.0		100.0	

\*As a percentage of January 1, 2007, cow inventory.

#### Percentage of Operations (and Percentage of Cows\* on These Operations) by Primary Milking Facility Used in 2006



As a percentage of January 1, 2007, cow inventory



Herringbone and parallel parlors were the two most common parlor types. Over half of operations that used parlors (54.4 percent) used a herringbone parlor, and these operations accounted for 48.7 percent of cows. Approximately one-fifth of operations (19.7 percent) used a parallel parlor to milk, and 30.6 percent of cows were on these operations.

b. For operations that primarily used a parlor milking facility, percentage of operations (and percentage of cows on these operations) by parlor type:

<b>Parlor Type</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Cows*</b>	<b>Standard Error</b>
Side-opening (tandem)	6.6	(0.9)	3.7	(0.7)
Herringbone (fishbone)	54.4	(1.8)	48.7	(1.9)
Parallel (side-by-side)	19.7	(1.3)	30.6	(1.7)
Parabone (herringbone-parallel hybrid)	3.8	(0.6)	3.8	(0.6)
Swing	2.2	(0.6)	0.8	(0.2)
Rotary (carousel)	1.1	(0.3)	5.2	(1.3)
Flat barn	9.9	(1.2)	6.2	(0.8)
Other	2.3	(0.6)	1.0	(0.3)
Total	100.0		100.0	

\*As a percentage of January 1, 2007, cow inventory.

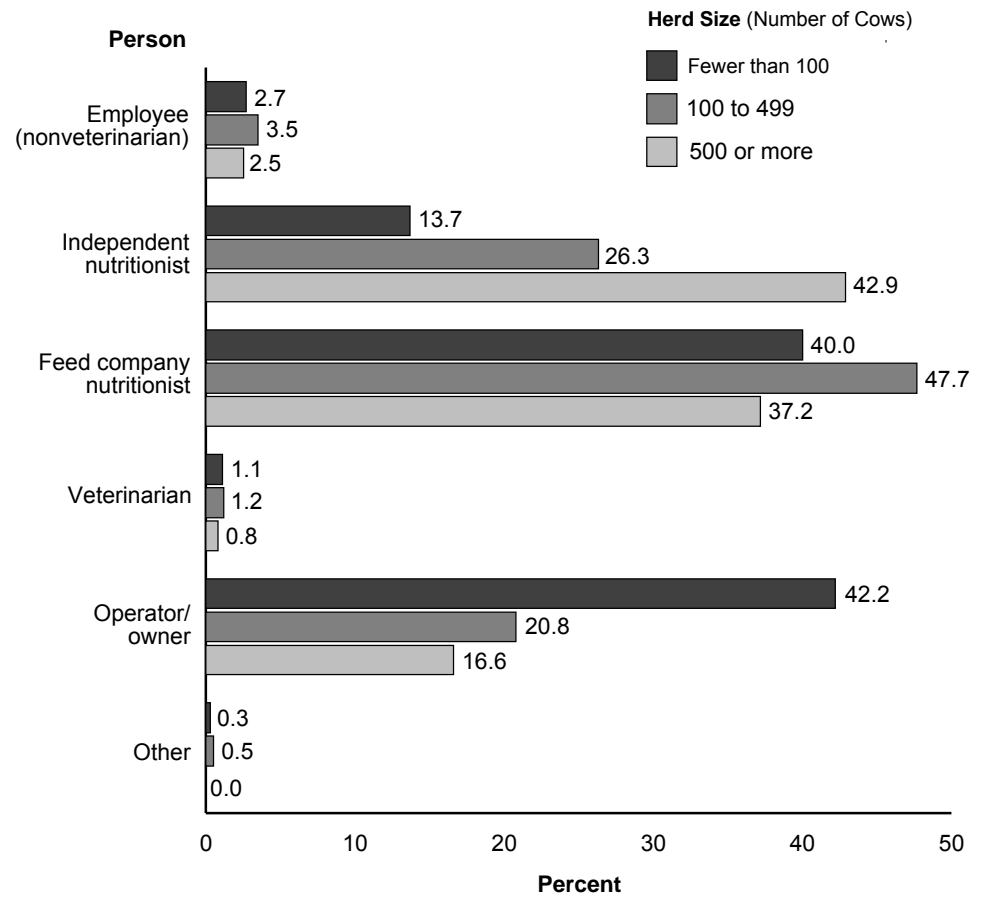
#### 4. Cow nutrition

Nutrition is an important component of herd health and productivity. The majority of operations used either a feed company nutritionist or the owner/operator for balancing rations fed to cows (41.6 and 36.1 percent of operations, respectively). The percentage of operations that used an independent nutritionist to balance rations increased as herd size increased. The percentage of operations that used the owner/operator to balance rations decreased from 42.2 percent of small operations to 16.6 percent of large operations. Very few operations used an employee or veterinarian to balance feed rations.

a. Percentage of operations by person primarily responsible for balancing feed rations, and by herd size:

Person	Percent Operations							
	Herd Size (Number of Cows)							
	Small		Medium		Large		All	
	(Fewer than 100)		(100-499)		(500 or More)		Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Employee (nonveterinarian)	2.7	(0.6)	3.5	(1.0)	2.5	(1.0)	2.8	(0.5)
Independent nutritionist	13.7	(1.3)	26.3	(2.1)	42.9	(2.6)	18.0	(1.0)
Feed company nutritionist	40.0	(1.7)	47.7	(2.3)	37.2	(2.9)	41.6	(1.4)
Veterinarian	1.1	(0.3)	1.2	(0.5)	0.8	(0.3)	1.1	(0.3)
Operator/owner	42.2	(1.8)	20.8	(1.9)	16.6	(2.5)	36.1	(1.4)
Other	0.3	(0.2)	0.5	(0.4)	0.0	(0.0)	0.4	(0.1)
Total	100.0		100.0		100.0		100.0	

### Percentage of Operations by Person Primarily Responsible for Balancing Feed Rations, and by Herd Size



Approximately half of operations (51.1 percent) fed a total mixed ration. Feeding a total mixed ration has the advantage of providing a consistent mixture of feeds to the cow and her rumen environment. Only 37.8 percent of small operations fed a total mixed ration, compared to 94.1 percent of large operations. This practice may be much more common in large herds because there are enough cows in a similar stage of lactation and/or level of milk production, and the facility design usually accommodates the efficient formulation of a total mixed ration.

b. Percentage of operations that fed a total mixed ration, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
37.8	(1.6)	84.7	(1.7)	94.1	(1.4)	51.1	(1.3)

A higher percentage of operations with RHA milk production of 20,000 lb/cow or more (70.7 percent) fed a total mixed ration, compared to 23.5 percent of operations with an RHA milk production of less than 16,000 lb/cow.

c. Percentage of operations that fed a total mixed ration, by RHA milk production (lb/cow):

Percent Operations					
RHA Milk Production (lb/cow)					
Less Than 16,000		16,000 to 19,999		20,000 or More	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
23.5	(2.4)	42.7	(2.3)	70.7	(1.9)

Forage test results were used to balance feed rations on three of four operations (75.5 percent). A lower percentage of small operations (70.1 percent) used forage test results to balance feed rations compared to medium and large operations (89.9 and 90.7 percent, respectively).

d. Percentage of operations that used forage test results to balance feed rations, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
70.1	(1.7)	89.9	(1.4)	90.7	(1.8)	75.5	(1.2)

The use of pasture decreased as herd size increased. The majority of small operations (68.7 percent) relied on pasture for forage while less than 1 in 5 large operations (18.6 percent) allowed cows access to pasture during the growing season. More than half of operations (58.9 percent) used pasture during the growing season to provide part of the ration forage component. The percentage of cows that had access to pasture also decreased as herd size increased, with 33.0 percent of all cows having access to pasture.

e. Percentage of operations (and percentage of cows on these operations) that relied on pasture during the growing season to provide part of the ration forage component for cows, by herd size:

Percent Operations								
Herd Size (Number of Dairy Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Operations	68.7	(1.6)	36.6	(2.2)	18.6	(2.3)	58.9	(1.3)
Cows	64.3	(1.7)	34.5	(2.1)	16.1	(2.0)	33.0	(1.3)

### 5. Number of bulls

The percentage of operations that used bulls for breeding increased as herd size increased. Approximately half of small operations (46.3 percent) used bulls for breeding compared to 82.6 percent of large operations.

a. Percentage of operations by the number of bulls in the January 1, 2007, inventory used for breeding dairy cows or heifers, and by herd size:

Percent Operations								
Herd Size (Number of Dairy Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Number of Bulls	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
0	53.7	(1.8)	38.1	(2.3)	17.4	(1.7)	48.3	(1.4)
1	31.9	(1.7)	22.6	(1.9)	6.5	(1.6)	28.5	(1.3)
2 to 4	14.2	(1.2)	31.8	(2.1)	22.8	(2.2)	18.6	(1.0)
5 or more	0.2	(0.1)	7.5	(0.9)	53.3	(2.5)	4.6	(0.3)
Total	100.0		100.0		100.0		100.0	

b. Of all bulls present on January 1, 2007, used for breeding dairy cows and heifers, percentage of bulls that were dairy bulls:

Percent Bulls*	Standard Error
87.3	(2.1)

\*Number of dairy bulls used for breeding dairy cattle, as a percentage of all bulls used for breeding dairy cattle.

## 6. Adverse drug reactions

Adverse reactions, which include a lump or swelling at the injection site, hives, abortion, collapse, or death, can occur following the administration of preventive or therapeutic products. Only 12.7 percent of operations had at least one adverse reaction on their operation during 2006.

a. Percentage of operations with at least one cow that had an adverse reaction to an injection during 2006:

Percent Operations	Standard Error
12.7	(0.8)

The most common adverse reaction was a lump or swelling at the injection site (75.9 percent of operations). Loss of milk production was observed on 31.4 percent of operations reporting an adverse reaction.

b. For operations with at least one cow that had an adverse reaction to an injection, percentage of operations with any cows displaying clinical signs:

Clinical Sign	Percent Operations	Standard Error
Collapse	19.7	(2.8)
Hives	12.7	(2.1)
Abortion	13.2	(2.1)
Lump or swelling at injection site	75.9	(3.0)
Loss of milk production	31.4	(3.3)
Lack of product efficacy	5.4	(1.7)
Fever	11.1	(2.3)
Lethargy	9.4	(2.1)
Respiratory disease	6.3	(1.6)
Infertility	4.5	(1.4)
Other	6.0	(1.5)

For operations with at least one cow that had an adverse reaction to an injection, approximately one in three operations (29.8 percent) had a veterinarian examine any cows with adverse reactions.

c. For operations with at least one cow that had an adverse reaction to an injection, percentage of operations that had a veterinarian examine any cows with an adverse reaction:

Percent Operations	Standard Error
29.8	(3.2)

Vaccines, veterinary drugs, and medicated feeds are regulated by two different governmental agencies: vaccines and other biologics are regulated by the USDA's Centers for Veterinary Biologics; veterinary drugs, medicated feeds, and animal devices are regulated by the Food and Drug Administration, Center for Veterinary Medicine. Both agencies strongly encourage producers encountering any problems with veterinary products, including adverse reactions in animals, to contact the manufacturer and report the event prior to contacting the appropriate regulatory agency. Both agencies have Web sites where the adverse event can be reported.

To report adverse events associated with vaccines and other biologics, contact USDA—Center for Veterinary Biologics:

<http://www.aphis.usda.gov/vs/cvb/html/adverseeventreport.html>.

Adverse events associated with drugs, medicated feeds, and animal devices should be reported to the FDA—Center for Veterinary Medicine:

<http://www.fda.gov/cvm/adetoc.htm>.

Nearly half of operations (47.1 percent) reported the adverse reaction to their veterinarian. No producers reported reactions to either USDA or FDA, and only 3.9 percent of operations reported adverse reactions to the manufacturer. More than half of operations (52.4 percent) did not report the adverse reaction.



d. For operations with at least one cow that had an adverse reaction to an injection, percentage of operations that reported any adverse reaction, by official reported to:

Official	Percent Operations	Standard Error
Veterinarian	47.1	(3.5)
Manufacturer	3.9	(1.1)
USDA's Center for Veterinary Biologics	0.0	(--)
FDA's Center for Veterinary Medicine	0.0	(--)
Other	0.3	(0.3)
Did not report adverse reaction	52.4	(3.5)

## 7. Preventive practices

Almost all operations (95.3 percent) used some preventive practice for cows. Providing vitamin A-D-E or selenium in feed and deworming were the most frequently practiced preventives given on 80.2, 76.1, and 63.3 percent of operations, respectively.

Percentage of operations (and percentage of cows on these operations) by preventive practices normally used for cows:

Preventive Practice	Percent Operations	Standard Error	Percent Cows*	Standard Error
Dewormers	63.3	(1.4)	46.0	(1.3)
Ionophores in feed (e.g., Rumensin®)	26.8	(1.1)	40.0	(1.5)
Vitamins A-D-E injection	12.9	(0.8)	20.2	(1.2)
Vitamins A-D-E in feed	80.2	(1.2)	79.3	(1.2)
Selenium injection	14.9	(0.9)	19.8	(1.2)
Selenium in feed	76.1	(1.2)	73.5	(1.3)
Probiotics	26.1	(1.2)	34.8	(1.6)
Anionic salts in close-up dry cow feed	26.7	(1.2)	44.5	(1.5)
Limited potassium in dry cow ration	46.9	(1.4)	62.8	(1.4)
Other	3.6	(0.6)	2.8	(0.4)
Any preventive	95.3	(0.7)	96.0	(0.7)

\*As a percentage of January 1, 2007, cow inventory.

### 8. Vaccination practices

Approximately four of five operations (82.2 percent) vaccinated cows. With the exception of “other” disease, a lower percentage of small operations vaccinated against any single disease listed in the table below compared to medium and large operations. Compared to medium operations, a higher percentage of large operations vaccinated against BVD, *Salmonella*, *E. coli* mastitis, and clostridia. Vaccinating for any disease increased as herd size increased, with 77.8, 92.7, and 98.4 percent of small, medium, and large operations, respectively, vaccinating for any disease.

a. Percentage of operations that normally vaccinated cows against the following diseases, by herd size:

Disease	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Bovine viral diarrhea (BVD)	69.8	(1.7)	87.2	(1.6)	95.7	(1.0)	75.0	(1.3)
Infectious bovine rhinotracheitis (IBR)	66.1	(1.7)	84.3	(1.7)	88.0	(2.1)	71.3	(1.3)
Parainfluenza Type 3 (PI3)	58.0	(1.8)	72.3	(2.0)	72.9	(2.5)	61.9	(1.4)
Bovine respiratory syncytial virus (BRSV)	59.9	(1.8)	78.1	(1.8)	79.4	(2.5)	65.0	(1.4)
<i>Haemophilus somnus</i>	30.8	(1.7)	41.3	(2.3)	40.8	(2.9)	33.6	(1.3)
Leptospirosis	65.6	(1.7)	81.1	(1.8)	84.3	(2.4)	70.0	(1.3)
<i>Salmonella</i>	16.2	(1.3)	37.9	(2.3)	55.1	(3.0)	23.0	(1.1)
<i>E. coli</i> mastitis	25.3	(1.5)	50.0	(2.3)	79.1	(2.5)	33.5	(1.2)
Clostridia	20.7	(1.5)	42.7	(2.2)	60.8	(2.9)	27.7	(1.2)
<i>Neospora</i>	3.6	(0.7)	10.7	(1.6)	17.8	(2.3)	5.9	(0.6)
Other	7.6	(0.9)	6.6	(1.1)	7.7	(1.5)	7.4	(0.7)
Any vaccination	77.8	(1.5)	92.7	(1.2)	98.4	(0.5)	82.2	(1.1)

b. Percentage of operations that normally vaccinated cows against the following diseases, by region:

Disease	Percent Operations			
	Region			
	West		East	
	Pct.	Std. Error	Pct.	Std. Error
Bovine viral diarrhea (BVD)	82.2	(2.5)	74.4	(1.3)
Infectious bovine rhinotracheitis (IBR)	73.6	(2.8)	71.1	(1.4)
Parainfluenza Type 3 (PI3)	59.7	(3.0)	62.1	(1.5)
Bovine respiratory syncytial virus (BRSV)	66.8	(3.0)	64.8	(1.5)
<i>Haemophilus somnus</i>	30.9	(2.8)	33.8	(1.4)
Leptospirosis	74.7	(2.8)	69.6	(1.4)
<i>Salmonella</i>	44.5	(3.0)	21.3	(1.2)
<i>E. coli</i> mastitis	62.1	(2.9)	31.2	(1.3)
Clostridia	53.7	(3.1)	25.6	(1.3)
<i>Neospora</i>	14.2	(2.3)	5.3	(0.6)
Other	6.6	(1.4)	7.4	(0.8)
Any disease	89.7	(2.2)	81.6	(1.2)

### 9. Types of BVD vaccine

A higher percentage of operations administered killed versus modified live vaccines to cows (56.3 and 48.9 percent, respectively).

a. For operations that gave BVD vaccinations to cows, percentage of operations by type of BVD vaccine given:

Type of Vaccine	Percent Operations	Standard Error
Killed	56.3	(1.6)
Modified live	48.9	(1.6)

For operations that administered BVD vaccine, 60.8 percent reported that the vaccine contained both Type I and Type II strains. Approximately one-quarter of operations (27.2 percent) did not know which strain was included in the vaccine.

b. For operations that gave BVD vaccinations, percentage of operations by strain of BVD contained in vaccine administered:

BVD Strain	Percent Operations	Standard Error
Type I only	4.3	(0.6)
Type II only	7.7	(0.8)
Combination (Type I and Type II)	60.8	(1.5)
Did not know	27.2	(1.4)
Total	100.0	

More than four of five operations that administered BVD vaccine to cows (80.2 percent) reported giving annual booster vaccines.

c. For operations that gave BVD vaccinations to cows, percentage of operations that gave annual BVD booster injections:

Percent Operations	Standard Error
80.2	(1.3)

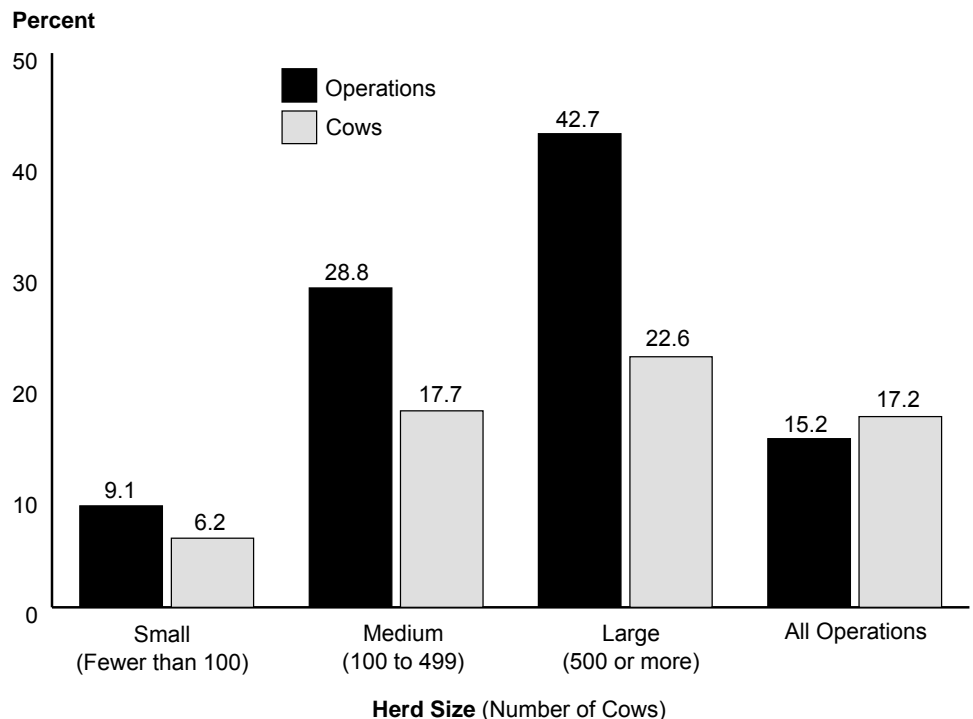
### 10. Bovine somatotropin (bST)

A total of 15.2 percent of operations used bST on 17.2 percent of cows. As herd size increased so did the percentage of operations that used bST, ranging from 9.1 percent of small operations to 42.7 percent of large operations.

a. Percentage of operations (and percentage of cows milked on January 1, 2007) that used bST in cows during the current lactation (at the time of the Dairy 2007 interview), by herd size:

Measure	Percent							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Operations	9.1	(0.9)	28.8	(2.0)	42.7	(2.5)	15.2	(0.8)
Cows	6.2	(0.7)	17.7	(1.4)	22.6	(1.5)	17.2	(0.8)

**Percentage of Operations (and Percentage of Cows Milked on January 1, 2007) that Used bST in Cows During the Current Lactation (at the Time of the Dairy 2007 Interview), by Herd Size**



Although the percentages of operations that used bST were similar between regions, a higher percentage of cows in the East region (20.8 percent) received bST compared to 12.3 percent in the West region.

b. Percentage of operations (and percentage of cows milked on January 1, 2007) that used bST in cows during the current lactation (at the time of the Dairy 2007 interview), by region:

Measure	Percent			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Operations	16.3	(1.6)	15.1	(0.9)
Cows	12.3	(1.3)	20.8	(1.1)

Operations that used bST on at least some cows had a RHA milk production of 3,000 to 5,000 lb/cow more milk compared to operations that did not use bST. Operations that used bST had a RHA of 23,304 lb/cow compared to 18,433 lb/cow for operations that did not use bST.

c. Operation average RHA milk production (lb/cow) by bST use and by herd size:

bST Used	Operation Average							
	Herd Size (Number of Dairy Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Lb/Cow	Std. Error	Lb/Cow	Std. Error	Lb/Cow	Std. Error	Lb/Cow	Std. Error
Yes	22,490	(392)	23,705	(281)	24,576	(249)	23,304	(210)
No	17,980	(142)	19,783	(184)	21,278	(275)	18,433	(118)

## F. Cow Health

### 1. Abortions

Abortion is a term generally used to describe the expulsion of a dead fetus from 45 to 265 days of gestation. A goal is to have less than 2 percent of cows and heifers abort each year, although up to 5 percent is considered normal. The overall abortion percentage (including both heifers and cows) was 4.5 percent during 2006. The abortion percentage was higher for cows than for heifers (5.0 and 3.3 percent, respectively). Large operations had a higher percentage of abortions than medium and small operations.

a. Percentage of heifers, cows, and both heifers and cows (number aborted divided by inventory) that aborted during 2006, by herd size:

Percent Abortions								
Cattle Class	Herd Size (Number of Cows)							
	Small		Medium		Large		All	
	(Fewer than 100)		(100-499)		(500 or More)		Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Heifers*	2.4	(0.2)	2.8	(0.2)	4.1	(0.4)	3.3	(0.2)
Cows**	4.4	(0.2)	4.1	(0.2)	5.8	(0.4)	5.0	(0.2)
Both heifers and cows***	3.7	(0.1)	3.7	(0.1)	5.3	(0.3)	4.5	(0.2)

\*Breeding age or older heifers on January 1, 2007

\*\*Cow inventory minus breeding age and older heifers on January 1, 2007

\*\*\*Cow inventory on January 1, 2007

Over one-third of operations (38.2 percent) reported an abortion percentage of less than 2.0 percent. Less than 5 percent of cows and heifers aborted on 72.5 of operations, while on 6.9 percent of operations 10 percent or more of cows and heifers aborted during 2006.

b. Percentage of operations by reported total abortion percentage:

<b>Abortion Percentage</b>	<b>Percent Operations</b>	<b>Standard Error</b>
Less than 2.0	38.2	(1.4)
2.0 to 4.9	34.3	(1.3)
5.0 to 9.9	20.6	(1.1)
10.0 to 14.9	4.9	(0.6)
15.0 or more	2.0	(0.4)
Total	100.0	



## 2. Cow morbidity

During 2006, more than 80 percent of operations identified at least one case of clinical mastitis, lameness, retained placenta, infertility problems, or milk fever. With the exception of “other” health related problems, a higher percentage of large operations than small operations observed at least one cow with health problems. Large operations would be expected to observe more health problems due to the larger numbers of cows at risk for developing any health problem. All medium and large operations (100.0 percent) observed at least one case of clinical mastitis, lameness, and milk fever. Neurological problems and “other” health-related problems were identified on 10.7 and 7.7 percent of all operations, respectively.

a. Percentage of operations by producer-identified health problems occurring in cows during 2006, and by herd size:

Producer-Identified Health Problem	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Clinical mastitis	93.0	(1.0)	100.0	(--)	100.0	(--)	94.9	(0.8)
Lameness	83.4	(1.4)	100.0	(--)	100.0	(--)	87.9	(1.0)
Respiratory problems	38.0	(1.7)	98.1	(0.8)	100.0	(--)	51.5	(1.4)
Retained placenta (more than 24 hours)	76.9	(1.5)	99.7	(0.2)	100.0	(--)	82.6	(1.2)
Infertility problems (not pregnant 150 days after calving)	78.2	(1.5)	99.2	(0.4)	100.0	(--)	83.5	(1.1)
Other reproductive problems (e.g., dystocia, metritis)	31.0	(1.6)	58.1	(2.2)	67.4	(2.7)	38.8	(1.3)
Diarrhea for more than 48 hours	28.7	(1.6)	51.0	(2.3)	72.6	(2.8)	35.7	(1.3)
Milk fever	77.9	(1.5)	100.0	(--)	100.0	(--)	83.5	(1.2)
Displaced abomasum	51.2	(1.7)	98.9	(0.4)	100.0	(--)	62.3	(1.4)
Neurological problems	7.6	(1.0)	18.1	(1.7)	23.5	(2.3)	10.7	(0.8)
Other health-related problems	7.4	(1.0)	8.3	(1.3)	10.0	(1.7)	7.7	(0.8)

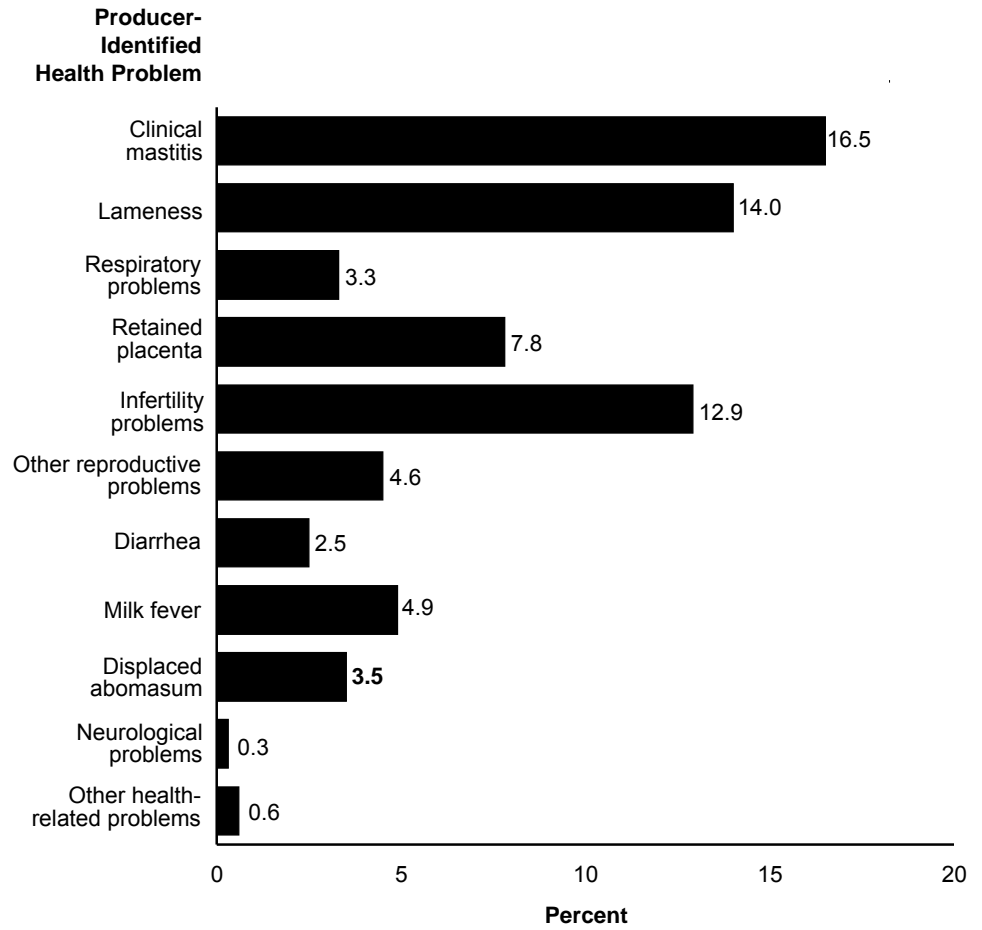
The three most prevalent diseases reported in cows were clinical mastitis, lameness, and infertility problems (16.5, 14.0, and 12.9 percent of cows, respectively). Small operations reported a lower percentage of cows with infertility problems and other reproductive problems compared to medium and large operations, while large operations reported a lower percentage of cows with retained placenta, diarrhea for more than 48 hours, milk fever, and displaced abomasum compared to medium and small operations.

b. Percentage of cows\* by producer-identified health problems occurring in cows during 2006, and by herd size:

Producer-Identified Health Problem	Percent Cows*							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Clinical mastitis	16.5	(0.5)	14.8	(0.6)	17.5	(1.0)	16.5	(0.5)
Lameness	13.2	(0.5)	15.6	(0.6)	13.5	(0.8)	14.0	(0.4)
Respiratory problems	2.5	(0.2)	4.1	(0.3)	3.4	(0.3)	3.3	(0.1)
Retained placenta (more than 24 hours)	8.9	(0.3)	8.9	(0.3)	6.4	(0.4)	7.8	(0.2)
Infertility problems (not pregnant 150 days after calving)	10.8	(0.4)	13.2	(0.5)	14.1	(0.6)	12.9	(0.3)
Other reproductive problems (e.g., dystocia, metritis)	3.4	(0.2)	5.0	(0.3)	5.0	(0.5)	4.6	(0.3)
Diarrhea for more than 48 hours	3.9	(0.5)	2.5	(0.3)	1.6	(0.1)	2.5	(0.2)
Milk fever	6.6	(0.2)	5.9	(0.3)	3.0	(0.2)	4.9	(0.1)
Displaced abomasum	3.6	(0.2)	4.8	(0.2)	2.5	(0.2)	3.5	(0.1)
Neurological problems	0.3	(0.0)	0.3	(0.0)	0.2	(0.0)	0.3	(0.0)
Other health-related problems	0.8	(0.2)	1.0	(0.4)	0.2	(0.0)	0.6	(0.1)

\*As a percentage of January 1, 2007, cow inventory

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**Percentage of Cows\* by Producer-Identified Health Problems Occuring in Cows During 2006**

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\*As a percentage of January 1, 2007, cow inventory

### 3. Permanently removed cows

The vast majority of operations permanently removed at least one cow during 2006, regardless of herd size.

a. Percentage of operations that permanently removed any cows from the operation (excluding cows that died) during 2006, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
96.5	(0.8)	98.7	(0.7)	97.3	(0.8)	97.0	(0.6)

There were no differences by region in the percentages of operations that permanently removed at least one cow during 2006.

b. Percentage of operations that permanently removed any cows from the operation (excluding cows that died) during 2006, by region:

Percent Operations			
Region			
West		East	
Percent	Std. Error	Percent	Std. Error
94.7	(2.2)	97.2	(0.6)

Approximately one in four cows (23.6 percent) was permanently removed from operations (excluding cows that died) during 2006. The percentages of permanently removed cows were not different across herd sizes or between regions.

c. Percentage of cows permanently removed from operations (excluding cows that died) during 2006, by herd size:

<b>Percent Cows*</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
24.1	(0.6)	23.7	(0.5)	23.4	(0.7)	23.6	(0.4)

\*As a percentage of January 1, 2007, cow inventory.

d. Percentage of cows permanently removed from operations (excluding cows that died) during 2006, by region:

<b>Percent Cows*</b>			
<b>Region</b>			
<b>West</b>		<b>East</b>	
<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
22.8	(0.7)	24.3	(0.4)

\*As a percentage of January 1, 2007, cow inventory

For operations that permanently removed cows during 2006, the majority (85.5 percent) sent some cows to a market, auction, or stockyard. Of permanently removed cows, the majority (76.2 percent) were sent to a market, auction, or stockyard.

e. For operations that permanently removed cows (excluding cows that died) during 2006, percentage of operations and percentage of cows removed, by destination of removed cows:

Destination	Percent			
	Operations		Cows	
	Percent	Std. Error	Percent	Std. Error
Directly to another dairy	14.3	(1.0)	5.5	(0.7)
Market, auction, or stockyard	85.5	(1.0)	76.2	(1.1)
Directly to a packer or slaughter plant	26.5	(1.2)	17.5	(1.3)
Sent elsewhere	3.7	(0.6)	0.8	(0.3)
Total	NA		100.0	

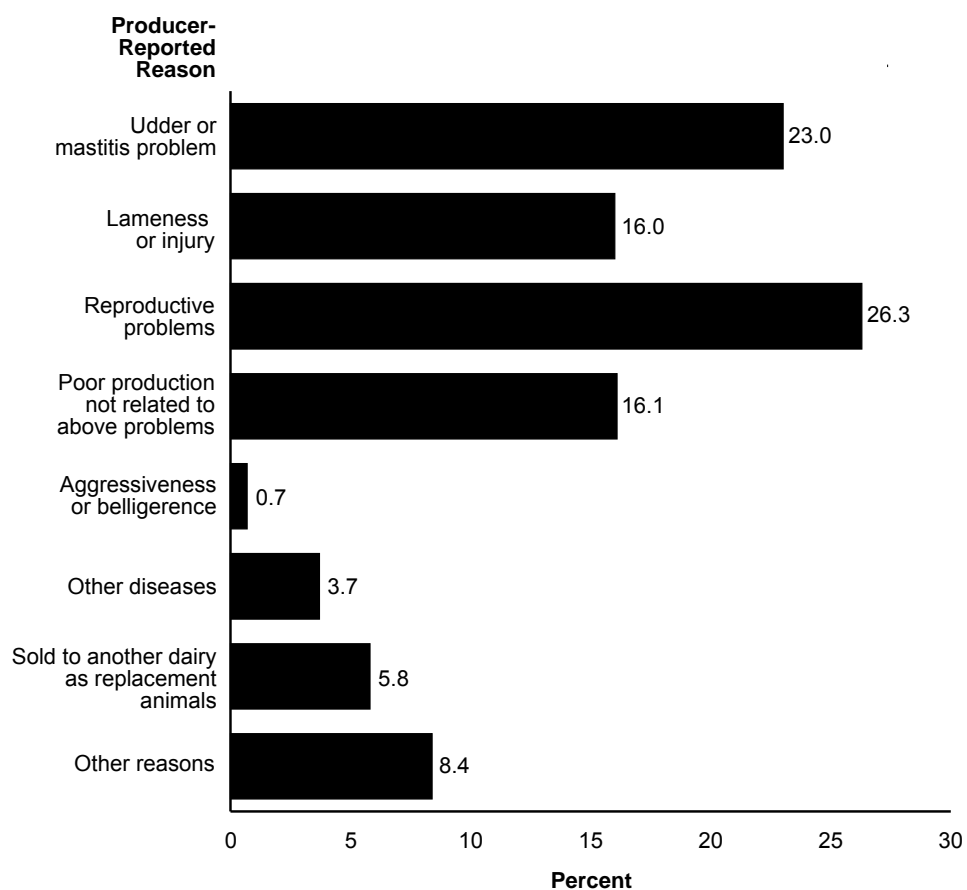
For operations that permanently removed cows, the highest percentages removed some cows because of udder or mastitis problems, reproductive problems, and lameness or injury (79.2, 78.8, and 65.6 percent of operations, respectively). Of permanently removed cows, 26.3 percent were removed for reproductive problems and 23.0 percent for udder or mastitis problems. Lameness or injury and poor production not related to other listed problems led to the permanent removal of 16.0 and 16.1 percent of cows, respectively. Only 5.8 percent of permanently removed cows were sold to another dairy as replacement animals. Almost one in six operations (16.8 percent) reported “other” as a reason for permanently removing cows. These operations accounted for 8.4 percent of the cows permanently removed. Reasons listed in the “other” category included specific diseases such as Johne’s disease or reductions in herd size, but the majority of operations did not specify a reason.

f. For operations that permanently removed cows (excluding cows that died) during 2006, percentage of operations and percentage of cows removed, by producer-reported reason:

<b>Producer-Reported Reason</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Cows</b>	<b>Standard Error</b>
Udder or mastitis problem	79.2	(1.2)	23.0	(0.6)
Lameness or injury	65.6	(1.4)	16.0	(0.4)
Reproductive problems	78.8	(1.2)	26.3	(0.7)
Poor production not related to above problems	47.2	(1.4)	16.1	(0.7)
Aggressiveness or belligerence (kickers)	9.6	(0.9)	0.7	(0.1)
Other diseases	15.4	(1.0)	3.7	(0.2)
Sold as replacement animals to another dairy	14.7	(1.0)	5.8	(0.7)
Other reasons	16.8	(1.1)	8.4	(1.1)
Total	NA		100.0	

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**For Operations That Permanently Removed Cows, Percentage of Cows  
Removed, by Producer-Reported Reason**





## G. Heifer and Cow Mortality

### 1. Mortality

Compared to small operations, large operations had a lower percentage of unweaned heifer deaths but a higher percentage of cow deaths. Unweaned heifer deaths during 2006 accounted for the highest percentage of deaths among the animal classes at 7.8 percent, while 5.7 percent of cows and 1.8 percent of weaned heifers died.

a. Percentage of unweaned heifers, weaned heifers, and cows that died during 2006, by herd size:

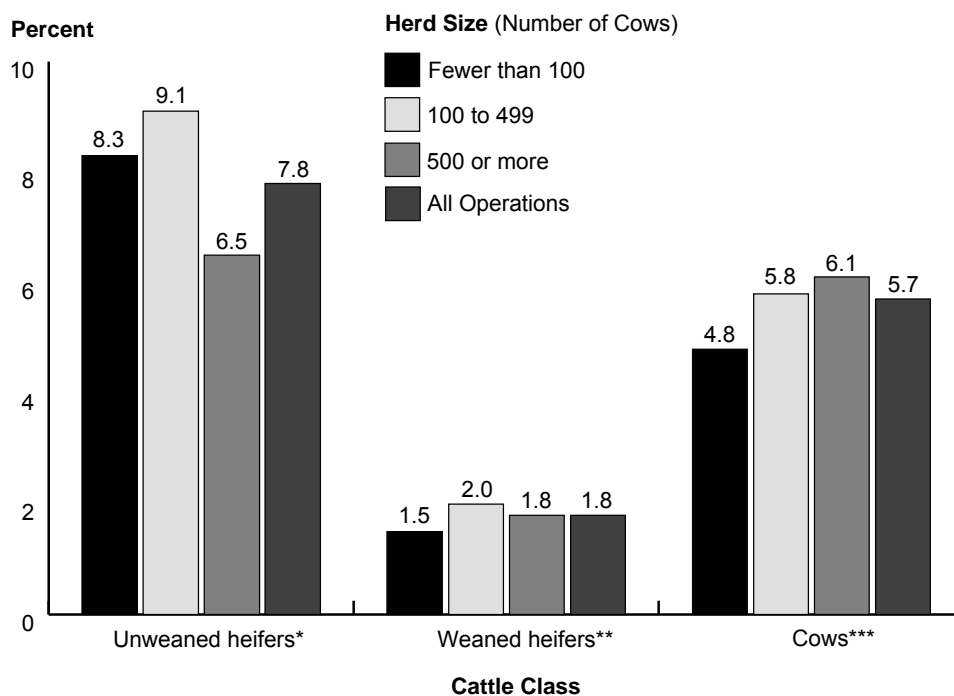
Percent								
Herd Size (Number of Cows)								
Cattle Class	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Unweaned heifers*	8.3	(0.4)	9.1	(0.4)	6.5	(0.4)	7.8	(0.2)
Weaned heifers**	1.5	(0.1)	2.0	(0.1)	1.8	(0.1)	1.8	(0.1)
Cows***	4.8	(0.1)	5.8	(0.2)	6.1	(0.2)	5.7	(0.1)

\*As a percentage of heifers born during 2006 and alive at 48 hours.

\*\*As a percentage of January 1, 2007, heifer inventory (weaning age to calving).

\*\*\*As a percentage of January 1, 2007, cow inventory.

### Percentage of Unweaned Heifers, Weaned Heifers, and Cows that Died During 2006, by Herd Size



\*As a percentage of heifers born during 2006 and alive at 48 hours.

\*\*As a percentage of January 1, 2007, heifer inventory (weaning age to calving).

\*\*\*As a percentage of January 1, 2007, cow inventory.

Determining the cause of death is important in preventing future deaths and improving the health of the herd. A relatively small percentage of operations performed necropsies on unweaned heifers, weaned heifers, or cows (8.0, 7.1, and 13.0 percent, respectively) in order to determine cause of death. With the exception of weaned heifers, the percentage of operations that performed any necropsy for a particular cattle class increased as herd size increased. Less than 1 in 10 small operations (8.4 percent) performed necropsies on cows compared to 33.3 percent of large operations.

b. For operations that had at least one death in the following cattle classes, percentage of operations that performed necropsies to determine the cause of death, by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Cattle Class</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Unweaned heifers	4.4	(0.9)	11.9	(1.4)	22.6	(2.5)	8.0	(0.7)
Weaned heifers	5.8	(1.4)	6.9	(1.2)	13.5	(2.1)	7.1	(0.9)
Cows	8.4	(1.0)	20.2	(1.8)	33.3	(2.7)	13.0	(0.9)

Approximately 4 percent of deaths within any cattle class were necropsied to determine the cause of death. There were no substantial differences in the percentages of deaths necropsied among animal classes or herd sizes.

c. For operations that had at least one death in the following cattle classes, percentage of unweaned heifer deaths, weaned heifer deaths, and cow deaths where necropsies were performed to determine cause of death, by herd size:

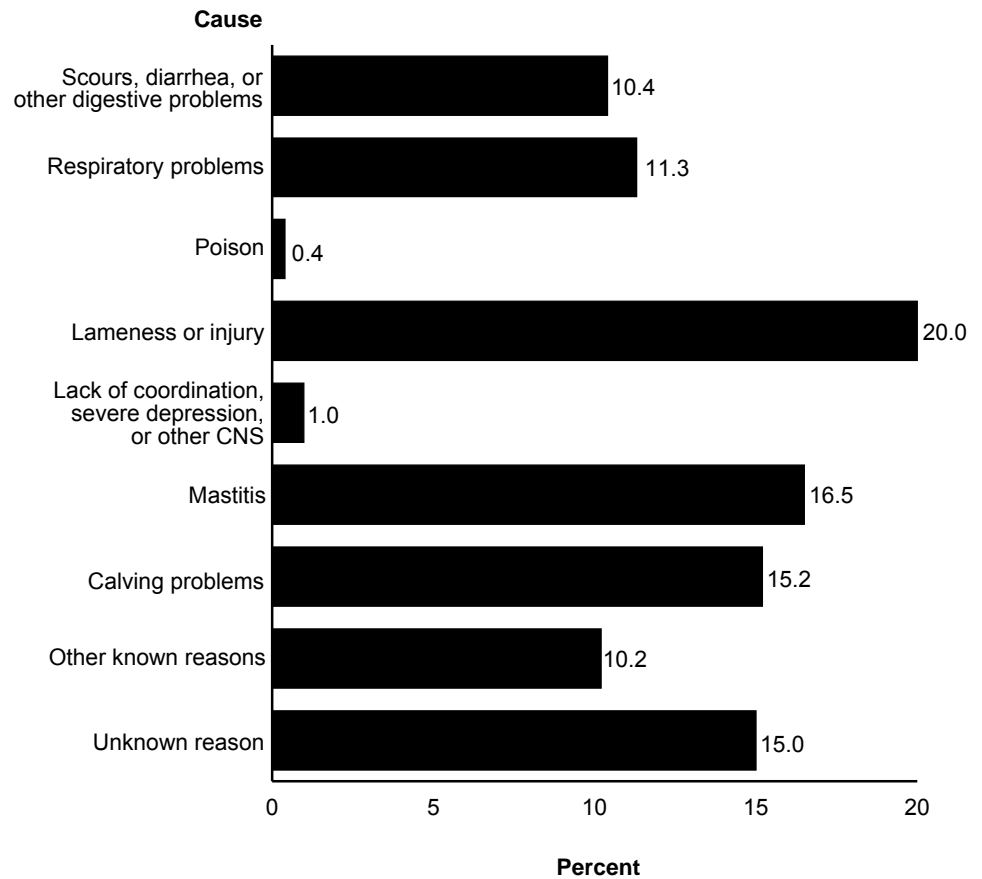
<b>Percent Deaths Necropsied</b>								
<b>Herd Size (Number of Dairy Cows)</b>								
<b>Cattle Class</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Unweaned heifers	1.8	(0.4)	4.7	(1.1)	3.8	(0.5)	3.5	(0.4)
Weaned heifers	3.9	(1.0)	4.8	(1.5)	3.7	(0.7)	4.1	(0.6)
Cows	4.4	(0.7)	6.0	(0.9)	3.5	(0.4)	4.4	(0.4)

Scours, diarrhea, or other digestive problems accounted for the highest percentage of unweaned heifer deaths (56.5 percent), followed by respiratory problems (22.5 percent). For weaned heifers, respiratory disease was the single largest cause of death (46.5 percent), with unknown reasons, lameness or injury, scours, diarrhea or other digestive problems each accounting for between 12 and 15 percent of deaths. The single largest cause of cow deaths was lameness or injury (20.0 percent), followed by mastitis (16.5 percent), calving problems (15.2 percent), and unknown reasons (15.0 percent).

d. Percentage of unweaned heifer deaths, weaned heifer deaths, and cow deaths, by producer-attributed cause:

Producer-Attributed Cause	Percent Deaths					
	Unweaned Heifers		Weaned Heifers		Cows	
	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
Scours, diarrhea, or other digestive problems	56.5	(1.3)	12.6	(1.0)	10.4	(0.5)
Respiratory problems	22.5	(0.9)	46.5	(1.7)	11.3	(0.7)
Poison	0.0	(0.0)	1.9	(0.9)	0.4	(0.1)
Lameness or injury	1.7	(0.3)	12.8	(1.0)	20.0	(0.8)
Lack of coordination, severe depression, or other CNS	0.3	(0.1)	0.7	(0.2)	1.0	(0.1)
Mastitis					16.5	(0.7)
Calving problems	5.3	(0.7)			15.2	(0.7)
Joint or navel problems	1.6	(0.3)	1.0	(0.3)		
Other known reasons	4.3	(0.7)	9.9	(1.0)	10.2	(0.8)
Unknown reason	7.8	(0.9)	14.6	(1.2)	15.0	(1.1)
Total	100.0		100.0		100.0	

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**Percentage of Cow Deaths, by Producer-Attributed Cause**

## 2. Carcass disposal

Rendering and burial were the two most common forms of disposing of dead calves (36.5 and 32.6 percent of operations, respectively). Burial as a disposal method decreased as herd size increased. Conversely, rendering increased as herd size increased. Almost two of three large operations (65.4 percent) disposed of dead calves by rendering. Composting calf carcasses was more common on medium operations (29.5 percent) than on large operations (21.8 percent).

a. Percentage of operations by primary method used to dispose of **dead calves**, and by herd size:

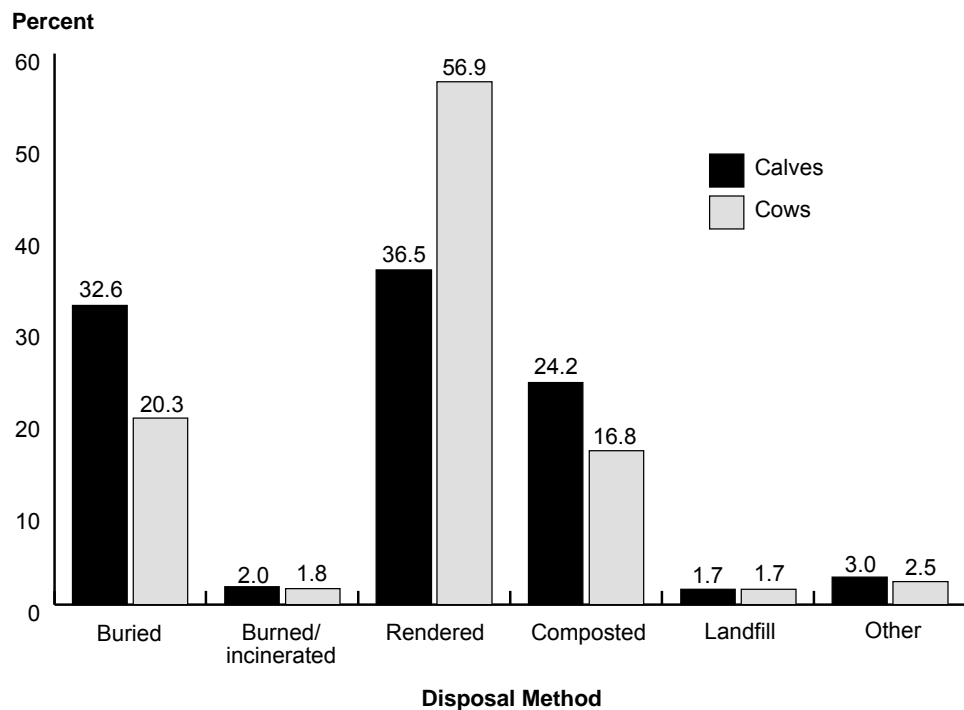
Disposal Method	Percent Operations							
	Herd Size (Number of Cows)							
	Small		Medium		Large		All	
	(Fewer than 100)		(100-499)		(500 or More)		Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Buried	36.5	(1.7)	25.5	(1.9)	7.8	(1.2)	32.6	(1.3)
Burned/ incinerated	2.5	(0.6)	0.8	(0.3)	0.3	(0.1)	2.0	(0.4)
Rendered	33.5	(1.7)	39.6	(2.2)	65.4	(2.2)	36.5	(1.3)
Composted	22.8	(1.5)	29.5	(1.9)	21.8	(1.8)	24.2	(1.2)
Landfill	1.6	(0.4)	2.2	(0.5)	1.4	(0.5)	1.7	(0.3)
Other	3.1	(0.6)	2.4	(0.7)	3.3	(1.1)	3.0	(0.5)
Total	100.0		100.0		100.0		100.0	

Rendering was the most common method of disposing of dead cows on all operations (56.9 percent). A lower percentage of large operations (6.2 percent) buried cow carcasses compared to medium or small operations (17.9 and 22.1 percent, respectively). A higher percentage of large operations (71.9 percent) had cow carcasses rendered compared to medium and small operations (55.6 and 56.2 percent, respectively). A lower percentage of small operations (15.0 percent) composted cow carcasses compared to medium operations (22.5 percent).

b. Percentage of operations by primary method used to dispose of **dead cows**, and by herd size:

Percent Operations								
Herd Size (Number of Dairy Cows)								
Disposal Method	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Buried	22.1	(1.4)	17.9	(1.5)	6.2	(1.1)	20.3	(1.1)
Burned/ incinerated	2.4	(0.5)	0.2	(0.2)	0.2	(0.1)	1.8	(0.4)
Rendered	56.2	(1.7)	55.6	(2.1)	71.9	(2.4)	56.9	(1.3)
Composted	15.0	(1.2)	22.5	(1.7)	17.0	(2.0)	16.8	(1.0)
Landfill	1.6	(0.3)	2.1	(0.4)	1.4	(0.5)	1.7	(0.3)
Other	2.7	(0.6)	1.7	(0.6)	3.3	(1.1)	2.5	(0.4)
Total	100.0		100.0		100.0		100.0	

### Percentage of Operations by Primary Method Used to Dispose of Dead Calves and Dead Cows





## H. Biosecurity

### 1. Physical contact with unweaned calves

Unweaned calves are the most susceptible animals to illness on the operation. Separating calves from older animals is an effective management practice used to reduce disease exposure to unweaned calves. Seventy-six percent of operations representing 84.4 percent of calves did not allow unweaned calves to have physical contact with weaned calves, and approximately 85 percent of operations did not allow contact with bred heifers or adult cattle. More than two of three operations (69.5 percent) housing 78.7 percent of heifer calves did not allow weaned calves to have contact with older animals.

Percentage of operations (and percentage of heifer calves born on these operations) where after separation from the dam unweaned heifer calves did not have physical contact\* with the following cattle classes:

<b>Cattle Class</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Calves</b>	<b>Standard Error</b>
Weaned calves not yet of breeding age	76.0	(1.2)	84.4	(1.1)
Bred heifers not yet calved	86.8	(1.0)	91.3	(0.8)
Adult cattle	84.3	(1.1)	89.2	(0.9)
No contact with above classes	69.5	(1.3)	78.7	(1.2)

\*Physical contact is defined as nose-to-nose contact or sniffing/touching/licking each other, including through a fence

## 2. Physical contact with other animals

Cattle can contract disease agents directly from other animals or by ingesting fecal material from other animals that have contaminated their feed or water. For example, *Neospora*, which can cause abortions, is transmitted via the feces of dogs and other canids.

More than 40 percent of operations reported that cats, dogs, and deer or other members of the deer family had contact with cattle, their feed, and/or water supply. Cattle on operations in the East region were more likely to have contact with sheep, beef cattle, cats, and deer compared to cattle on operations in the West region. Almost 4 of 5 operations in the West region (79.2 percent) and 9 of 10 operations in the East region (95.2 percent) reported that at least one of the listed animals had physical contact with cattle and/or contact with their feed, minerals, or water.

a. Percentage of operations where the following animals had physical contact with cattle and/or contact with their feed, minerals, or water supply, by region:

	Percent Operations					
	Region					
	West		East		All Operations	
Animal Type	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
Chickens or other poultry	9.2	(2.1)	8.3	(0.8)	8.3	(0.8)
Horses or other equids	10.2	(2.2)	13.6	(1.1)	13.3	(1.0)
Pigs	2.0	(0.6)	2.0	(0.5)	2.0	(0.4)
Sheep	0.1	(0.1)	1.0	(0.3)	0.9	(0.3)
Goats	4.8	(1.6)	2.3	(0.4)	2.5	(0.4)
Beef cattle	5.1	(1.5)	11.8	(1.0)	11.3	(1.0)
Exotic species (e.g., llamas, alpacas, emus, etc.)	1.0	(0.6)	0.7	(0.2)	0.7	(0.2)
Dogs	63.4	(2.7)	69.4	(1.4)	68.9	(1.3)
Cats	62.1	(2.8)	87.1	(1.0)	85.2	(0.9)
Deer or other members of the deer family (e.g., elk, moose, etc.)	20.9	(2.9)	51.6	(1.5)	49.3	(1.4)
Any animal	79.2	(2.0)	95.2	(0.6)	94.0	(0.6)

Cattle that have direct contact with deer could pose a risk of transmitting diseases such as tuberculosis (TB). TB is transmitted most commonly by the respiratory route, whereby invisible droplets (aerosols) containing TB bacteria are exhaled or coughed by infected animals and then inhaled by susceptible animals or humans. The risk of exposure is greatest in enclosed areas, such as barns; however, livestock can become infected if they share a common watering place contaminated with saliva and other discharges from infected deer or other animals.

For operations where deer or members of the deer family had contact with cattle, their feed, or water, the majority of operations (90.8 percent) reported that cattle could possibly or sometimes have face-to-face contact with deer. There were no differences by region in the percentages of operations that reported face-to-face contact with deer.

b. For operations where deer had physical contact with cattle and/or contact with their feed, minerals, or water supply, percentage of operations by frequency with which members of the deer family had face-to-face contact with cattle, and by region:

Percent Operations						
Region						
West			East		All Operations	
Frequency	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
Never	4.8	(2.1)	9.4	(1.2)	9.2	(1.2)
Possibly	56.3	(8.0)	64.3	(2.1)	64.1	(2.0)
Sometimes	38.9	(7.9)	26.3	(1.9)	26.7	(1.9)
Total	100.0		100.0		100.0	

### **3. Biosecurity for new arrivals**

NOTE: The percentage of operations that brought bred dairy heifers onto the operation (12.2 percent) [table a.] is similar to the percentage of operations where dairy cow replacements were born off the operation (14.1 percent), see “Source of cow replacements” p. 62. However, these percentages are higher than the percentage of heifers born off the operation (6.6 percent), see “Source of heifer inventory” p. 28. This discrepancy between the percentage of operations and the source of heifers and cow replacements could be due to a difference in the survey questions, since the source of heifers in the herd on January 1, 2007, may not be representative of the source of heifers brought on over the course of 2006.

The introduction of new animals can introduce diseases to the herd, especially if the new additions are not properly screened for disease prior to introduction. Almost 4 of 10 operations (38.9 percent) brought at least 1 new addition onto the operation during 2006. Approximately one in eight operations brought on bred dairy heifers, lactating dairy cows, or dairy bulls (12.2, 13.8, and 12.5 percent, respectively). A lower percentage of large operations brought on unweaned calves compared to small operations (1.0 and 3.8 percent, respectively), but a higher percentage of large operations brought on dairy heifers, bred dairy heifers, dairy bulls, and “any beef or dairy cattle” compared to medium or small operations.

a. Percentage of operations that brought the following classes of cattle onto the operation during 2006, by herd size:

Cattle Class	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Unweaned calves (dairy or beef)	3.8	(0.8)	2.5	(0.6)	1.0	(0.3)	3.4	(0.6)
Dairy heifers (weaned but not bred)	5.3	(0.8)	7.6	(1.2)	16.3	(2.6)	6.4	(0.7)
Bred dairy heifers	8.9	(1.0)	18.1	(1.8)	34.7	(2.6)	12.2	(0.9)
Lactating dairy cows	13.2	(1.3)	16.0	(1.7)	13.0	(1.9)	13.8	(1.0)
Dry dairy cows	4.1	(0.8)	4.3	(0.9)	5.5	(1.5)	4.3	(0.6)
Beef heifers and cows	0.9	(0.3)	2.5	(0.7)	1.1	(0.6)	1.3	(0.3)
Dairy bulls (weaned)	11.4	(1.1)	14.1	(1.6)	22.5	(2.4)	12.5	(0.9)
Beef bulls (weaned)	1.5	(0.4)	2.2	(0.6)	1.5	(0.5)	1.7	(0.3)
Steers (weaned)	2.0	(0.5)	1.3	(0.5)	0.7	(0.6)	1.8	(0.4)
Any cattle	35.6	(1.7)	44.3	(2.3)	61.6	(2.8)	38.9	(1.4)

Although more operations in the West region brought on animals during 2006 compared to operations in the East region (49.3 and 38.0 percent, respectively), a higher percentage of operations in the East region brought on unweaned calves, lactating dairy cows, and steers.

b. Percentage of operations that brought the following classes of cattle onto the operation during 2006, by region:

Cattle Class	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Unweaned calves (dairy or beef)	0.6	(0.3)	3.6	(0.6)
Dairy heifers (weaned but not bred)	12.6	(2.2)	5.9	(0.7)
Bred dairy heifers	21.1	(2.3)	11.5	(0.9)
Lactating dairy cows	8.5	(1.5)	14.3	(1.1)
Dry dairy cows	2.3	(0.7)	4.4	(0.7)
Beef heifers and cows	1.5	(0.7)	1.3	(0.3)
Dairy bulls (weaned)	21.8	(2.6)	11.8	(0.9)
Beef bulls (weaned)	2.8	(0.9)	1.6	(0.3)
Steers (weaned)	0.3	(0.3)	1.9	(0.4)
Any cattle	49.3	(3.0)	38.0	(1.5)

For operations that introduced bred heifers, the percentage of cow inventory brought on as bred heifers was similar across herd sizes, ranging from 15.1 percent on small operations to 17.3 percent on large operations. For operations that introduced dry cows, the percentage of inventory brought on as dry cows ranged from 3.5 percent on medium operations to 9.5 percent on small operations.

c. For operations that brought the specified cattle classes onto the operation during 2006, percentage of cow inventory that was brought on as bred heifers, lactating cows, and dry cows, by herd size:

<b>Percent Inventory*</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Cattle Class</b>	<b>Small</b>		<b>Medium</b>		<b>Large</b>		<b>All Operations</b>	
	(Fewer than 100)		(100-499)		(500 or More)			
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Bred heifers	15.1	(1.7)	15.6	(1.8)	17.3	(1.4)	16.7	(1.1)
Lactating cows	15.1	(1.7)	14.0	(2.2)	10.9	(1.4)	13.1	(1.1)
Dry cows	9.5	(1.1)	3.5	(1.0)	4.2	(2.1)	5.0	(1.0)

\*As a percentage of January 1, 2007, cow inventory

The most common herd additions—bred dairy heifers, lactating cows, and dairy bulls—were quarantined on less than 20 percent of operations (14.5, 12.1, and 17.1 percent, respectively). Approximately one in five operations (20.3 percent) that brought cattle onto the operation during 2006 quarantined new additions. For operations that quarantined new additions, the operation average number of days quarantined ranged from 15 to 45 days. One-sixth of cattle brought on were quarantined upon arrival at the operation.

d. For operations that brought the following classes of cattle onto the operation during 2006, percentage of operations that quarantined the following classes of cattle upon arrival, percentage of arriving cattle quarantined, and operation average number of days quarantined:

<b>Cattle Class</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Cattle Quarantined</b>	<b>Standard Error</b>	<b>Operation Average Days Quarantined</b>	<b>Standard Error</b>
Unweaned calves (dairy or beef)	44.2	(8.3)	20.1	(12.6)	42.4	(4.8)
Dairy heifers (weaned but not bred)	23.0	(4.7)	7.1	(2.6)	20.0	(3.6)
Bred dairy heifers	14.5	(2.3)	19.7	(3.5)	22.0	(3.1)
Lactating dairy cows	12.1	(2.4)	17.4	(3.9)	15.6	(2.5)
Dry dairy cows	15.9	(4.8)	39.5	(14.8)	16.5	(4.3)
Beef heifers and cows	30.1	(9.8)	14.7	(7.2)	33.3	(12.1)
Dairy bulls (weaned)	17.1	(2.9)	25.6	(6.3)	25.3	(3.5)
Beef bulls (weaned)	20.3	(6.5)	53.2	(14.6)	31.9	(12.6)
Steers (weaned)	30.0	(9.6)	32.7	(14.5)	40.7	(18.7)
Any cattle	20.3	(1.7)	16.7	(2.4)	31.2	(3.5)

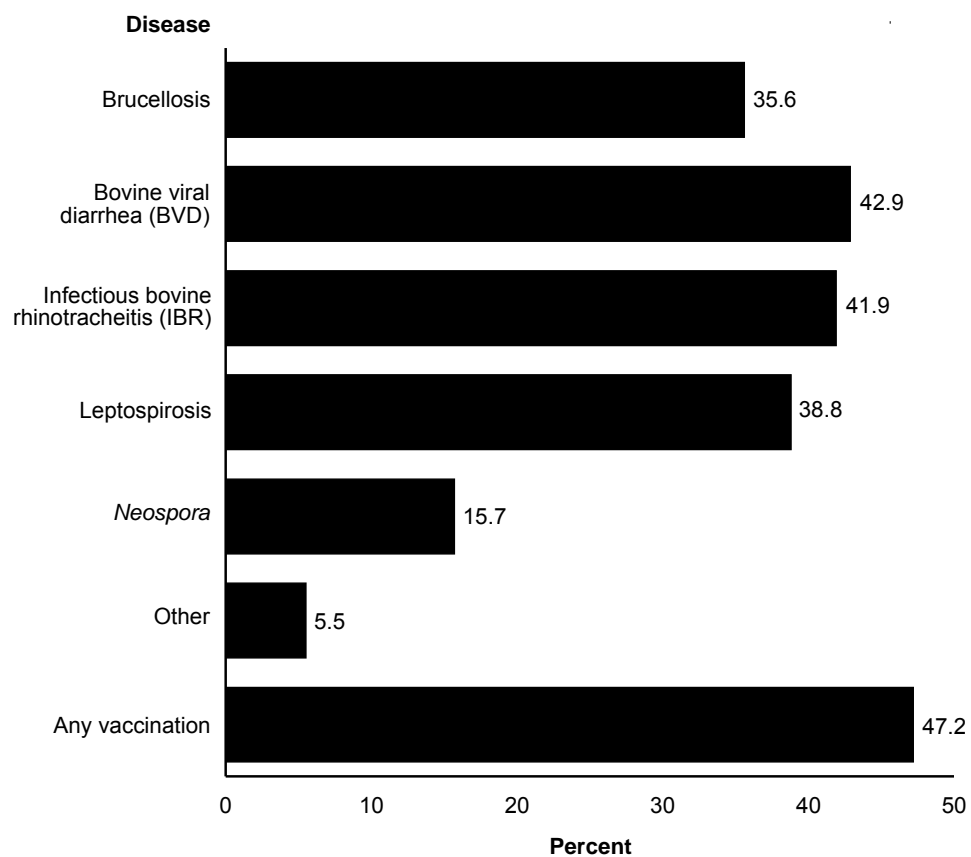


Less than 50 percent of operations that brought cattle onto the operation during 2006 required vaccination of new additions prior to arrival. Cattle were required to be vaccinated against BVD, IBR, and leptospirosis on 42.9, 41.9, and 38.8 percent of all operations, respectively. For all diseases listed below, a lower percentage of small operations required vaccination of new additions prior to arrival compared to medium and large operations.

e. For operations that brought any dairy cattle onto the operation during 2006, percentage of operations that normally required vaccination against the following diseases before bringing animals onto the operation, by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Disease</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Brucellosis	28.0	(2.6)	50.2	(3.5)	52.2	(3.9)	35.6	(2.0)
Bovine viral diarrhea (BVD)	34.8	(2.8)	59.9	(3.4)	56.7	(3.7)	42.9	(2.1)
Infectious bovine rhinotracheitis (IBR)	34.2	(2.8)	57.3	(3.4)	57.1	(3.7)	41.9	(2.1)
Leptospirosis	32.0	(2.7)	53.6	(3.4)	48.4	(3.8)	38.8	(2.1)
<i>Neospora</i>	10.8	(1.7)	26.6	(3.1)	22.4	(3.3)	15.7	(1.5)
Other	4.2	(1.1)	8.7	(1.8)	6.5	(1.6)	5.5	(0.9)
Any vaccination	37.7	(2.9)	65.2	(3.3)	68.5	(3.2)	47.2	(2.2)

**For Operations That Brought Any Cattle onto the Operation During 2006, Percentage of Operations That Normally Required Vaccination Against the Following Diseases Before Bringing Animals onto the Operation**

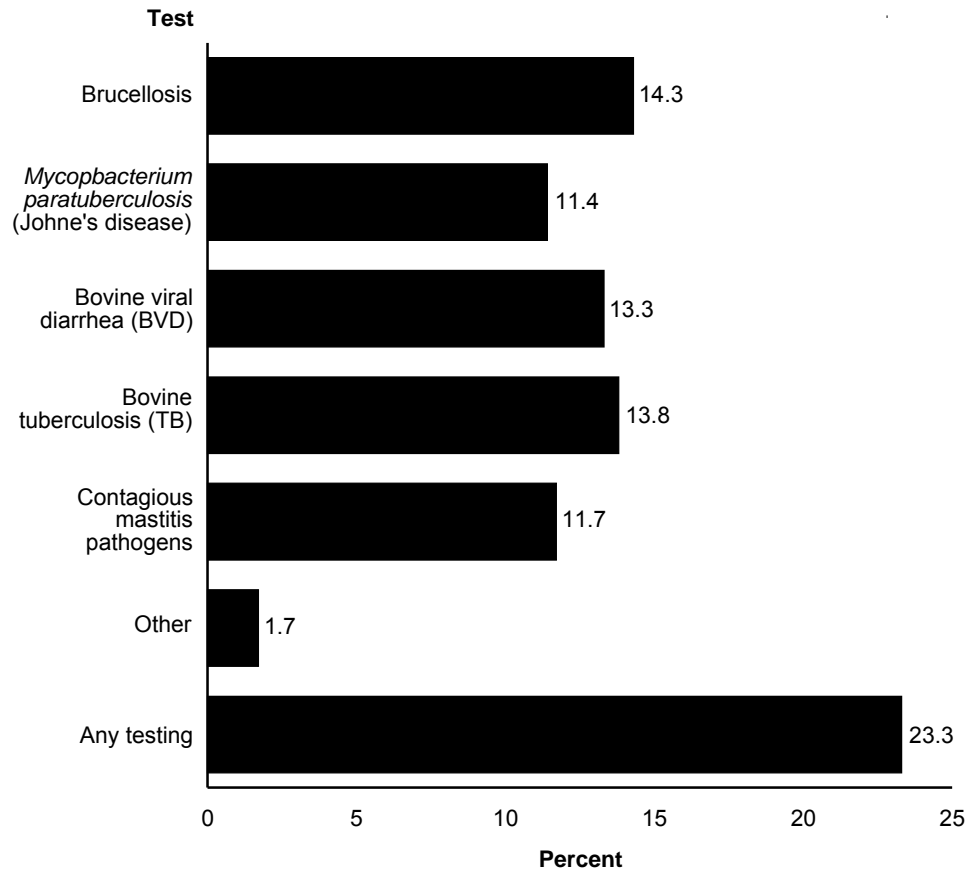


Testing individual animals prior to purchase can reduce the chances of bringing new diseases to an operation. Almost one-fourth of operations (23.3 percent) required testing of animals brought onto the operation.

f. For operations that brought beef or dairy cattle onto the operation during 2006, percentage of operations that tested individual animals brought onto the operation, by testing normally required by operation and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Test	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Brucellosis	11.6	(1.9)	19.8	(2.8)	19.0	(3.0)	14.3	(1.5)
<i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> (Johne's disease)	9.9	(1.8)	16.6	(2.7)	7.2	(1.8)	11.4	(1.4)
Bovine viral diarrhea (BVD)	10.7	(1.8)	19.4	(2.8)	15.8	(2.7)	13.3	(1.4)
Bovine tuberculosis (TB)	12.0	(1.8)	17.8	(2.7)	15.8	(2.3)	13.8	(1.4)
Contagious mastitis pathogens	10.5	(1.8)	13.1	(2.3)	16.3	(3.3)	11.7	(1.4)
Other	1.6	(0.6)	2.2	(1.0)	0.4	(0.2)	1.7	(0.5)
Any testing	20.2	(2.4)	28.2	(3.2)	34.7	(3.8)	23.3	(1.8)

**For Operations that Brought any Beef or Dairy Cattle Onto the Operation During 2006, Percentage of Operations That Tested Individual Animals Brought Onto the Operation, by Testing Normally Required by Operation**



Approximately 25 percent of operations reported that testing was already performed at the herd of origin or that the disease was not a concern to their operation. "Other" reasons included animals not eligible for testing or were not at risk for disease transmission (such as testing weaned heifers or bulls for contagious mastitis pathogens), owners trusted the herd of origin, owners vaccinated and tested after the animals arrived, owners did not know to vaccinate and/or test, and owners were bringing back their own cattle.

g. For operations that brought beef or dairy cattle onto the operation during 2006 and did not require individual animal testing, percentage of operations by reason for not testing and by disease:

Percent Operations									
Disease									
Reason	Brucellosis		Johne's Disease		BVD		TB		Contagious Mastitis Pathogens
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Std. Pct. Error
Tests already performed by herd of origin	25.6	(2.0)	22.3	(1.9)	25.9	(2.1)	25.1	(2.0)	23.8 (1.9)
Too expensive to test	4.3	(1.1)	5.9	(1.3)	4.1	(1.0)	4.2	(1.1)	4.3 (1.0)
Not enough time to test	9.5	(1.7)	8.9	(1.5)	9.9	(1.6)	9.4	(1.6)	10.7 (1.7)
Not recommended by veterinarian	7.7	(1.3)	6.8	(1.2)	6.1	(1.2)	7.4	(1.3)	5.7 (1.1)
Too many sources to test	2.5	(0.9)	1.8	(0.6)	2.7	(0.9)	2.3	(0.9)	2.8 (0.9)
Tests not reliable	0.2	(0.2)	4.4	(1.0)	1.0	(0.4)	0.7	(0.3)	0.7 (0.3)
Disease is not a concern to my operation	28.0	(2.3)	28.6	(2.2)	27.5	(2.2)	29.1	(2.3)	27.9 (2.2)
Other	22.2	(1.9)	21.3	(1.9)	22.8	(2.0)	21.8	(1.9)	24.1 (2.0)
Total	100.0		100.0		100.0		100.0		100.0

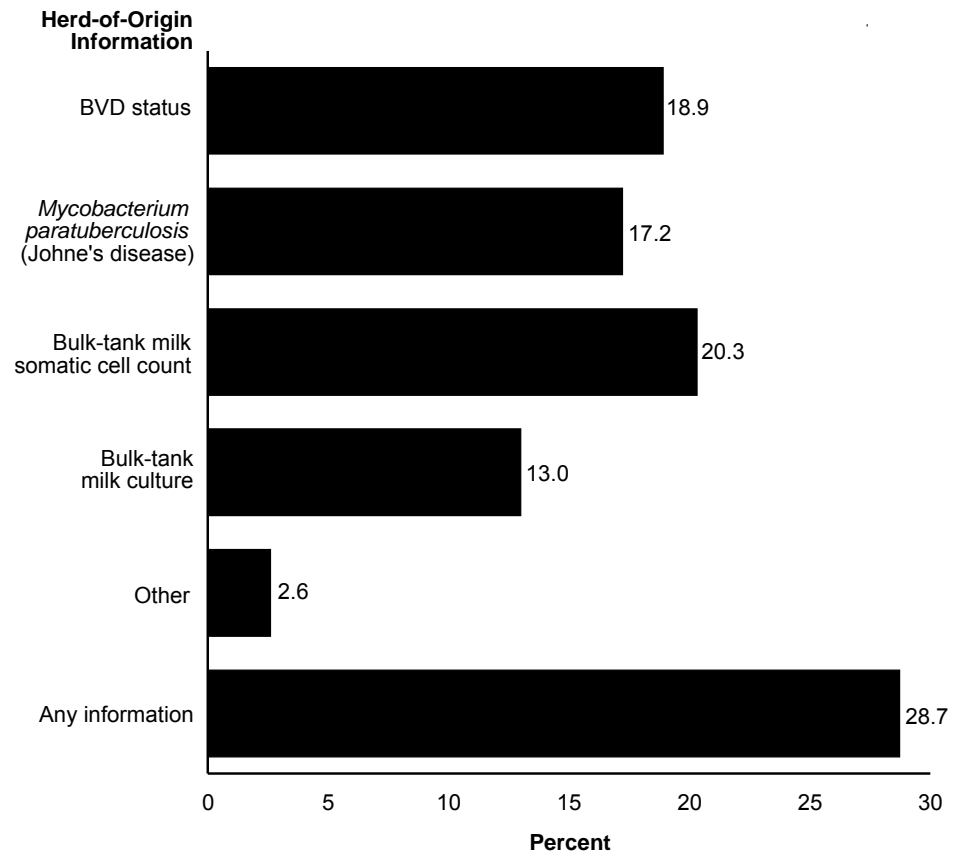
For many diseases, such as Johne's disease and contagious mastitis, knowing the status of the herd of origin can be more reliable than testing individual animals. Almost 3 of 10 operations (28.7 percent) required herd-of-origin information on disease status prior to purchasing cattle. The only herd-size difference was in the percentage of operations performing bulk-tank milk cultures for contagious mastitis pathogens, where a lower percentage of small operations performed the culture compared to large operations (10.1 and 20.9 percent, respectively).

h. For operations that brought beef or dairy cattle onto the operation during 2006, percentage of operations by information on herd of origin normally required by operation, and by herd size:

Percent Operations								
Herd-of-origin Information	Herd Size (Number of Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
BVD status	16.7	(2.3)	24.5	(3.0)	19.8	(3.0)	18.9	(1.7)
<i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> (Johne's disease) status	16.0	(2.2)	21.9	(2.9)	12.7	(2.3)	17.2	(1.7)
Bulk-tank milk somatic cell count	18.8	(2.4)	24.4	(3.1)	19.8	(2.9)	20.3	(1.8)
Bulk-tank milk culture	10.1	(1.7)	17.8	(2.8)	20.9	(2.9)	13.0	(1.4)
Other	2.8	(1.0)	2.3	(1.2)	1.3	(0.8)	2.6	(0.7)
Any information	25.4	(2.7)	36.0	(3.4)	32.9	(3.3)	28.7	(2.0)

---

**For Operations that Brought Beef or Dairy Cattle Onto the Operation During 2006, Percentage of Operations by Information on Herd-of-Origin Normally Required by Operation**



The most common reason given for not requiring herd-of-origin information on disease status was that the disease was not a concern to the operation (approximately 30 percent of operations). Interestingly, mastitis was the most prevalent disease causing illness in cows, the second highest reported reason for removing cows from the herd, and the second highest reported cause of cattle death during 2006. A percentage of these mastitis cases would be due to contagious pathogens. Infertility, which could be associated with BVD, was the third most prevalent disease on operations, and reproductive problems, such as infertility, was the most common reason that cows were permanently removed from the operation. Close to 25 percent of operations listed “other” as the reason for not evaluating herd-of-origin information. Other reasons for not evaluating herd-of-origin information were similar to reasons for not testing incoming cattle: trusted the herd of origin, owned the herd of origin, would address disease issues after cattle arrived, and didn’t know to test or inquire about diseases.

i. For operations that brought beef or dairy cattle onto the operation during 2006 and did not require herd-of-origin information on the status of the following diseases and bulk-tank milk, percentage of operations by reason for not normally requiring information:

Percent Operations								
Herd-of-Origin Information								
Reason Not Required	BVD Status		Johne’s Disease Status		Bulk-Tank Milk Somatic Cell Count		Bulk-Tank Milk Culture	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Tests already performed by herd of origin	18.6	(1.8)	15.2	(1.6)	15.2	(1.6)	15.7	(1.6)
Too expensive to test	3.9	(1.1)	4.4	(1.2)	3.2	(1.0)	3.8	(1.1)
Not enough time to test	9.3	(1.6)	9.3	(1.5)	9.2	(1.6)	10.6	(1.6)
Not recommended by veterinarian	8.1	(1.4)	8.9	(1.4)	8.6	(1.4)	8.4	(1.4)
Too many sources to test	3.0	(1.0)	3.0	(1.0)	3.5	(1.1)	3.1	(1.0)
Tests not reliable	1.1	(0.4)	3.3	(0.9)	1.5	(0.5)	1.4	(0.5)
Disease is not a concern to the operation	30.5	(2.4)	31.6	(2.3)	30.2	(2.3)	30.0	(2.3)
Other	25.5	(2.2)	24.3	(2.1)	28.6	(2.2)	27.0	(2.1)
Total	100.0		100.0		100.0		100.0	



## Section II: Methodology

### A. Needs Assessment

NAHMS develops study objectives by exploring existing literature and contacting industry members about their informational needs and priorities during a needs-assessment phase. The objective of the needs assessment for the NAHMS Dairy 2007 study was to collect information from U.S. dairy producers and other dairy specialists about what they perceived to be the most important dairy health and productivity issues. A driving force of the needs assessment was the desire of NAHMS to receive as much input as possible from a variety of producers, industry experts and representatives, veterinarians, extension specialists, universities, and dairy organizations. Information was collected via focus groups and through a Needs Assessment Survey.

Focus group teleconferences and meetings were held to help determine the focus of the study.

Teleconference, March 30, 2006  
National Johne's Working Group

Louisville, KY, April 2, 2006  
National Johne's Working Group  
National Institute for Animal Agriculture

Louisville, KY, April 3, 2006  
National Milk Producers Federation  
Animal Health Committee

Teleconference, December 15, 2006  
Bovine Alliance on  
Management and Nutrition

In addition, a Needs-Assessment Survey was designed to ascertain the top three management issues, diseases/disorders, and producer incentives from producers, veterinarians, extension personnel, university researchers, and allied industry groups. The survey, created in SurveyMonkey, was available online from early February through late April 2006. The survey was promoted via electronic newsletters, magazines, and Web sites. Organizations/magazines promoting the study included Vance Publishing's "Dairy Herd Management, Dairy Alert", "Dairy Today", "Hoard's Dairyman", NMC, "Journal of the American Veterinary Medical Association", and the American Association of Bovine Practitioners. E-mail messages were also sent to cooperative members of the National Milk Producers Federation as well as State and Federal personnel asking for input and identifying the online site. A total of 313 people completed the questionnaire.

Universities/extension personnel accounted for 23 percent of respondents, while producers accounted for 22 percent, and veterinarians/consultants accounted for another 20 percent.

Fort Collins, CO, May 18, 2006  
CEAH Focus Group meeting

Draft objectives for the Dairy 2007 study, using input from teleconferences, face-to-face meetings, and the online survey, were drafted prior to the CEAH focus group meeting. Attendees included producers, university/extension personnel, veterinarians, and government personnel. The day-long meeting culminated in the formulation of eight objectives for the study:

- Describe trends in dairy cattle health and management practices,
- Evaluate management factors related to cow comfort and removal rates,
- Describe dairy-calf health and nutrition from birth to weaning and evaluate heifer disease prevention practices,
- Estimate the prevalence of herds infected with bovine viral diarrhea virus (BVD),
- Describe current milking procedures and estimate the prevalence of contagious mastitis pathogens,
- Estimate the herd-level prevalence and associated costs of *Mycobacterium avium* subspecies *paratuberculosis* (Johne's disease),
- Describe current biosecurity practices and determine producer motivation for implementing or not implementing biosecurity practices, and
- Determine the prevalence of specific food-safety pathogens and describe antimicrobial resistance patterns.

## **B. Sampling and Estimation**

### **1. State selection**

The preliminary selection of States to be included in the study was done in February 2006, using the National Agricultural Statistics Service (NASS) January 27, 2006, "Cattle Report". A goal for NAHMS national studies is to include States that account for at least 70 percent of the animals and producer population in the United States. The initial review of States identified 16 major States representing 82.0 percent of the milk cow inventory and 79.3 percent of the operations with milk cows (dairy herds). The States were: California, Idaho, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New Mexico, New York, Ohio, Pennsylvania, Texas, Vermont, Washington, and Wisconsin.

A memo identifying these 16 States was provided in March 2006 to the USDA-APHIS-VS CEAH Director and, in turn, the VS Regional Directors. Each Regional Director sought input from the respective States about being included or excluded from the study. Virginia expressed interest in participating and was included, bringing the total number of participating States to 17.

## **2. Operation selection**

The list sampling frame was provided by NASS. Within each State a stratified random sample was selected. The size indicator was the number of milk cows for each operation. NASS selected a sample of dairy producers in each State for making their January 1 cattle estimates. The list sample from the January 2006 survey was used as the screening sample. Those producers in the 17 States reporting one or more milk cows on January 1, 2006, were included in the sample for contact in January 2007.

## **3. Population inferences**

### **a. Phase I: General Dairy Management Report**

Inferences cover the population of dairy producers with at least 1 milk cow in the 17 participating States. As of January 1, 2007, these States accounted for 82.5 percent (7,533,000 head) of milk cows and 79.5 percent (59,740) of operations with milk cows in the United States. (See Appendix II for respective data on individual States.) All respondent data were statistically weighted to allow the sample to reflect the population from which it was selected. The inverse of the probability of selection for each operation was the initial selection weight. This selection weight was adjusted for nonresponse within each State and size group to allow for inferences back to the original population from which the sample was selected.

## **C. Data Collection**

### **1. Data collectors and data collection period**

#### **a. Phase I: General Dairy Management Report**

From January 1-31, 2007, NASS enumerators administered the General Dairy Management Report. The interview took slightly over 1 hour.

## **D. Data Analysis**

### **1. Phase I: Validation—General Dairy Management Report**

Initial data entry and validation for the General Dairy Management Report were performed in individual NASS State offices. Data were entered into a SAS data set. NAHMS national staff performed additional data validation on the entire data set after data from all States were combined.

## E. Sample Evaluation

The purpose of this section is to provide various performance measurement parameters. Historically, the term “response rate” was used as a catch-all parameter, but there are many ways to define and calculate response rates. Therefore, the table below presents an evaluation based upon a number of measurement parameters, which are defined with an “x” in categories that contribute to the measurement.

### 1. Phase I: General Dairy Management Report

A total of 3,554 operations were selected for the survey. Of these operations, 3,304 (93.0 percent) were contacted. There were 2,519 operations that provided usable inventory information (70.9 percent of the total selected and 76.2 percent of those contacted). In addition, there were 2,194 operations (61.7 percent) that provided “complete” information for the questionnaire. Of operations that provided complete information and were eligible to participate in the VMO phase of the study (2,067 operations), 1,077 (52.1 percent) consented to be contacted for consideration/discussion about further participation.

Response Category	Number Operations	Percent Operations	Measurement Parameter		
			Contacts	Usable <sup>1</sup>	Complete <sup>2</sup>
Survey complete and VMO consent	1,077	30.3	x	x	x
Survey complete, refused VMO consent	990	27.9	x	x	x
Survey complete, ineligible <sup>4</sup> for VMO	127	3.6	x	x	x
No dairy cows on January 1, 2007	214	6.0	x	x	
Out of business	111	3.1	x	x	
Out of scope	6	0.2			
Refusal of GDMR	785	22.1	x		
Office hold (NASS elected not to contact)	126	3.5			
Inaccessible	118	3.3			
<b>Total</b>	<b>3,554</b>	<b>100.0</b>	<b>3,304</b>	<b>2,519</b>	<b>2,194</b>
Percent of total operations			93.0	70.9	61.7
Percent of total operations weighted <sup>3</sup>			94.0	74.1	59.6

<sup>1</sup>Useable operation—respondent provided answers to inventory questions for the operation (either zero or positive number on hand).

<sup>2</sup>Survey complete operation—respondent provided answers to all or nearly all questions for at least one site.

<sup>3</sup>Weighted response—the rate was calculated using the initial selection weights.

<sup>4</sup>Ineligible—less than 30 head of milk cows on January 14, 2007.

## Appendix I: Sample Profile

### A. Responding Operations

#### 1. Total inventory, by herd size

Herd Size (Total Inventory)	Number of Responding Sites
Less than 100	1,028
100 to 499	691
500 or more	475
Total	2,194

#### 2. Number of responding operations, by region

Region	Number of Responding Sites
West	426
East	1768
Total	2,194

## Appendix II: U.S. Milk Cow Population and Operations

Number of milk cows on January 1, 2007\*

Region	State	Number of Milk Cows (Thousand Head)		Number of Operations 2006	
		Milk cows on operations with 1 or more head	Milk cows on operations with 30 or more head	Operations with 1 or more head	Operations with 30 or more head
<b>West</b>	California	1,790	1,788.2	2,300	1,950
	Idaho	502	501.0	800	620
	New Mexico	360	359.3	450	180
	Texas	347	344.2	1,300	660
	Washington	235	234.3	790	540
	Total	3,234	3,227.0	5,640	3,950
<b>East</b>	Indiana	166	154.4	2,100	1,150
	Iowa	210	203.7	2,400	1,870
	Kentucky	93	86.5	2,000	1,180
	Michigan	324	317.5	2,700	1,910
	Minnesota	455	441.3	5,400	4,800
	Missouri	114	108.3	2,600	1,400
	New York	628	612.3	6,400	5,100
	Ohio	274	252.1	4,400	2,500
	Pennsylvania	550	536.3	8,700	7,000
	Vermont	140	137.2	1,200	1,060
	Virginia	100	97.5	1,300	820
	Wisconsin	1,245	1,213.9	14,900	12,800
	Total	4,299	4,161.0	54,100	41,590
<b>Total (17 States)</b>		7,533	7,388.0	59,740	45,540
<b>Percentage of U.S.</b>		82.5	82.5	79.5	84.6
<b>Total U.S. (50 States)</b>		9,129.0	8,955.5	75,140	53,860

\*Source: NASS Cattle report, February 2, 2007, and NASS Farms, Land in Farms, and Livestock Operations 2006 Summary report, February 2007. An operation is any place having one or more head of milk cows, excluding cows used to nurse calves, on hand at any time during the year.

## Appendix III: Study Objectives and Related Outputs

1. Describe trends in dairy cattle health and management practices
  - Part II: Changes in the United States Dairy Cattle Industry 1991-2007, expected December 2008
  - Part V: Changes in Dairy Cattle Health and Management in the United States, 1991-2007, expected May 2008
2. Evaluate management factors related to cow comfort and removal rates
  - Dairy Facilities and Cow Comfort on U.S Dairy Operations, 2007 interpretive report, expected spring 2008
  - Info sheets, expected spring 2008
3. Describe dairy calf health and nutrition from birth to weaning and evaluate heifer disease prevention practices
  - **Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, October 2007**
  - Colostrum Management info sheet, October 2007
  - Off-Site Heifer Raising info sheet, October 2007
  - Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, expected April 2008
  - Calf Health and Management Practices on U.S. Dairy Operations, 2007 interpretive report, expected spring 2008
  - Additional info sheets, expected spring 2008
4. Estimate the prevalence of herds infected with bovine viral diarrhea virus (BVD)
  - Info sheets, expected spring 2008.
5. Describe current milking procedures and estimate the prevalence of contagious mastitis pathogens
  - Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, expected February 2008.
  - Info sheets, expected spring 2008.
6. Estimate the herd-level prevalence and associated costs of *Mycobacterium avium* subspecies *paratuberculosis*
  - Info sheets, expected spring 2008.
7. Describe current biosecurity practices and determine producer motivation for implementing or not implementing biosecurity practices
  - **Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, October 2007**

- Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, expected February 2008
  - Interpretive report and info sheets, expected spring 2008
8. Determine the prevalence of specific food-safety pathogens and describe antimicrobial resistance patterns
- Info sheets, expected spring 2008





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Agriculture

Animal and  
Plant Health  
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Service

Veterinary  
Services

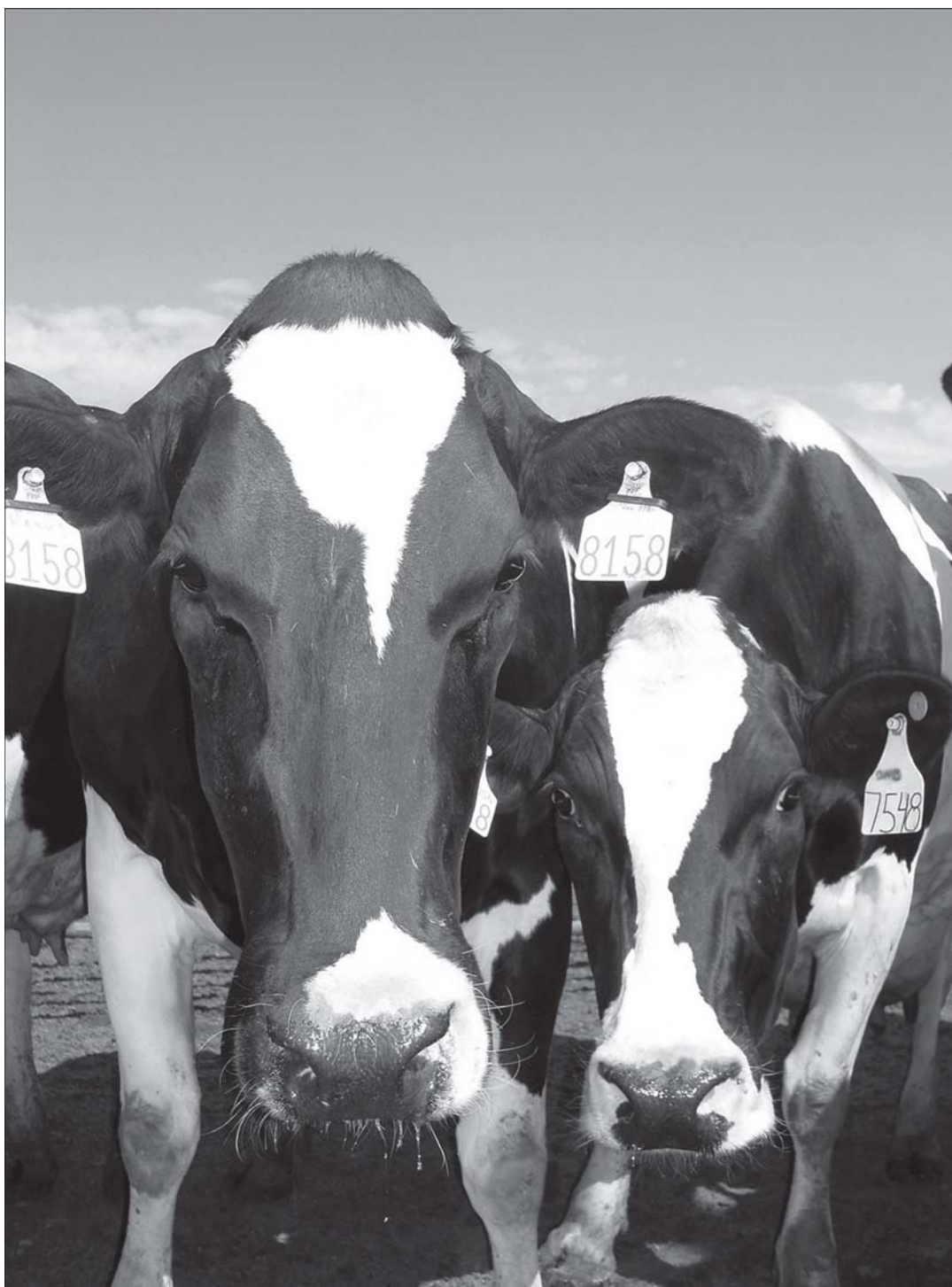
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Monitoring  
System

March 2007



# Dairy 2007

## Part II: Changes in the U.S. Dairy Cattle Industry, 1991–2007



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Dr. Jason Lombard

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The 1991 National Dairy Heifer Evaluation Project, Dairy 1996, Dairy 2002, and Dairy 2007 were cooperative efforts between State and Federal agricultural statisticians, animal health officials, university researchers, and extension personnel. We want to thank the National Agricultural Statistics Service (NASS) enumerators, State and Federal veterinary medical officers (VMOs), and animal health technicians (AHTs) who visited the farms and collected the data. Their hard work and dedication to the National Animal Health Monitoring System (NAHMS) are invaluable. The roles of the producer, Area Veterinarian in Charge (AVIC), NAHMS Coordinator, VMOs, AHTs, and NASS enumerators were critical in providing quality data for Dairy 2007 reports. Thanks also to the personnel at the Centers for Epidemiology and Animal Health (CEAH) for their efforts in generating and distributing valuable reports from Dairy 2007 data.

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- USDA-ARS, Russell Research Center
- Antel BioSystems, Inc.
- Cornell University Animal Health Diagnostic Laboratory
- Quality Milk Production Services
- Tetracore, Inc
- University of Pennsylvania, New Bolton Center
- University of Wisconsin, Madison
- Wisconsin Veterinary Diagnostic Laboratory

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Director

Centers for Epidemiology and Animal Health

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## Introduction

In 1983, promoters of the concept that would become the USDA's National Animal Health Monitoring System (NAHMS) envisioned a program that would monitor changes and trends in national animal health and management. They hoped to provide periodic snapshots of U.S. food animal industries. With these industry overviews, members could identify opportunities for improvement, provide changing foundations for research and special studies, and detect emerging problems.

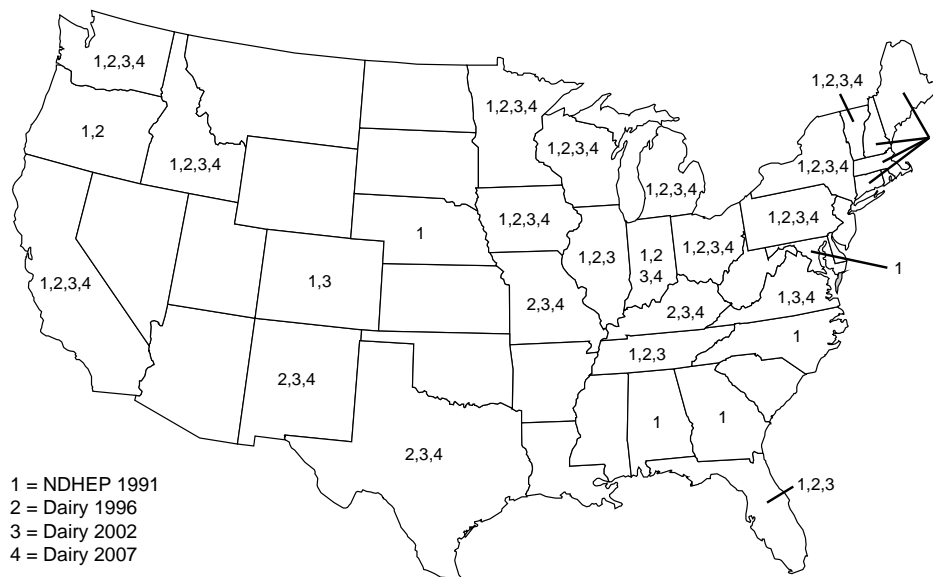
Section I of this report shows demographic changes of the U.S. dairy industry from a historical perspective using data provided by the USDA's National Agricultural Statistics Service (NASS) and Agricultural Marketing Service (AMS). Section II shows demographic changes of the world dairy industry using data provided by USDA's Foreign Agricultural Service (FAS). Results of four NAHMS national studies in Section III complete the overview of change in the U.S. dairy industry during the 16-year period of 1991 to 2007.

NAHMS' first national study of the U.S. dairy industry, the 1991 National Dairy Heifer Evaluation Project (NDHEP), provided the snapshot of animal health and management that would serve as a baseline from which to measure industry changes in animal health and management. NAHMS' Dairy 1996, Dairy 2002, and Dairy 2007 studies have fulfilled the vision of the program's founding objective, monitoring the trends in national animal health and management practices.

The NDHEP 1991 included herds of 30 or more milk cows and heifer-rearing operations in 28 States representing 83 percent of U.S. milk cows. Dairy 1996 described dairy production for operations with one or more milk cows in 20 States representing 83 percent of the Nation's milk cows. Dairy 2002 described dairy production for operations with one or more milk cows in 21 States representing 85 percent of the Nation's dairy cows. Dairy 2007 was conducted in 17 of the Nation's major dairy States and provides information representing 80 percent of U.S. dairy operations and 83 percent of U.S. dairy cows. This report, Part II: Changes in the United States Dairy Industry, 1991-2007, provides national estimates of animal health management practices for comparable populations from all four studies. Reports from all four NAHMS dairy studies—including the studies' methodologies—are available at <http://nahms.usda.aphis.gov>.

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**States Participating in NAHMS Dairy Studies, 1991, 1996, 2002, 2007**



Further information on NAHMS studies and reports is available at:  
<http://nahms.aphis.usda.gov>.

For questions about this report or additional copies, please contact:

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## Terms Used In This Report

**Cow:** Female dairy bovine that has calved at least once.

**Cow average:** The average value for all cows; the reported value for each operation multiplied by the number of cows on that operation is summed over all operations and divided by the number of cows on all operations. This way, the result is adjusted for the number of cows on each operation. For instance, on p 41 the cow average age at first calving is multiplied by the number of cows for each operation. This product is then summed over all operations and divided by the sum of cows over all operations. The result is the average age at first calving for all cows.

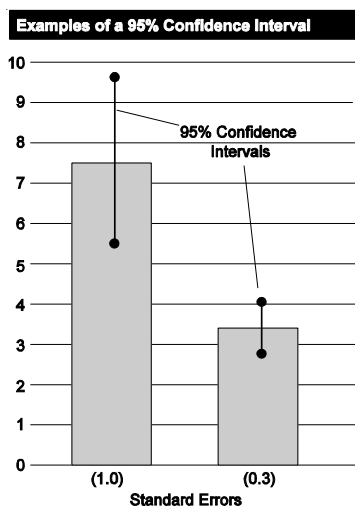
**Dairy Herd Improvement Association (DHIA):** An organization with programs and objectives intended to improve the production and profitability of dairy farming. DHIA also aids farmers in keeping milk production and management records.

**Heifer:** Female dairy bovine that has not yet calved.

**Herd size:** Herd size is based on January 1 respective inventories. Small herds are those with fewer than 100 head; medium herds are those with 100 to 499 head; and large herds are those with 500 or more head.

**NA:** Not available.

**Operation average:** A single value for each operation is summed over all operations reporting divided by the number of operations reporting. For instance, operation average age at first calving (shown on p 41) is calculated by summing reported average age over all operations divided by the number of operations.



**Population estimates:** Estimates in this report are provided with a measure of precision called the **standard error**. A 95-percent confidence interval can be created with bounds equal to the estimate, plus or minus two standard errors. If the only error is sampling error, the confidence intervals created in this manner will contain the true population mean 95 out of 100 times. In the example to the left, an estimate of 7.5 with a standard error of 1.0 results in limits of 5.5 to 9.5 (two times the standard error above and below the estimate). The second estimate of 3.4 shows a standard error of 0.3 and results in limits of 2.8 and 4.0. Alternatively, the 90-percent confidence interval would be created by multiplying the standard error by 1.65 instead of 2. Most estimates in this report are rounded to the nearest tenth. If rounded to 0, the standard error was reported. If there were no reports of the event, no standard error was reported.

**Rolling Herd Average (RHA):** Average milk production per cow (lb/cow) in the herd during the previous 12 months.

## Section I: Historical Changes in the U.S. Dairy Industry

### A. General Trends

**Note:** Unless otherwise noted, tables in this section are comprised from data collected by USDA's National Agricultural Statistics Service (NASS).

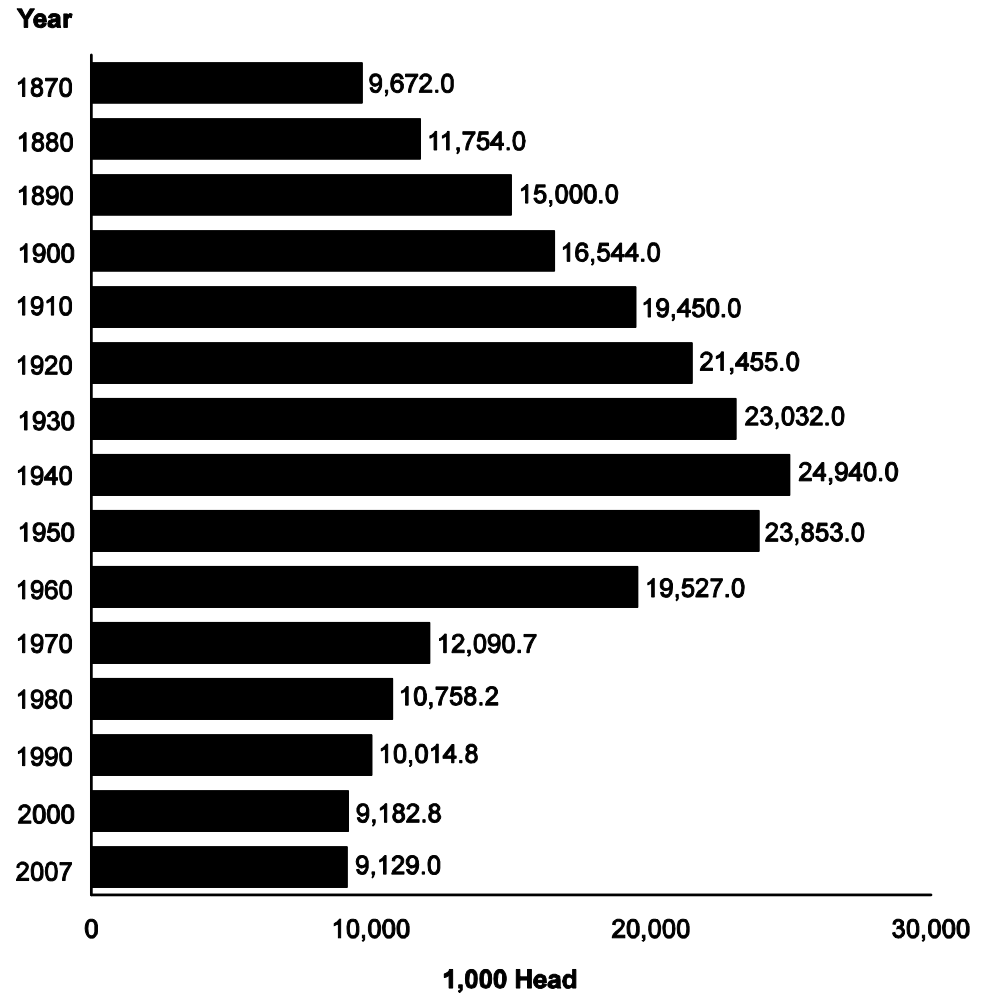
#### 1. Milk cow inventory

On January 1, 2007, U.S. milk cows numbered 9,129,000 head, 94.4 percent of the 9,672,000 milk cows in 1870. All U.S. cattle and calves numbered 97,002,900 head in 2007, about three times the number of cattle and calves in 1870 (31,082,000 head).

a. Long-term changes in U.S. milk cow January 1 inventory, 1870-2007:

Year	Milk Cows			All Cattle and Calves
	1,000 Head	Percent of 1870	Percent of All Cattle and Calves	1,000 Head
1870	9,672.0	100.0	31.1	31,082.0
1880	11,754.0	121.5	27.1	43,347.0
1890	15,000.0	155.1	25.0	60,014.0
1900	16,544.0	171.1	27.7	59,739.0
1910	19,450.0	201.1	33.0	58,993.0
1920	21,455.0	221.8	30.5	70,400.0
1930	23,032.0	238.1	37.8	61,003.0
1940	24,940.0	257.9	36.5	68,309.0
1950	23,853.0	246.6	30.6	77,963.0
1960	19,527.0	201.9	20.3	96,236.0
1970	12,090.7	125.0	10.8	112,368.7
1980	10,758.2	111.2	9.7	111,242.4
1990	10,014.8	103.5	10.5	95,816.2
2000	9,182.8	94.9	9.4	98,199.0
2007	9,129.0	94.4	9.4	97,002.9

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**Long-term Changes in U.S. Milk Cow January 1 Inventory, 1870-2007**

The number of milk cows that calved each year decreased about 6 percent from 1992 to 2002 but remained stable from 2002 to 2007.

b. Recent changes in U.S. milk cow January 1 inventory, 1992-2007:

<b>Milk Cows</b>					
<b>Year</b>	<b>1,000 Head</b>	<b>Percent Previous Year</b>	<b>Percent of 1992</b>	<b>Percent of 1996</b>	<b>Percent of 2002</b>
1992	9,728.2	97.6	100.0	--	--
1993	9,658.1	99.3	99.3	--	--
1994	9,507.0	98.4	97.7	--	--
1995	9,481.8	99.7	97.5	--	--
1996	9,419.9	99.3	96.8	100.0	--
1997	9,317.9	98.9	95.8	98.9	--
1998	9,199.0	98.7	94.6	97.7	--
1999	9,128.0	99.2	93.8	96.9	--
2000	9,182.8	100.6	94.4	97.5	--
2001	9,171.7	99.9	94.3	97.4	--
2002	9,105.6	99.3	93.6	96.7	100.0
2003	9,141.7	100.4	94.0	97.0	100.4
2004	8,989.5	98.3	92.4	95.4	98.7
2005	9,005.0	100.2	92.6	95.6	98.9
2006	9,062.9	100.6	93.2	96.2	99.5
2007	9,129.0	100.7	93.8	96.9	100.3

The January 1, 2007, number of replacement heifers has increased 4.3 percent since 1992. Replacement heifers as a percentage of the milk cow inventory remains between 42.5 and 47.2 percent, with recent years showing the larger percentage.

c. Recent changes in U.S. replacement heifer January 1 inventory, 1992-2007:

Milk Cow Replacement Heifers						
Year	1,000 Head	Percent Previous Year	Percent of 1992	Percent of 1996	Percent of 2002	Percent of Milk Cows
1992	4,131.4	100.9	100.0	--	--	42.5
1993	4,176.2	101.1	101.1	--	--	43.2
1994	4,124.5	98.8	99.8	--	--	43.4
1995	4,121.3	99.9	99.8	--	--	43.5
1996	4,090.3	99.2	99.0	100.0	--	43.4
1997	4,058.4	99.2	98.2	99.2	--	43.6
1998	3,985.7	98.2	96.5	97.4	--	43.3
1999	4,068.8	102.1	98.5	99.5	--	44.6
2000	3,999.8	98.3	96.8	97.8	--	43.6
2001	4,057.0	101.4	98.2	99.2	--	44.2
2002	4,054.8	99.9	98.1	99.1	100.0	44.5
2003	4,113.9	101.5	99.6	100.6	101.5	45.0
2004	4,020.0	97.7	97.3	98.3	99.1	44.7
2005	4,118.3	102.4	99.7	100.7	101.6	45.7
2006	4,275.0	103.8	103.5	104.5	105.4	47.2
2007	4,309.9	100.8	104.3	105.4	106.3	47.2

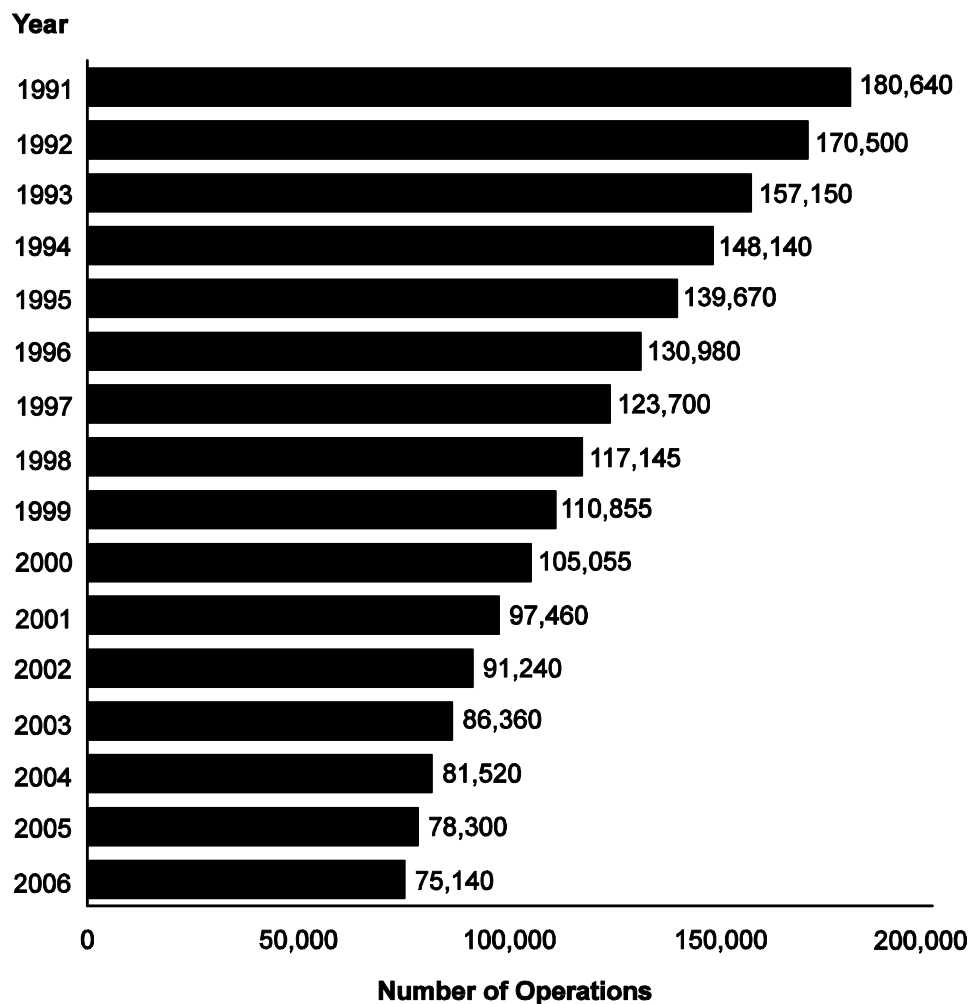
## 2. Number and size of dairy operations

Approximately 4 to 7 percent of dairy operations have gone out of business each year since 1991. Since 1991, the number of dairy operations decreased by 58.4 percent, while milk cow numbers in 2007 were at 93.8 percent of 1992 numbers. In this time frame, milk per cow increased by 32.7 percent and total milk production increased by 23.1 percent.

a. Recent changes in the number of U.S. dairy operations\*, 1991-2006:

Year	Number of Operations	Percent Previous Year	Percent of 1991	Percent of 1995	Percent of 2001
1991	180,640	93.8	100.0	--	--
1992	170,500	94.4	94.4	--	--
1993	157,150	92.2	87.0	--	--
1994	148,140	94.3	82.0	--	--
1995	139,670	94.3	77.3	100.0	--
1996	130,980	93.8	72.5	93.8	--
1997	123,700	94.4	68.5	88.6	--
1998	117,145	94.7	64.8	83.9	--
1999	110,855	94.6	61.4	79.4	--
2000	105,055	94.8	58.2	75.2	--
2001	97,460	92.8	54.0	69.8	100.0
2002	91,240	93.6	50.5	65.3	93.6
2003	86,360	94.7	47.8	61.8	88.6
2004	81,520	94.4	45.1	58.4	83.6
2005	78,300	96.1	43.3	56.1	80.3
2006	75,140	96.0	41.6	53.8	77.1

\* An operation is any place having one or more milk cows—excluding cows used to nurse calves—on hand any time during the year.

**Recent Changes in the Number of U.S. Dairy Operations\*, 1991-2006**

\*An operation is any place having one or more milk cows-excluding cows used to nurse calves-on hand any time during the year.

The percentage of operations with fewer than 50 cows has decreased since 1991, while the percentage of operations with more than 100 head has increased every year since 1991. More than 1 in 10 operations (11.5 percent) had more than 100 cows in 1991 compared to about 2 in 10 (23.3 percent) in 2006.

b. Percentage of U.S. dairy operations by herd size, 1991-2006:

Percent Operations						
Herd Size (Number of Cows)						
Year	1-29	30-49	50-99	100-199	200-499	500+
1991	39.8	22.8	25.9	11.5 <sup>1</sup>		
1992	38.9	22.1	26.0	13.0 <sup>1</sup>		
1993	37.3	22.2	26.8	9.3	4.4 <sup>2</sup>	
1994	36.1	22.0	27.4	9.8	4.7 <sup>2</sup>	
1995	34.5	22.2	28.1	10.2	5.0 <sup>2</sup>	
1996	32.9	22.3	28.7	10.7	5.4 <sup>2</sup>	
1997	31.6	22.1	29.0	11.3	4.1	1.9
1998	30.8	21.8	29.1	11.9	4.4	2.0
1999	29.7	21.7	29.6	11.9	4.8	2.3
2000	29.3	21.2	29.7	12.2	5.1	2.5
2001	29.0	20.4	29.8	12.6	5.3	2.9
2002	28.9	19.8	30.0	12.6	5.5	3.2
2003	29.0	19.5	29.9	12.7	5.5	3.4
2004	29.2	19.0	29.5	12.8	5.8	3.7
2005	28.7	19.0	29.6	12.8	6.0	3.9
2006	28.3	18.8	29.6	13.0	6.1	4.2

<sup>1</sup>These estimates include herds of 100 or more head.

<sup>2</sup>These estimates include herds of 200 or more head.



Operations with more than 200 cows accounted for 61.7 percent of cows in 2006 compared to 31.8 percent in 1993.

c. Percentage of U.S. milk cow inventory by herd size, 1991-2006:

Percent Inventory						
Herd Size (Number of Cows)						
Year	1-29	30-49	50-99	100-199	200-499	500+
1991	6.3	16.6	31.7	45.4 <sup>1</sup>		
1992	5.5	15.2	30.0	49.3 <sup>1</sup>		
1993	5.0	14.8	29.2	19.2	31.8 <sup>2</sup>	
1994	4.6	14.0	28.7	19.3	33.4 <sup>2</sup>	
1995	4.0	13.0	28.0	20.0	35.0 <sup>2</sup>	
1996	4.0	12.0	27.0	20.0	37.0 <sup>2</sup>	
1997	3.5	11.5	26.0	20.0	14.6	24.4
1998	3.6	10.5	24.3	19.3	15.5	26.8
1999	3.2	10.2	23.3	18.4	16.3	28.6
2000	2.9	9.1	22.0	18.1	16.6	31.3
2001	2.7	8.0	20.8	17.2	16.3	35.0
2002	2.4	7.4	19.6	16.4	15.9	38.3
2003	2.3	6.9	18.8	15.7	15.4	40.9
2004	2.1	6.6	17.8	15.1	15.5	42.9
2005	2.0	6.4	17.1	14.6	15.4	44.5
2006	1.9	6.0	16.3	14.1	15.0	46.7

<sup>1</sup>These estimates include herds of 100 or more head.

<sup>2</sup>These estimates include herds of 200 or more head.

### 3. Milk production

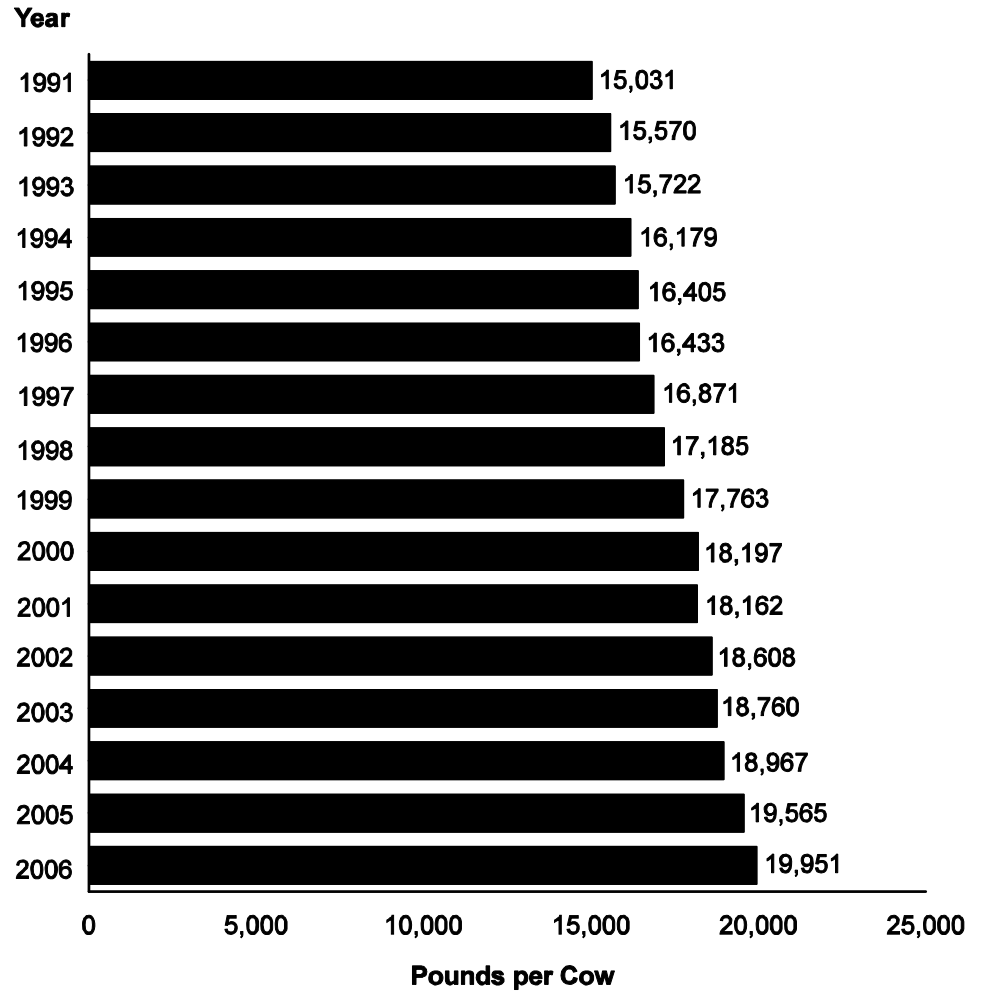
Milk production per cow has increased as much as 1 to 3 percent annually since 1991, with the exception of 2001. Milk production per cow was 19,951 pounds in 2006 compared to 15,031 pounds in 1991—a 32.7-percent increase.

a. Recent changes in U.S. milk production per cow, 1991-2006:

Milk per Cow						
Year	Average Number of Milk Cows* (1,000 Head)	Pounds per Cow	Percent Previous Year	Percent of 1991	Percent of 1995	Percent of 2001
1991	9,826	15,031	101.7	100.0	--	--
1992	9,688	15,570	103.6	103.6	--	--
1993	9,581	15,722	101.0	104.6	--	--
1994	9,494	16,179	102.9	107.6	--	--
1995	9,466	16,405	101.4	109.1	100.0	--
1996	9,372	16,433	100.2	109.3	100.2	--
1997	9,252	16,871	102.7	112.2	102.8	--
1998	9,151	17,185	101.9	114.3	104.8	--
1999	9,153	17,763	103.4	118.2	108.3	--
2000	9,199	18,197	102.4	121.1	110.9	--
2001	9,103	18,162	99.8	120.8	110.7	100.0
2002	9,139	18,608	102.5	123.8	113.4	102.5
2003	9,083	18,760	100.8	124.8	114.4	103.3
2004	9,012	18,967	101.1	126.2	115.6	104.4
2005	9,043	19,565	103.2	130.2	119.3	107.7
2006	9,112	19,951	102.0	132.7	121.6	109.9

\*Average number during the year, excluding heifers not yet fresh.

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**Recent Changes in U.S. Milk Production per Cow, 1991-2006**

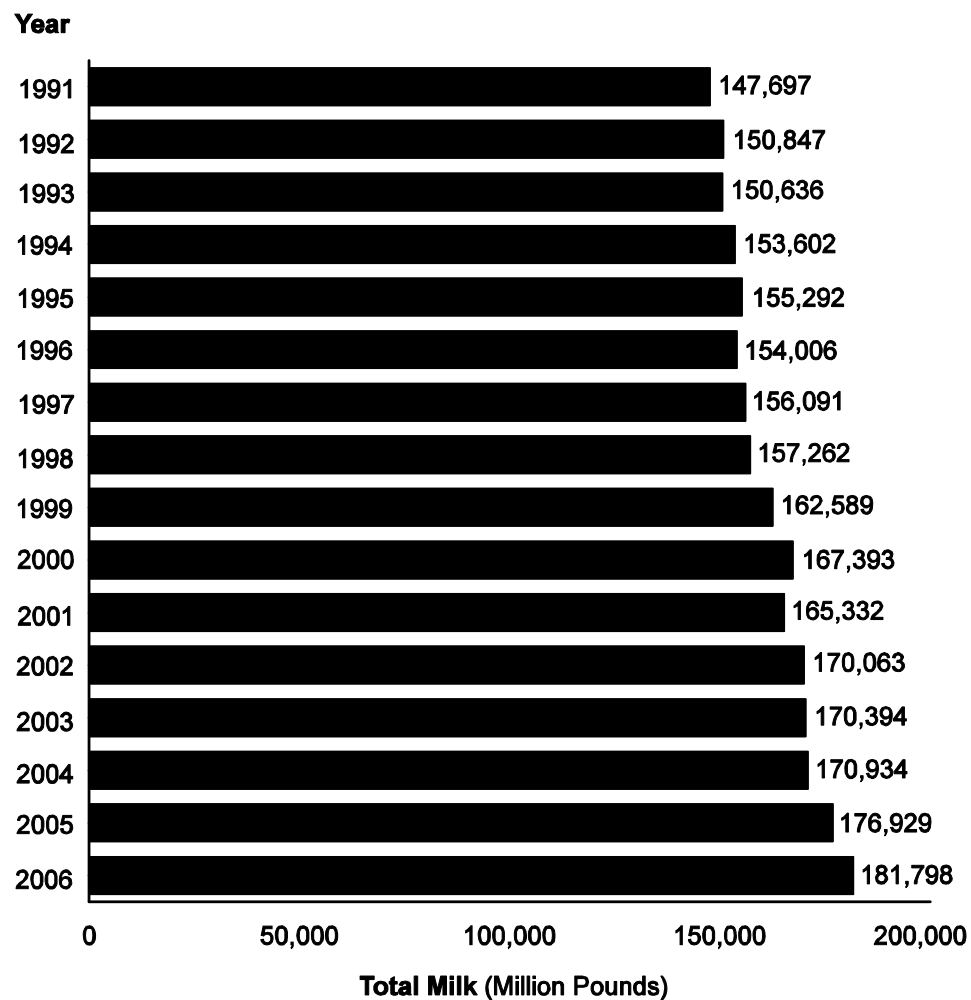
Total milk production in the United States has increased more than 20 percent since 1991, despite an approximate 6-percent drop in the number of cows. In 2006, total milk production was 181,798 million pounds compared to 147,697 million pounds in 1991.

b. Recent changes in U.S. total milk production, 1991-2006:

<b>Total Milk Production</b>					
<b>Year</b>	<b>Total Milk* (Million Pounds)</b>	<b>Percent Previous Year</b>	<b>Percent of 1991</b>	<b>Percent of 1995</b>	<b>Percent of 2001</b>
1991	147,697	100.0	100.0	--	--
1992	150,847	102.1	102.2	--	--
1993	150,636	99.8	102.0	--	--
1994	153,602	102.0	104.0	--	--
1995	155,292	101.1	105.1	100.0	--
1996	154,006	99.2	104.3	99.2	--
1997	156,091	101.4	105.7	100.5	--
1998	157,262	100.8	106.5	101.3	--
1999	162,589	103.4	110.1	104.7	--
2000	167,393	103.0	113.3	107.8	--
2001	165,332	98.8	111.9	106.5	100.0
2002	170,063	102.9	115.1	109.5	102.9
2003	170,394	100.2	115.4	109.7	103.1
2004	170,934	100.3	115.7	110.1	103.4
2005	176,929	103.5	119.8	113.9	107.0
2006	181,798	102.8	123.1	117.1	110.0

\*Excluding milk nursed by calves.

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**Recent Changes in U.S. Total Milk Production\*, 1991-2006**

\*Excluding milk nursed by calves

#### 4. Bulk-tank somatic cell counts

Bulk tank somatic cell counts (BTSCCs) from 4 of the 10 U.S. Federal Milk Marketing Orders were analyzed from 1995 to 2006. Monthly BTSCCs were weighted based on the pounds of milk shipped, and, subsequently, a geometric mean of all milk-weighted somatic cell counts was calculated. BTSCCs from the four Federal Milk Marketing Orders have decreased over the last 12 years. Typically, BTSCCs spike during summer months and decline quickly during fall. BTSCCs have ranged from a high of 384,100 in August 1995 to a low of 234,200 in March 2006. Beginning in 2004, BTSCCs have decreased in January through July for each subsequent year.

a. Milk-weighted bulk tank somatic cell counts from Federal Milk Marketing Orders, 1995–2006\* (January through June):

<b>Bulk Tank Somatic Cell Counts (x1,000 cells/ml), 1995–2006</b>						
<b>Month (January–June)</b>						
<b>Year</b>	<b>January</b>	<b>February</b>	<b>March</b>	<b>April</b>	<b>May</b>	<b>June</b>
1995	298.8	293.2	297.0	289.3	286.1	308.6
1996	275.5	283.5	283.3	277.0	280.4	309.2
1997	288.2	294.9	295.9	291.3	293.4	299.9
1998	284.4	280.2	282.4	282.6	284.2	298.6
1999	278.5	288.8	282.8	283.9	286.4	315.3
2000	258.0	279.9	283.7	282.5	292.6	311.9
2001	286.5	280.2	281.7	284.5	291.6	305.9
2002	283.4	281.8	279.1	279.5	270.9	284.9
2003	274.4	279.9	281.0	271.5	277.6	292.2
2004	250.0	257.6	266.3	264.4	260.5	274.7
2005	246.7	248.2	243.8	244.9	245.5	264.3
2006	240.8	234.7	234.2	236.4	234.7	249.1

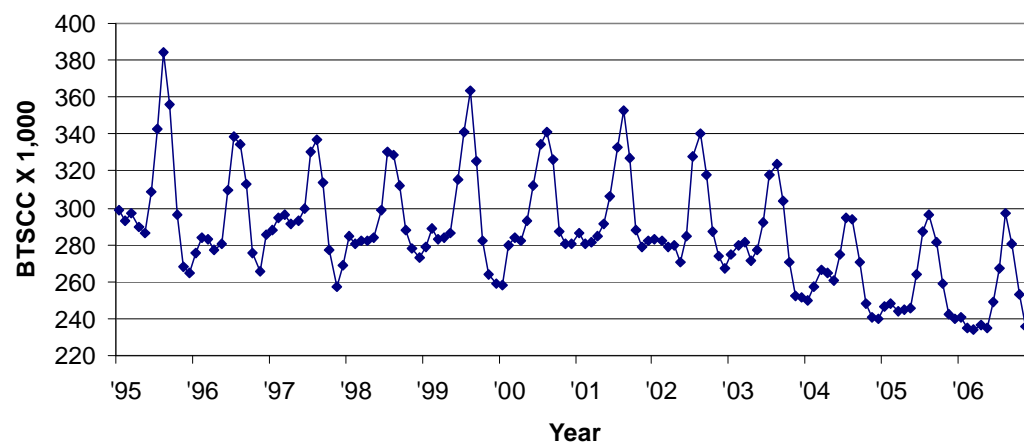
\*Agricultural Marketing Service data summarized by NAHMS.

b. Milk-weighted bulk tank somatic cell counts from Federal Milk Marketing Orders, 1995–2006\* (July through December):

<b>Bulk Tank Somatic Cell Counts (x1,000 cells/ml), 1995–2006</b>						
<b>Month (July–December)</b>						
<b>Year</b>	<b>July</b>	<b>August</b>	<b>September</b>	<b>October</b>	<b>November</b>	<b>December</b>
1995	342.8	384.1	356.4	296.6	267.7	265.2
1996	338.7	334.1	313.0	275.6	265.3	285.4
1997	330.3	336.7	314.1	276.9	257.0	269.3
1998	330.2	328.4	312.3	288.2	278.2	272.7
1999	341.4	363.7	325.5	282.4	263.6	259.3
2000	334.2	341.4	326.4	287.4	280.4	280.5
2001	332.5	352.5	327.3	288.1	278.7	282.6
2002	328.0	340.1	318.0	287.0	273.6	267.2
2003	317.8	323.7	304.1	270.3	252.0	251.2
2004	294.5	293.6	270.4	247.9	240.9	239.5
2005	286.8	296.1	281.7	258.9	242.5	240.1
2006	267.1	296.9	280.3	253.0	235.4	239.4

\*Agricultural Marketing Service data summarized by NAHMS.

**Monthly milk-weighted bulk tank somatic cell counts from Federal Milk Marketing Orders, 1995–2006**



### 5. Milk prices

From 1991 through 2006, milk prices paid to producers ranged from a low of \$11.00 per hundred pounds of milk from March through June 2003 to a high of \$19.30 in May of 2004. On average, milk prices during this time were between \$13.00 and \$14.00. In general, milk prices rise during late summer and early fall, decrease in mid-winter, and remain stable through the summer.

a. Monthly milk prices received by farmers, all milk 1991–2006 (January through June):

<b>Milk Prices* 1991–2006 (Dollars)</b>						
<b>Month (January–June)</b>						
<b>Year</b>	<b>January</b>	<b>February</b>	<b>March</b>	<b>April</b>	<b>May</b>	<b>June</b>
1991	11.70	11.60	11.40	11.30	11.30	11.40
1992	13.40	12.90	12.50	12.60	12.80	13.20
1993	12.50	12.20	12.20	12.60	12.90	13.00
1994	13.60	13.40	13.50	13.40	12.80	12.60
1995	12.60	12.50	12.60	12.30	12.30	12.10
1996	14.10	13.90	13.80	13.90	14.30	14.80
1997	13.50	13.40	13.60	13.20	12.70	12.20
1998	14.70	14.90	14.50	14.00	13.30	14.20
1999	17.40	15.20	15.20	12.60	12.80	13.10
2000	12.00	11.80	11.80	11.90	12.00	12.30
2001	13.00	13.10	13.90	14.60	15.50	16.20
2002	13.60	13.10	12.60	12.50	12.10	11.50
2003	11.80	11.30	11.00	11.00	11.00	11.00
2004	13.20	13.60	15.50	18.10	19.30	18.20
2005	16.10	15.40	15.50	15.20	14.70	14.40
2006	14.40	13.50	12.60	12.10	11.90	11.90

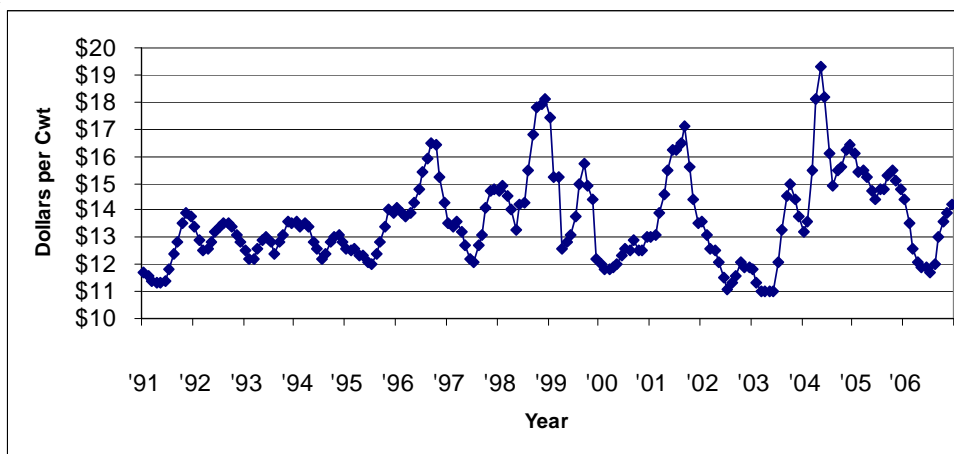
\*Per 100 pounds of milk.



b. Monthly milk prices received by farmers, all milk 1991–2006 (July through December):

<b>Milk Prices* 1991–2006 (Dollars)</b>						
<b>Month (July–December)</b>						
<b>Year</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>	<b>Nov</b>	<b>Dec</b>
1991	11.80	12.40	12.80	13.50	13.90	13.80
1992	13.40	13.50	13.50	13.40	13.10	12.80
1993	12.80	12.40	12.80	13.10	13.60	13.50
1994	12.20	12.40	12.80	13.00	13.10	12.80
1995	12.00	12.40	12.80	13.40	14.00	13.90
1996	15.40	15.90	16.50	16.40	15.20	14.30
1997	12.10	12.70	13.10	14.10	14.70	14.80
1998	14.30	15.50	16.80	17.80	17.90	18.10
1999	13.80	15.00	15.70	14.90	14.40	12.20
2000	12.60	12.50	12.90	12.50	12.50	13.00
2001	16.20	16.50	17.10	15.60	14.40	13.50
2002	11.10	11.30	11.60	12.10	11.90	11.90
2003	12.10	13.30	14.50	15.00	14.40	13.80
2004	16.10	14.90	15.50	15.60	16.20	16.40
2005	14.80	14.80	15.30	15.50	15.10	14.80
2006	11.70	12.00	13.00	13.60	13.90	14.20

\*Per 100 pounds of milk.

**Monthly Milk Prices Received by Farmers, All Milk 1991–2006**

c. Annual milk prices received by farmers, all milk 1991–2006:

<b>Annual Milk Prices<sup>1</sup> 1991–2006 (Dollars)</b>		
	<b>Nominal Dollars<sup>2</sup></b>	<b>2000 Dollars<sup>3</sup></b>
1991	12.27	14.53
1992	13.15	15.22
1993	12.84	14.52
1994	13.01	14.41
1995	12.78	13.87
1996	14.75	15.71
1997	13.36	14.00
1998	15.46	16.02
1999	14.38	14.69
2000	12.40	12.40
2001	15.05	14.70
2002	12.18	11.69
2003	12.55	11.80
2004	16.13	14.78
2005	15.19	13.48
2006	12.97	11.16

<sup>1</sup>Per 100 pounds of milk.

<sup>2</sup>Prices producers received.

<sup>3</sup>Nominal prices adjusted for inflation.

## 6. Milk cow prices

Cow prices were stable from 1991 through 1998, with prices averaging between \$1,000 and \$1,200 per cow. Since 1998, cow prices have varied more, with a low of \$1,240 per cow in 1999 and a high of \$1,870 in 2005.

Milk-cow prices received by producers, 1991–2006:

Milk–Cow Prices <sup>1</sup> (Dollars)						
Year	January	April	July	October	Annual Nominal Dollars <sup>2</sup>	2002 Dollars <sup>3</sup>
1991	1,100	1,090	1,090	1,100	1,100	1,303
1992	1,100	1,120	1,150	1,150	1,130	1,308
1993	1,140	1,160	1,170	1,170	1,160	1,312
1994	1,170	1,190	1,160	1,160	1,170	1,296
1995	1,150	1,140	1,130	1,090	1,130	1,227
1996	1,060	1,070	1,090	1,130	1,090	1,161
1997	1,090	1,110	1,100	1,090	1,100	1,153
1998	1,070	1,110	1,120	1,180	1,120	1,161
1999	1,250	1,240	1,280	1,380	1,280	1,308
2000	1,330	1,340	1,350	1,350	1,340	1,340
2001	1,320	1,400	1,590	1,700	1,500	1,465
2002	1,610	1,710	1,670	1,430	1,600	1,536
2003	1,380	1,300	1,310	1,380	1,340	1,259
2004	1,390	1,580	1,720	1,640	1,580	1,444
2005	1,620	1,770	1,830	1,870	1,770	1,570
2006	1,840	1,770	1,680	1,650	1,730	1,488

<sup>1</sup>Cows that calved.

<sup>2</sup>Prices producers received.

<sup>3</sup>Nominal prices adjusted for inflation.

### 7. Dairy cow slaughter

Approximately 2 to 3 million dairy cows have been slaughtered annually since 1991. The number of cows slaughtered as a percentage of January 1 inventory ranged from 25.0 to 32.2 percent.

Recent changes in dairy-cow slaughter, 1991-2006:

Dairy-Cow Slaughter			
Year	1,000 Head	Percent of January 1 Cow Inventory	Percent Previous Year
1991	2,840.0	28.5	106.3
1992	2,892.0	29.7	101.8
1993	2,994.8	31.0	103.6
1994	2,857.8	30.1	95.4
1995	2,861.7	30.2	100.1
1996	3,036.9	32.2	106.1
1997	2,926.2	31.4	96.4
1998	2,619.6	28.5	89.5
1999	2,573.3	28.2	98.2
2000	2,631.5	28.7	102.3
2001	2,581.9	28.2	98.1
2002	2,606.9	28.6	101.0
2003	2,859.9	31.3	109.7
2004	2,362.7	26.3	82.6
2005	2,252.1	25.0	95.3
2006	2,353.5	26.0	104.5

### 8. Value of production

In 2006, milk sales accounted for 23.6 percent of the value of selected U.S. commodities (cattle, milk, poultry, swine, sheep and wool, catfish and trout, and honey). Since dairy cows, bulls, and steers are also marketed for beef (cattle), the percentage of value assigned to the entire dairy industry totals more than one-quarter of the selected U.S. commodity value.

Value of production for selected U.S. commodities, 2002-2006:

Commodity	Year									
	2002		2003		2004		2005		2006	
	Value (\$1,000)	Pct.	Value (\$1,000)	Pct.	Value (\$1,000)	Pct.	Value (\$1,000)	Pct.	Value (\$1,000)	Pct.
Cattle	27,097,532	34.7	32,112,931	36.7	34,830,872	33.0	36,628,658	34.4	35,740,774	35.7
Milk	20,720,482	26.6	21,381,324	24.4	27,567,726	26.1	26,873,946	25.2	23,573,744	23.6
Poultry <sup>1</sup>	20,501,173	26.3	23,295,445	26.6	28,857,215	27.4	28,174,715	26.5	26,842,833	26.8
Swine	8,690,923	11.1	9,663,024	11.0	13,072,025	12.4	13,606,780	12.8	12,703,842	12.7
Sheep and wool	335,635	0.4	419,891	0.5	441,199	0.4	479,397	0.4	392,598	0.4
Catfish and trout <sup>2</sup>	476,902	0.6	484,894	0.5	546,390	0.5	551,483	0.5	555,675	0.6
Honey	228,338	0.3	253,106	0.3	196,259	0.2	160,428	0.2	161,314	0.2
Total	78,050,985	100.0	87,610,615	100.0	105,511,686	100.0	106,475,407	100.0	99,970,780	100.0

<sup>1</sup>Includes boilers, eggs, turkeys, and chickens (value of sales).

<sup>2</sup>Total of sales for trout (excluding eggs), and catfish foodsize, broodfish, stocker, and fingerling sales.

**B. Dairy Industry  
Changes by State**

**Note: The following tables describe U.S. dairy industry changes by State between 1991 and 2007, based on USDA–NASS data. The tables also identify which States were in the four NAHMS national dairy studies: the National Dairy Heifer Evaluation Project (NDHEP) 1991, Dairy 1996, Dairy 2002, and Dairy 2007.**

**1. Milk cow inventory**

States in the Western United States have shown the largest growth in the number of milk cows since 1992. Arizona, California, Colorado, Idaho, Kansas, Nevada, New Mexico, Oregon, and Utah have all increased cow numbers since 1992. States in the Southeast, including Alabama, Arkansas, Louisiana, and Mississippi, had the largest percentage decline in dairy cows, but these States represented less than 5 percent of the overall dairy population. In 2007, California had the largest number of dairy cows (1.79 million) followed by Wisconsin (1.245 million), and New York (628,000).

## Changes in U.S. milk cow inventories by State:

Number of Milk Cows that Calved (1,000 Head) January							
State	1992	1996	2002	2007	2007 as Percent of 1992	2007 as Percent of 1996	2007 as Percent of 2002
Alabama	43*	32	20	13	30.2	40.6	65.0
Alaska	0.8	0.8	1.2	0.6	75.0	75.0	50.0
Arizona	96	118	140	175	182.3	148.3	125.0
Arkansas	69	58	33	19	27.5	32.8	57.6
California	1,160*	1,320*	1,620*	1,790*	154.3	135.6	110.5
Colorado	77*	82	93*	115	149.4	140.2	123.7
Connecticut	33*	31	24	19	57.6	61.3	79.2
Delaware	9	10	9	7	77.8	70.0	77.8
Florida	179*	155*	152*	130	72.6	83.9	85.5
Georgia	105*	98	86	75	71.4	76.5	87.2
Hawaii	10	10	7	3.8	38.0	38.0	54.3
Idaho	178*	245*	377*	502*	282.0	204.9	133.2
Illinois	170*	145*	115*	103	60.6	71.0	89.6
Indiana	145*	140*	154*	166*	114.5	118.6	107.8
Iowa	270*	245*	205*	210*	77.8	85.7	102.4
Kansas	95	83	96	110	115.8	132.5	114.6
Kentucky	185	160*	125*	93*	50.3	58.1	74.4
Louisiana	79	72	54	30	38.0	41.7	55.6
Maine	41*	40	38	32	78.0	80.0	84.2
Maryland	95*	91	81	60	63.2	65.9	74.1
Massachusetts	31*	27	21	15.5	50.0	57.4	73.8
Michigan	332*	326*	299*	324*	97.6	99.4	108.4
Minnesota	660*	585*	500*	455*	68.9	77.8	91.0
Mississippi	60	53	34	22	36.7	41.5	64.7
Missouri	210	185*	140*	114*	54.3	61.6	81.4
Montana	24	20	19	18	75.0	90.0	94.7
Nebraska	90*	70	68	60	66.7	85.7	88.2
Nevada	20	23	25	27	135.0	117.4	108.0
New Hampshire	21*	20	18	14.5	69.0	72.5	80.6
New Jersey	24	23	13	10.5	43.8	45.7	80.8
New Mexico	101	195*	290*	360*	356.4	184.6	124.1
New York	740*	700*	675*	628*	84.9	89.7	93.0
North Carolina	99*	84	66	48	48.5	57.1	72.7
North Dakota	80	63	42	31	38.8	49.2	73.8
Ohio	320*	285*	260*	274*	85.6	96.1	105.4
Oklahoma	97	94	84	70	72.2	74.5	83.3
Oregon	100*	95*	105	115	115.0	121.1	109.5
Pennsylvania	663*	636*	588*	550*	83.0	86.5	93.5
Rhode Island	2.4*	2.1	1.4	1.1	45.8	52.4	78.6
South Carolina	33	26	20	17	51.5	65.4	85.0
South Dakota	132	115	87	81	61.4	70.4	93.1
Tennessee	165*	120*	90*	67	40.6	55.8	74.4
Texas	385	400*	315*	347*	90.1	86.8	110.2
Utah	76	90	93	86	113.2	95.6	92.5
Vermont	163*	157*	154*	140*	85.9	89.2	90.9
Virginia	140*	128	120*	100*	71.4	78.1	83.3
Washington	238*	260*	247*	235*	98.7	90.4	95.1
West Virginia	23	21	16	13	56.5	61.9	81.3
Wisconsin	1,650*	1,475*	1,280*	1,245*	75.5	84.4	97.3
Wyoming	9	6	5	7	77.8	116.7	140.0
U.S.	9,728.2	9,419.9	9,105.6	9,129	93.8	96.9	100.3
NAHMS total	7,910.4	7,829	7,799	7,533	95.2	96.2	96.6

\*NAHMS participating States.



Photo by Dr. Jason Lombard

## **2. Number of U.S. dairy operations**

With the exception of Alaska, the number of dairy operations in all States has decreased since 1991. In 2006, Wisconsin had the largest number of dairy operations (14,900) followed by Pennsylvania (8,700) and New York (6,400). California reported 2,300 operations, but had the highest number of dairy cows, demonstrating a large number of cows per herd.



## a. Changes in number of U.S. dairy operations, by State:

State	Number of Operations <sup>1</sup> with Milk Cows				2006 as Percent of 1991	2006 as Percent of 1995	2006 as Percent of 2001
	1991 <sup>2</sup>	1995 <sup>3</sup>	2001 <sup>4</sup>	2006 <sup>5</sup>			
Alabama	1,100*	510	250	170	15.5	33.3	68.0
Alaska	30	30	30	30	100.0	100.0	100.0
Arizona	500	300	250	200	40.0	66.7	80.0
Arkansas	2,000	1,700	700	280	14.0	16.5	40.0
California	4,200*	3,300*	2,500*	2,300*	54.8	69.7	92.0
Colorado	1,400*	1,000	800*	630	45.0	63.0	78.8
Connecticut	500*	380	310	220	44.0	57.9	71.0
Delaware	160	150	110	90	56.3	60.0	81.8
Florida	1,000*	800*	510*	460	46.0	57.5	90.2
Georgia	1,400*	1,100	720	580	41.4	52.7	80.6
Hawaii	80	60	30	30	37.5	50.0	100.0
Idaho	1,900*	1,500*	1,000*	800*	42.1	53.3	80.0
Illinois	3,000*	2,600*	1,900*	1,300	43.3	50.0	68.4
Indiana	4,500*	3,900*	2,900*	2,100*	46.7	53.8	72.4
Iowa	7,000*	5,200*	3,500*	2,400*	34.3	46.2	68.6
Kansas	2,300	1,600	1,200	900	39.1	56.3	75.0
Kentucky	5,500	4,000*	2,900*	2,000*	36.4	50.0	69.0
Louisiana	1,800	1,100	610	350	19.4	31.8	57.4
Maine	1,100*	750	600	460	41.8	61.3	76.7
Maryland	1,600*	1,100	950	810	50.6	73.6	85.3
Massachusetts	800*	500	350	240	30.0	48.0	68.6
Michigan	6,000*	4,700*	3,300*	2,700*	45.0	57.4	81.8
Minnesota	15,000*	12,000*	7,800*	5,400*	36.0	45.0	69.2
Mississippi	1,300	800	480	330	25.4	41.3	68.8
Missouri	6,900	5,000*	3,700*	2,600*	37.7	52.0	70.3
Montana	1,600	900	650	600	37.5	66.7	92.3
Nebraska	2,700*	1,800	1,100	700	25.9	38.9	63.6
Nevada	260	200	150	100	38.5	50.0	66.7
New Hampshire	400*	400	260	200	50.0	50.0	76.9
New Jersey	450	400	230	150	33.3	37.5	65.2
New Mexico	1,300	900*	500*	450*	34.6	50.0	90.0
New York	12,200*	10,000*	7,300*	6,400*	52.5	64.0	87.7
North Carolina	1,800*	1,300	900	590	32.8	45.4	65.6
North Dakota	2,100	1,500	850	500	23.8	33.3	58.8
Ohio	8,900*	6,800*	5,200*	4,400*	49.4	64.7	84.6
Oklahoma	3,000	2,400	1,700	1,400	46.7	58.3	82.4
Oregon	1,900*	1,300*	820	720	37.9	55.4	87.8
Pennsylvania	14,500*	11,800*	10,300*	8,700*	60.0	73.7	84.5
Rhode Island	60*	40	30	30	50.0	75.0	100.0
South Carolina	800	350	240	200	25.0	57.1	83.3
South Dakota	3,300	2,400	1,400	750	22.7	31.3	53.6
Tennessee	3,500*	2,600*	1,500*	1,100	31.4	42.3	73.3
Texas	5,300	4,000*	2,100*	1,300*	24.5	32.5	61.9
Utah	1,500	1,000	760	560	37.3	56.0	73.7
Vermont	2,600*	2,100*	1,600*	1,200*	46.2	57.1	75.0
Virginia	2,800*	2,100	1,500*	1,300*	46.4	61.9	86.7
Washington	3,000*	1,800*	1,000*	790*	26.3	43.9	79.0
West Virginia	2,000	1,100	600	470	23.5	42.7	78.3
Wisconsin	33,000*	28,000*	19,100*	14,900*	45.2	53.2	78.0
Wyoming	600	400	270	250	41.7	62.5	92.6
U.S.	180,640	139,670	97,460	75,140	41.6	53.8	77.1
NAHMS total	137,860	112,300	80,910	59,740	43.3	53.2	73.8

<sup>1</sup>An operation is any place having one or more milk cows, excluding cows used to nurse calves, on hand any time during the year.

<sup>2</sup>NASS, Milk Final Estimates 1988-92.

<sup>3</sup>NASS, Milk Cows and Production Final Estimates 1993-97, January 1999.

<sup>4</sup>NASS, Livestock Operations, Final Estimates 1998-2002, April 2004.

<sup>5</sup>NASS, Farms, Land in Farms, and Livestock Operations, 2006 Summary, February 2007.

\*NAHMS participating States.

Similar to the changes in the number of dairy operations, the number of licensed dairy operations (Grade A or B) decreased from 2002 to 2006 for every State except Alaska, which remained the same over the 5-year period. More than four of five U.S. dairy operations (82.5 percent) were licensed.

b. Changes in U.S. licensed dairy operations by State:

Number of U.S. Licensed Dairy Operations (Grade A or B)							
Year							
State	2002	2003	2004	2005	2006	2006 as Percent of 2002	2006 as Percent of NASS Operations
Alabama	120*	110	100	90	75	62.5	44.1
Alaska	10	10	10	10	10	100.0	33.3
Arizona	160	160	150	140	130	81.3	65.0
Arkansas	320	290	240	210	190	59.4	67.9
California	2,030*	2,060*	2,030*	1,970*	1,960	96.6	85.7
Colorado	180*	180	170*	170	170	94.4	27.0
Connecticut	210*	200	180	170	170	81.0	77.3
Delaware	95	90	90	90	60	63.2	66.7
Florida	210*	190*	190*	180	160	76.2	34.8
Georgia	380*	360	330	320	300	78.9	55.2
Hawaii	10	10	10	5	5	50.0	16.7
Idaho	815*	775*	755*	725*	690	84.7	86.3
Illinois	1,340*	1,295*	1,210*	1,155	1,105	82.5	85.0
Indiana	2,150*	2,010*	1,900*	1,830*	1,750	81.4	83.3
Iowa	2,760*	2,500*	2,420*	2,370*	2,230	80.8	92.9
Kansas	565	530	490	460	450	79.6	50.0
Kentucky	1,835	1,630*	1,435*	1,335*	1,240	67.6	62.0
Louisiana	380	340	310	280	250	65.8	71.4
Maine	430*	400	390	370	350	81.4	76.1
Maryland	735*	715	695	655	630	85.7	77.8
Massachusetts	250*	230	220	200	190	76.0	79.2
Michigan	3,040*	2,840*	2,680*	2,590*	2,530	83.2	93.7
Minnesota	6,775*	6,235*	5,810*	5,530*	5,295	78.2	98.1
Mississippi	300	270	250	230	190	63.3	57.8
Missouri	2,110	1,980*	1,840*	1,780*	1,710	81.0	65.8
Montana	120	110	120	120	110	91.7	18.3
Nebraska	540*	500	450	405	380	70.4	54.3
Nevada	35	30	30	30	30	85.7	30.0
New Hampshire	170*	150	140	140	130	76.5	65.0
New Jersey	140	130	130	120	120	85.7	80.0
New Mexico	160	170*	170*	170*	170	106.3	37.8
New York	6,930*	6,700*	6,600*	6,430*	5,970	86.1	93.3
North Carolina	420*	395	375	365	345	82.1	58.5
North Dakota	510	440	400	360	320	62.7	64.0
Ohio	4,100*	3,960*	3,780*	3,610*	3,530	86.1	80.2
Oklahoma	440	420	400	380	350	79.5	25.0
Oregon	350*	350*	350	330	320	91.4	44.4
Pennsylvania	9,240*	9,130*	8,720*	8,700*	8,610	93.2	99.0
Rhode Island	20*	20	20	20	15	75.0	50.0
South Carolina	120	120	110	95	95	79.2	47.5
South Dakota	860	780	700	650	600	69.8	80.0
Tennessee	860*	820*	760*	710	650	75.6	59.1
Texas	890	850*	810*	780*	740	83.1	56.9
Utah	405	365	360	345	320	79.0	57.1
Vermont	1,480*	1,390*	1,280*	1,230*	1,170	79.1	97.5
Virginia	940*	910	850*	815*	775	82.4	59.6
Washington	660*	640*	620*	610*	610	92.4	77.2
West Virginia	170	150	140	130	120	70.6	25.5
Wisconsin	17,300*	16,400*	15,570*	15,100*	14,640	84.6	98.3
Wyoming	40	35	35	30	30	75.0	12.0
U.S.	74,110	70,375	66,825	64,540	61,990	83.6	82.5
NAHMS total	64,435	61,925	59,600	55,575			

### 3. U.S. average dairy herd size

Average dairy herd sizes in 2006 ranged from 20 cows in Alaska to 875 in Arizona. The U.S. average dairy herd size in 2006 was 121.5 cows, more than double the average in 1991 (53.9 cows).

Changes in U.S. average dairy herd size by State:

State	Average Herd Size <sup>1</sup> (Number of Milk Cows)				2006 as Percent of 1991	2006 as Percent of 1995	2006 as Percent of 2001
	1991	1995	2001	2006			
Alabama	39.1*	62.7	80.0	76.5	195.7	121.9	95.6
Alaska	26.7	26.7	43.3	20.0	74.9	75.0	46.2
Arizona	192.0	403.3	588.0	875.0	455.7	216.9	148.8
Arkansas	34.5	32.9	45.7	67.9	196.8	206.0	148.4
California	276.2*	408.8*	659.2*	778.3*	281.8	190.4	118.1
Colorado	55.0*	84.0	125.0*	182.5	331.8	217.3	146.0
Connecticut	66.0*	78.9	77.4	86.4	130.9	109.4	111.6
Delaware	56.3	64.7	81.8	77.8	138.2	120.3	95.1
Florida	179.0*	195.0*	294.1*	282.6	157.9	144.9	96.1
Georgia	75.0*	88.2	118.1	129.3	172.4	146.6	109.5
Hawaii	125.0	156.7	220.0	126.7	101.4	80.9	57.6
Idaho	93.7*	170.7*	388.0*	627.5*	669.7	367.7	161.7
Illinois	56.7*	53.8*	60.5*	79.2	139.7	147.1	130.9
Indiana	32.2*	35.9*	52.1*	79.0*	245.3	220.2	151.8
Iowa	38.6*	46.3*	59.7*	87.5*	226.7	188.8	146.5
Kansas	41.3	51.3	89.2	122.2	295.9	238.5	137.1
Kentucky	33.6	38.3*	42.1*	46.5*	138.4	121.6	110.5
Louisiana	43.9	62.7	78.7	85.7	195.2	136.6	108.9
Maine	37.3*	54.7	61.7	69.6	186.6	127.3	112.8
Maryland	59.4*	79.1	85.3	74.1	124.7	93.7	86.9
Massachusetts	38.8*	54.0	60.0	64.6	166.5	119.6	107.6
Michigan	55.3*	68.1*	91.2*	120.0*	217.0	176.3	131.6
Minnesota	44.0*	48.6*	62.4*	84.3*	191.6	173.4	135.0
Mississippi	46.2	63.8	70.8	66.7	144.4	104.6	94.1
Missouri	30.4	36.4*	37.0*	43.8*	144.1	120.5	118.4
Montana	15.0	22.2	27.7	30.0	200.0	135.0	108.3
Nebraska	33.3*	38.3	60.9	85.7	257.4	223.6	140.7
Nevada	76.9	125.0	166.7	270.0	351.1	216.0	162.0
New Hampshire	52.5*	50.0	69.2	72.5	138.1	145.0	104.7
New Jersey	53.3	55.0	56.5	70.0	131.3	127.3	123.8
New Mexico	77.7	216.7*	602.0*	800.0*	1029.6	369.2	132.9
New York	60.7*	70.2*	92.5*	98.1*	161.6	139.8	106.1
North Carolina	55.0*	63.1	71.1	81.4	148.0	129.0	114.4
North Dakota	38.1	41.3	47.1	62.0	162.7	150.0	131.8
Ohio	36.0*	41.3*	50.4*	62.3*	173.1	150.7	123.6
Oklahoma	32.3	39.2	49.4	50.0	154.8	127.7	101.2
Oregon	52.6*	71.5*	139.0	159.7	303.6	223.3	114.9
Pennsylvania	45.7*	53.7*	56.8*	63.2*	138.3	117.7	111.3
Rhode Island	40.0*	50.0	46.7	36.7	91.8	73.3	78.6
South Carolina	41.3	74.3	83.3	85.0	205.8	114.4	102.0
South Dakota	40.0	46.7	61.4	108.0	270.0	231.4	175.8
Tennessee	47.1*	45.0*	58.7*	60.9	129.3	135.4	103.8
Texas	72.6	99.3*	151.0*	266.9*	367.6	268.9	176.8
Utah	50.7	91.0	122.4	153.6	303.0	168.8	125.5
Vermont	62.7*	74.3*	96.3*	116.7*	186.1	157.1	121.2
Virginia	50.0*	60.0	79.3*	76.9*	153.8	128.2	97.0
Washington	79.3*	142.8*	247.0*	297.5*	375.2	208.3	120.4
West Virginia	11.5	18.2	26.7	27.7	240.9	152.1	103.7
Wisconsin	50.0*	51.8*	66.5*	83.6*	167.2	161.5	125.6
Wyoming	15.0	16.5	16.3	28.0	186.7	169.7	171.8
U.S.	53.9	67.1	93.8	121.5	225.4	181.1	129.6
NAHMS total	57.4	69.7	96.4	126.1	219.7	181.4	130.4

<sup>1</sup>Average herd size = NASS published number of dairy operations/following-year January 1 milk cow inventory.

\*NAHMS participating States.



Photo by Judy Rodriguez

#### **4. Milk production per cow**

Milk production per cow has increased in every State except Alaska since 1991. In 2006, Colorado had the highest milk production per cow at 23,155 pounds. In addition, Arizona (22,855), Idaho (22,326), Michigan (22,188), and Washington (23,055) all had milk production per cow higher than 22,000 pounds during 2006. The U.S. average milk per cow was 19,951 pounds in 2006, up 32.7 percent from 15,031 pounds in 1991.

## Changes in milk per cow, by State:

State	Milk per Cow Production (Pounds)				2006 as Percent of 1991	2006 as Percent of 1995	2006 as Percent of 2001
	1991 <sup>1</sup>	1995 <sup>2</sup>	2001 <sup>3</sup>	2006 <sup>4</sup>			
Alabama	12,707*	14,176	14,286	14,500	114.1	102.3	101.5
Alaska	13,300	17,000	13,055	12,250	92.1	72.1	93.8
Arizona	18,032	19,735	22,036	22,855	126.7	115.8	103.7
Arkansas	11,687	12,150	12,343	13,250	113.4	109.1	107.3
California	18,534*	19,573*	20,904*	21,815*	117.7	111.5	104.4
Colorado	17,338*	18,687	21,413*	23,155	133.6	123.9	108.1
Connecticut	15,848*	16,438	18,240	19,316	121.9	117.5	105.9
Delaware	14,130	14,500	16,667	17,429	123.3	120.2	104.6
Florida	13,933*	14,698*	15,758*	16,417	117.8	111.7	104.2
Georgia	13,523*	15,550	16,663	18,234	134.8	117.3	109.4
Hawaii	13,056	13,654	14,107	13,256	101.5	97.1	94.0
Idaho	16,399*	18,147*	21,194*	22,326*	136.1	123.0	105.3
Illinois	14,936*	15,887*	17,414*	19,204	128.6	120.9	110.3
Indiana	15,439*	15,375*	16,778*	19,994*	129.5	130.0	119.2
Iowa	15,095*	16,124*	18,024*	20,146*	133.5	124.9	111.8
Kansas	12,680	14,390	17,312	20,920	165.0	145.4	120.8
Kentucky	11,231	12,469*	12,969*	13,276*	118.2	106.5	102.4
Louisiana	11,675	11,908	11,704	12,375	106.0	103.9	105.7
Maine	14,786*	16,025	17,211	17,938	121.3	111.9	104.2
Maryland	14,480*	14,725	15,780	17,078	117.9	116.0	108.2
Massachusetts	15,000*	16,000	17,000	17,375	115.8	108.6	102.2
Michigan	15,690*	17,071*	19,373*	22,188*	141.4	130.0	114.5
Minnesota	14,354*	15,894*	17,278*	18,587*	129.5	116.9	107.6
Mississippi	12,098	12,909	14,200	14,826	122.5	114.9	104.4
Missouri	13,451	14,158*	13,441*	16,000*	119.0	113.0	119.0
Montana	13,750	15,000	18,211	18,632	135.5	124.2	102.3
Nebraska	13,913*	14,797	16,194	18,328	131.7	123.9	113.2
Nevada	17,500	18,128	19,412	20,667	118.1	114.0	106.5
New Hampshire	15,143*	16,300	17,889	19,533	129.0	119.8	109.2
New Jersey	14,160	13,913	16,643	16,182	114.3	116.3	97.2
New Mexico	19,561	18,969*	20,750*	21,515*	110.0	113.4	103.7
New York	15,005*	16,501*	17,530*	18,879*	125.8	114.4	107.7
North Carolina	15,424*	16,314	17,224	18,510	120.0	113.5	107.5
North Dakota	12,622	13,094	14,000	14,688	116.4	112.2	104.9
Ohio	14,446*	15,917*	16,519*	17,737*	122.8	111.4	107.4
Oklahoma	12,354	13,611	15,407	16,630	134.6	122.2	107.9
Oregon	16,590*	17,289*	18,074	19,000	114.5	109.9	105.1
Pennsylvania	15,263*	16,492*	18,112*	19,390*	127.0	117.6	107.1
Rhode Island	14,333*	14,773	16,571	17,273	120.5	116.9	104.2
South Carolina	12,273	14,481	17,476	16,353	133.2	112.9	93.6
South Dakota	12,309	13,398	15,393	18,580	150.9	138.7	120.7
Tennessee	11,863*	13,740*	14,511*	15,657	132.0	114.0	107.9
Texas	14,036	15,244*	15,666*	21,328*	152.0	139.9	136.1
Utah	15,975	16,739	17,211	20,291	127.0	121.2	117.9
Vermont	14,683*	16,210*	17,444*	18,383*	125.2	113.4	105.4
Virginia	14,614*	15,116	15,975*	17,363*	118.8	114.9	108.7
Washington	18,814*	20,091*	22,324*	23,055*	122.5	114.8	103.3
West Virginia	11,739	12,667	15,563	15,385	131.1	121.5	98.9
Wisconsin	14,140*	15,397*	17,182*	18,824*	133.1	122.3	109.6
Wyoming	12,563	13,197	14,000	17,612	140.2	133.5	125.8
U.S.	15,031	16,405	18,162	19,951	132.7	121.6	109.9

<sup>1</sup>NASS, Milk Final Estimates 1988-92.<sup>2</sup>NASS, Milk Cows and Production Final Estimates 1993-97, May 1999.<sup>3</sup>NASS, Milk Cows and Production Final Estimates 1998-2002, May 2004.<sup>4</sup>NASS, Milk Production, Disposition and Income 2006 Summary, April 2007.

\*NAHMS participating States



## Section II: Changes in World Dairy Production

### General Trends

**Note:** Tables in this section are comprised from data collected by USDA's Foreign Agricultural Service (FAS).

#### 1. Milk cow inventory

In 2006 India had 38 million milk cows, more than any other nation in the world. China showed the largest increase in number of milk cows from 1991 to 2006 (approximately 1.5 to 7.9 million, respectively). The former Soviet Union had the largest decrease in number of milk cows from 1991 to 2006 (approximately 20.6 to 9.9 million, respectively). Total milk cow numbers for these selected countries decreased 5.9 percent since 1991 but remained steady from 2001 to 2006 at approximately 125.6 million.

Changes in milk cow inventories in selected countries:

		Number of Milk Cows (1,000 Head)						
Continent/Country		1991	1995	2001	2006	2006 as Percent of 1991	2006 as Percent of 1995	2006 as Percent of 2001
North America	Canada	1,410	1,244	1,091	1,019	72.3	81.9	93.4
	Mexico	6,440	6,440	6,800	6,875	106.8	106.8	101.1
	United States	9,826	9,466	9,103	9,112	92.7	96.3	100.1
	<i>Subtotal</i>	<i>17,676</i>	<i>17,150</i>	<i>16,994</i>	<i>17,006</i>	<i>96.2</i>	<i>99.2</i>	<i>100.1</i>
South America	Argentina	2,000	2,350	2,450	2,150	107.5	91.5	87.8
	Brazil	15,500	17,500	15,900	15,290	98.6	87.4	96.2
	<i>Subtotal</i>	<i>17,500</i>	<i>19,850</i>	<i>18,350</i>	<i>17,440</i>	<i>99.7</i>	<i>87.9</i>	<i>95.0</i>
European Union <sup>1</sup>	<i>Subtotal</i>	<i>25,392<sup>2</sup></i>	<i>22,434<sup>2</sup></i>	<i>25,747<sup>3</sup></i>	<i>24,944<sup>4</sup></i>	<i>98.2</i>	<i>111.2</i>	<i>96.9</i>
Eastern Europe	Poland	4,707	3,715	<sup>3</sup>	<sup>4</sup>	--	--	--
	Romania	1,600	1,778	1,564	<sup>4</sup>	--	--	--
	<i>Subtotal</i>	<i>6,307</i>	<i>5,493</i>	<i>1,564</i>	<i><sup>4</sup></i>	<i>--</i>	<i>--</i>	<i>--</i>
Former Soviet Union	Russia	20,557	18,400	12,500	9,900	48.2	53.8	79.2
	Ukraine	8,378	7,818	4,958	3,491	41.7	44.7	70.4
	<i>Subtotal</i>	<i>28,935</i>	<i>26,218</i>	<i>17,458</i>	<i>13,391</i>	<i>46.3</i>	<i>51.1</i>	<i>76.7</i>
South Asia	India	30,700	33,000	35,900	38,000	123.8	115.2	105.8
	<i>Subtotal</i>	<i>30,700</i>	<i>33,000</i>	<i>35,900</i>	<i>38,000</i>	<i>123.8</i>	<i>115.2</i>	<i>105.8</i>
Asia	China	1,459	2,252	2,848	7,900	541.5	350.8	277.4
	Japan	1,081	1,034	971	900	83.3	87.0	92.7
	<i>Subtotal</i>	<i>2,540</i>	<i>3,286</i>	<i>3,819</i>	<i>8,800</i>	<i>346.5</i>	<i>267.8</i>	<i>230.4</i>
Oceania	Australia <sup>5</sup>	1,629	1,786	2,281	1,870	114.8	104.7	82.0
	New Zealand <sup>6</sup>	2,723	2,994	3,557	4,100	150.6	136.9	115.3
	<i>Subtotal</i>	<i>4,352</i>	<i>4,780</i>	<i>5,838</i>	<i>5,970</i>	<i>137.2</i>	<i>124.9</i>	<i>102.3</i>
Total		133,402	132,211	125,670	125,551	94.1	95.0	99.9

<sup>1</sup>Based on deliveries.

<sup>2</sup>EU-15 includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, U.K.

<sup>3</sup>EU-25 includes Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, U.K.

<sup>4</sup>EU-27 includes Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, U.K.

<sup>5</sup>Year ending June 30 of year shown.

<sup>6</sup>Year ending May 31 of year shown.

Source: FAS Dairy: World Markets and Trade. Based upon counselor and attaché reports, official statistics, and results of office research.

## 2. Milk production

The European Union produced the most milk in 2006 at 132.2 million metric tons, a 7.5 percent increase from 1991. China showed the largest increase in production with a 687 percent increase from 1991 to 2006, which is not surprising considering the nation's large increase in cow numbers. Excluding China, milk production in 2006 as a percentage of 2001 increased no more than 15.5 percent and decreased no more than 6 percent in any country. Milk production over all selected countries was approximately 419 million metric tons in 2006, an increase of about 41 million metric tons since 1991.

Changes in milk production in selected countries:

Milk Production (1,000 Metric Tons)								
Continent/Country		1991	1995	2001	2006	2006 as Percent of 1991	2006 as Percent of 1995	2006 as Percent of 2001
North America	Canada	7,790	7,920	8,106	8,041	103.2	101.5	99.2
	Mexico	10,200	7,399	9,501	10,051	98.5	135.8	105.8
	United States	66,994	70,440	74,994	82,462	123.1	117.1	110.0
	<i>Subtotal</i>	<i>84,984</i>	<i>85,759</i>	<i>92,601</i>	<i>100,554</i>	<i>118.3</i>	<i>117.3</i>	<i>108.6</i>
South America	Argentina	6,400	8,500	9,500	10,200	159.4	120.0	107.4
	Brazil	14,200	18,375	22,300	25,230	177.7	137.3	113.1
	<i>Subtotal</i>	<i>20,600</i>	<i>26,875</i>	<i>31,800</i>	<i>35,430</i>	<i>172.0</i>	<i>131.8</i>	<i>111.4</i>
European Union <sup>1</sup>	<i>Subtotal</i>	<i>122,961<sup>2</sup></i>	<i>121,740<sup>2</sup></i>	<i>130,069<sup>3</sup></i>	<i>132,206<sup>4</sup></i>	<i>107.5</i>	<i>108.6</i>	<i>101.6</i>
Eastern Europe	Poland	14,504	11,420	<sup>3</sup>	<sup>4</sup>	--	--	--
	Romania	4,391	5,885	5,188	<sup>4</sup>	--	--	--
	<i>Subtotal</i>	<i>18,895</i>	<i>17,305</i>	<i>5,188</i>	<i><sup>4</sup></i>	<i>--</i>	<i>--</i>	<i>--</i>
Former Soviet Union	Russia	51,971	39,300	33,000	31,100	59.8	79.1	94.2
	Ukraine	22,409	17,181	13,169	13,017	58.1	75.8	98.8
	<i>Subtotal</i>	<i>74,380</i>	<i>56,481</i>	<i>46,169</i>	<i>44,117</i>	<i>59.3</i>	<i>78.1</i>	<i>95.6</i>
South Asia	India	28,200	32,500	36,400	41,000	145.4	126.2	112.6
	<i>Subtotal</i>	<i>28,200</i>	<i>32,500</i>	<i>36,400</i>	<i>41,000</i>	<i>145.4</i>	<i>126.2</i>	<i>112.6</i>
Asia	China	4,646	5,764	10,255	31,934	687.3	554.0	311.4
	Japan	8,260	8,382	8,300	8,138	98.5	97.1	98.0
	<i>Subtotal</i>	<i>12,906</i>	<i>14,146</i>	<i>18,555</i>	<i>40,072</i>	<i>310.5</i>	<i>283.3</i>	<i>216.0</i>
Oceania	Australia <sup>5</sup>	6,578	8,433	10,864	10,395	158.0	123.3	95.7
	New Zealand <sup>6</sup>	8,122	9,684	13,162	15,200	187.1	157.0	115.5
	<i>Subtotal</i>	<i>14,700</i>	<i>18,117</i>	<i>24,026</i>	<i>25,595</i>	<i>174.1</i>	<i>141.3</i>	<i>106.5</i>
Total		377,626	372,923	384,808	418,974	110.9	112.3	108.9

<sup>1</sup>Based on deliveries.

<sup>2</sup>EU-15 includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, U.K.

<sup>3</sup>EU-25 includes Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, U.K.

<sup>4</sup>EU-27 includes Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, U.K.

<sup>5</sup>Year ending June 30 of year shown.

<sup>6</sup>Year ending May 31 of year shown.

Source: FAS Dairy: World Markets and Trade. Based upon counselor and attaché reports, official statistics, and results of office research.

## Section III: Management, NAHMS Population Estimates

**Note: The NDHEP 1991 study included only herds with 30 or more milk cows; the Dairy 1996, Dairy 2002, and Dairy 2007 studies included operations with one or more milk cows.**

### A. Dairy Herd Information

#### 1. Record-keeping systems

The percentage of operations using hand-written records decreased from 88.3 percent in 1991 to 73.5 percent in 2007, while the percentage of operations using on-farm computers increased from 13.7 percent to 19.4 during the same time period. These changes in record-keeping systems are consistent with the need to quickly store and access information on larger operations.

a. Percentage of operations by...

System	...type of record-keeping systems used for the dairy operation.		...type of individual animal record-keeping systems used.					
	NDHEP 1991	Std. Error	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Handwritten, such as a ledger or notebook	88.3	(1.0)	80.7	(1.0)	74.3	(1.1)	73.5	(1.2)
Dairy Herd Improvement Association	57.5	(1.8)	43.4	(1.2)	44.8	(1.3)	45.9	(1.4)
Computer located on the operation	13.7	(1.1)	15.1	(0.8)	19.4	(0.9)	19.4	(0.9)
Computer located off the operation	11.8	(1.2)	9.9	(0.8)	5.0	(0.5)	4.9	(0.5)
Other system	11.4	(1.1)	6.0	(0.7)	4.1	(0.5)	4.4	(0.6)
Any	99.9	(0.1)	100.0	(0.0)	95.2	(0.6)	95.1	(0.7)



For operations using on- or off-farm computer data records systems, the percentage of **operations** that used Dairy Comp 305 increased from 19.4 percent in 2002 to 34.9 percent in 2007. The percentage of **cows** whose records were kept using Dairy Comp 305 increased from 48.5 percent in 2002 to 60.3 percent in 2007.

b. For operations using on- or off-farm computer record systems, percentage of operations (and percentage of cows on these operations) by primary computerized record system used:

Primary Computer Record System	Dairy 2002				Dairy 2007			
	Operations		Cows		Operations		Cows	
	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
Dairy Comp 305	19.4	(1.7)	48.5	(1.9)	34.9	(2.3)	60.3	(2.0)
PC Dart	12.5	(1.4)	10.3	(0.8)	19.3	(1.9)	10.2	(0.9)
DHI Plus	13.3	(1.7)	13.7	(1.3)	15.0	(1.7)	15.9	(1.7)
Other	54.8	(2.5)	27.5	(1.6)	30.8	(2.4)	13.6	(1.3)
Total	100.0		100.0		100.0		100.0	

## 2. Identification

Identification methods for dairy cattle have changed little since 1996. The percentage of operations using ear tags or electronic identification (ID) increased slightly, while the percentage of operations using collars or photographs or sketches showed a slight decrease. These changes are expected, as herd sizes increase and housing systems change from individual animal stalls to freestalls and drylot housing.

a. Percentage of operations by type of *individual* animal ID used on at least some dairy cows:

ID Type	Percent Operations					
	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Ear tags	81.2	(1.1)	85.8	(1.0)	86.5	(1.0)
Collars	22.3	(1.0)	16.8	(1.0)	12.7	(0.9)
Photographs or sketches	17.4	(1.0)	14.1	(0.9)	13.3	(1.0)
Branding (all methods)	4.9	(0.5)	4.9	(0.5)	4.4	(0.5)
Electronic ID	0.3	(0.1)	0.1	(0.1)	4.1	(0.5)
Tattoos (other than for brucellosis)	6.5	(0.6)	8.8	(0.7)	7.7	(0.6)
Other	10.1	(0.9)	10.8	(0.8)	10.5	(0.9)
Any	91.2	(0.9)	93.7	(0.8)	93.0	(0.8)

The percentage of operations that used ear tags as herd identification at the operation level increased from 29.1 percent in 2002 to 34.5 percent in 2007, but the percentage of cows that had ear tags as herd ID remained unchanged. The use of electronic ID increased, as only 0.4 percent of cows were equipped with electronic ID in 2002 as a method to identify animals as part of a herd compared with 3.9 percent in 2007.

b. Percentage of operations (and percentage of cows) by type of **herd** identification used:

ID Type	Dairy 2002				Dairy 2007			
	Operations		Cows		Operations		Cows	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Ear tags	29.1	(1.1)	41.5	(1.2)	34.5	(1.3)	41.0	(1.5)
Collars	4.2	(0.5)	3.9	(0.5)	2.8	(0.4)	2.9	(0.5)
Branding (all methods)	3.7	(0.3)	18.0	(1.1)	3.1	(0.3)	18.7	(1.4)
Electronic ID	0.1	(0.0)	0.4	(0.2)	1.8	(0.3)	3.9	(0.6)
Tattoos (other than for brucellosis)	3.4	(0.4)	3.8	(0.5)	2.5	(0.4)	4.6	(0.8)
Other	2.7	(0.4)	2.9	(0.4)	2.0	(0.4)	1.7	(0.4)
Any	34.2	(1.1)	53.6	(1.1)	36.4	(1.3)	54.0	(1.5)

### 3. Breed of dairy cows

Holsteins remain the predominant breed in the United States, and the percentage of operations with specific breeds has not changed since 1991.

Percentage of operations by primary breed:

Percent Operations								
Breed	NDHEP 1991	Std. Error	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Holstein	94.9	(0.7)	93.0	(0.8)	92.4	(0.7)	92.2	(0.7)
Jersey	2.4	(0.4)	4.1	(0.6)	3.8	(0.5)	3.5	(0.4)
Ayrshire	0.6	(0.3)	0.3	(0.1)	0.3	(0.1)	0.3	(0.1)
Brown Swiss	1.0	(0.4)	0.4	(0.2)	0.9	(0.2)	0.9	(0.3)
Guernsey	0.9	(0.3)	1.7	(0.4)	1.1	(0.3)	0.9	(0.3)
Other	0.2	(0.2)	0.5	(0.2)	1.5	(0.4)	2.2	(0.5)
Total	100.0		100.0		100.0		100.0	

### 4. Cow registration

The percentage of operations with no registered cows increased from 59.6 in 1991 to 71.7 percent in 2007. Operations with 100 percent of cows registered remained similar from 1991 to 2007.

Percentage of operations by percentage of dairy cows registered with a breed association:

Percent Operations									
Percent Dairy Cows Registered	NDHEP 1991	Std. Error	Percent Dairy Cows Registered	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
0	59.6	(1.7)	0	65.5	(1.2)	71.6	(1.2)	71.7	(1.3)
1 to 9	10.8	(1.1)	0.1 to 9.9	6.7	(0.6)	5.3	(0.6)	5.6	(0.6)
10 to 50	16.3	(1.3)	10.0 to 49.9	10.3	(0.7)	8.1	(0.7)	6.5	(0.7)
51 to 75	3.2	(0.6)	50.0 to 74.9	4.4	(0.6)	3.2	(0.4)	2.1	(0.4)
76 to 99	4.2	(0.6)	75.0 to 99.9	5.5	(0.6)	4.2	(0.5)	5.2	(0.6)
100	5.9	(0.7)	100	7.6	(0.7)	7.6	(0.7)	8.9	(0.8)
Total	100.0		Total	100.0		100.0		100.0	

### 5. Quality assurance programs

The percentage of operations participating in any milk quality assurance program increased from 40.6 percent in 2002 to 47.3 percent in 2007. Local milk-cooperative or processor-sponsored programs showed the largest increase in the percentage of operation participation from 2002 to 2007 (35.2 to 42.2 percent of operations, respectively).

Percentage of operations that participated in quality assurance programs, by type of program:

Percent Operations				
Program Type	Dairy 2002	Std. Error	Dairy 2007	Std. Error
State sponsored	7.8	(0.6)	8.8	(0.7)
Local milk cooperative/ processor sponsored	35.2	(1.3)	42.2	(1.4)
National industry sponsored	2.8	(0.4)	3.1	(0.4)
Other	2.8	(0.4)	2.0	(0.3)
Any	40.6	(1.3)	47.3	(1.4)

**B. Productivity****1. Rolling herd average milk production**

Rolling herd average (RHA) milk production for all herds and for herds with primarily Holsteins has increased approximately 4,000 pounds (cow average) since 1991.

a. Operation average RHA milk production (lb/cow):

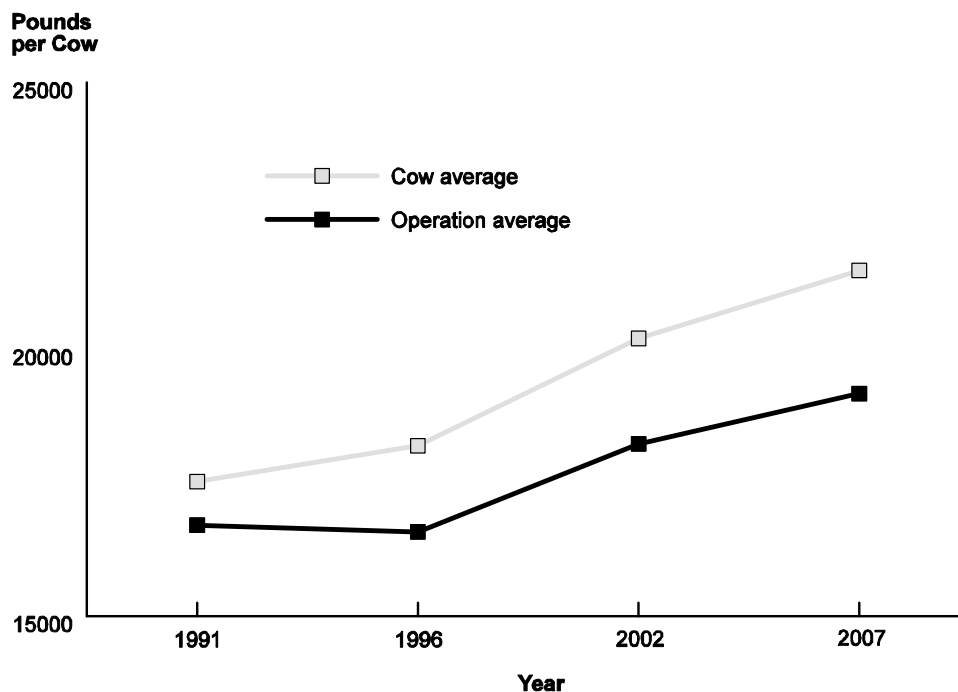
NDHEP 1991		Dairy 1996		Dairy 2002		Dairy 2007	
Op. Avg.	Std. Error	Op. Avg.	Std. Error	Op. Avg.	Std. Error	Op. Avg.	Std. Error
16,703	(96)	16,587	(100)	18,235	(103)	19,175	(112)
<b>Primarily Holsteins*</b>							
Op. Avg.	Std. Error	Op. Avg.	Std. Error	Op. Avg.	Std. Error	Op. Avg.	Std. Error
16,925	(96)	16,925	(99)	18,590	(102)	19,482	(115)

\*Operations where Holsteins accounted for 50 percent or more of the January 1, 1998, January 1, 2002, or January 1, 2007, cow inventory or was the main breed of dairy herd (1991).

b. Cow average RHA milk production (lb/cow):

NDHEP 1991		Dairy 1996		Dairy 2002		Dairy 2007	
Cow Avg.	Std. Error	Cow Avg.	Std. Error	Cow Avg.	Std. Error	Cow Avg.	Std. Error
17,532	(81)	18,198	(79)	20,210	(80)	21,483	(115)
<b>Primarily Holsteins*</b>							
Cow Avg.	Std. Error	Cow Avg.	Std. Error	Cow Avg.	Std. Error	Cow Avg.	Std. Error
17,735	(80)	18,442	(78)	20,467	(79)	21,807	(114)

\*Operations where Holsteins accounted for 50 percent or more of the January 1, 1998, January 1, 2002, or January 1, 2007, cow inventory or was the main breed of dairy herd (1991).

**Operation Average (and Cow Average) RHA Milk Production****2. Age at first calving**

The age at first calving at the operation level decreased from 25.9 months in 1991 to 25.2 in 2007. Similarly, the cow average age at first calving decreased from 25.8 to 24.5 months during the same time period.

a. Operation average age at first calving (months):

NDHEP 1991		Dairy 1996		Dairy 2002		Dairy 2007	
Op. Avg.	Std. Error	Op. Avg.	Std. Error	Op. Avg.	Std. Error	Op. Avg.	Std. Error
25.9	(0.1)	25.8	(0.1)	25.4	(0.1)	25.2	(0.1)

b. Cow average age at first calving (months):

NDHEP 1991		Dairy 1996		Dairy 2002		Dairy 2007	
Cow Avg.	Std. Error	Cow Avg.	Std. Error	Cow Avg.	Std. Error	Cow Avg.	Std. Error
25.8	(0.1)	25.5	(0.1)	25.0	(0.1)	24.5	(0.1)

### 3. Days dry

In 2007, the average days dry at the operation level and cow level was 57.8 and 58.5 days, respectively. These averages represent a decrease of about 3 days since 1991.

#### a. Operation average days dry:

NDHEP 1991		Dairy 1996		Dairy 2002		Dairy 2007	
Op. Avg.	Std. Error	Op. Avg.	Std. Error	Op. Avg.	Std. Error	Op. Avg.	Std. Error
61.1	(0.5)	60.5	(0.3)	60.6	(0.3)	57.8	(0.3)

#### b. Cow average days dry:

NDHEP 1991		Dairy 1996		Dairy 2002		Dairy 2007	
Cow Avg.	Std. Error	Cow Avg.	Std. Error	Cow Avg.	Std. Error	Cow Avg.	Std. Error
61.5	(0.3)	61.7	(0.4)	61.9	(0.2)	58.5	(0.3)

### 4. Calving interval

Although the operation average calving interval decreased slightly from 2002 to 2007 (13.3 and 13.2 months, respectively), the average increased from 12.8 months in 1991 to 13.2 in 2007.

#### a. Operation average calving interval for cows (months):

NDHEP 1991		Dairy 1996		Dairy 2002		Dairy 2007	
Op. Avg.	Std. Error	Op. Avg.	Std. Error	Op. Avg.	Std. Error	Op. Avg.	Std. Error
12.8	(0.0)	12.9	(0.0)	13.3	(0.0)	13.2	(0.0)



b. Cow average calving interval for cows (months):

NDHEP 1991		Dairy 1996		Dairy 2002		Dairy 2007	
Cow Avg.	Std. Error	Cow Avg.	Std. Error	Cow Avg.	Std. Error	Cow Avg.	Std. Error
12.9	(0.0)	13.0	(0.0)	13.4	(0.0)	13.3	(0.0)



Photo by Dr. Jason Lombard

**C. Heifer Management****1. Source of heifers**

In 2002 and 2007, the majority of heifers were born and raised on the same operation, and the majority of operations had heifers that were born and raised on the operation. A higher percentage of heifers were raised off the operation in 2007 compared to 2002 (11.5 and 7.2 percent, respectively).

Percentage of operations and percentage of dairy heifers\*, by source of heifers:

Heifer Source	Dairy 2002				Dairy 2007			
	Operations		Heifers		Operations		Heifers	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Heifers born and raised on same operation	98.1	(0.3)	89.5	(1.0)	96.5	(0.4)	87.4	(1.2)
Heifers born on the operation but raised off the operation	3.6	(0.4)	7.2	(0.8)	4.7	(0.5)	11.5	(1.2)
Heifers were born off the operation	6.7	(0.7)	3.3	(0.8)	6.6	(0.8)	1.1	(0.2)
Total			100.0				100.0	

\*As a percentage of January 1 heifer inventory

**2. Separation from dam**

The practice of separating newborn heifer calves from their dams immediately after birth doubled from 1991 to 2007 (28.0 and 55.9 percent of operations, respectively).

Percentage of operations by age at which newborn heifer calves were separated from their dams:

Percent Operations									
Age (Hours)	NDHEP 1991	Std. Error	Age (Hours)	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
0 (before any nursing)	28.0	(1.7)	Immediately (no nursing)	47.9	(1.3)	52.9	(1.3)	55.9	(1.4)
Less than 12	39.6	(1.7)	After nursing, but less than 12 hours	20.8	(1.0)	22.5	(1.1)	22.2	(1.2)
12 to 24	22.0	(1.4)	12 to 24	17.4	(1.1)	15.9	(1.0)	14.6	(1.0)
More than 24	10.4	(1.0)	More than 24	13.9	(1.0)	8.7	(0.8)	7.3	(0.8)
Total	100.0		Total	100.0		100.0		100.0	



Photo by Judy Rodriguez

### 3. Colostrum

In 1991, 1996, and 2002, about 3 of 10 operations allowed heifer calves to get colostrum during first nursing compared to about 4 of 10 operations in 2007. A smaller percentage of operations hand-fed colostrum from a bucket or bottle in 2007 compared to operations in 1991, 1996, and 2002.

a. Percentage of operations by method normally used for heifer calves' first feeding of colostrum:

Percent Operations								
Method	NDHEP 1991	Std. Error	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
First nursing	33.7	(1.7)	33.5	(1.2)	30.5	(1.2)	36.3	(1.4)
Hand-fed from bucket or bottle	64.0	(1.7)	62.5	(1.2)	64.8	(1.3)	59.2	(1.4)
Hand-fed using esophageal feeder	2.3	(0.6)	3.6	(0.4)	4.4	(0.5)	4.3	(0.5)
No colostrum	0.0	(0.0)	0.4	(0.2)	0.3	(0.1)	0.2	(0.1)
Total	100.0		100.0		100.0		100.0	

The percentage of operations that estimated immunoglobulin (Ig) levels in colostrum or evaluated its quality increased across all herd sizes from 2002 to 2007.

b. For operations that hand-fed colostrum, percentage of operations that estimated Ig levels of the colostrum or evaluated its quality, by herd size:

Percent Operations				
<b>Herd Size</b> (Number Dairy Cows)	<b>Dairy 2002</b>	<b>Std. Error</b>	<b>Dairy 2007</b>	<b>Std. Error</b>
Small (fewer than 100)	2.1	(0.6)	7.6	(1.3)
Medium (100 to 499)	10.6	(1.5)	19.8	(2.3)
Large (500 or more)	32.2	(2.8)	45.2	(3.2)
All operations	5.2	(0.5)	13.0	(1.1)

A smaller percentage of medium and large operations pooled colostrum from more than one cow in 2007 than in 2002.

c. For operations that normally hand-fed colostrum, percentage of operations that pooled colostrum from more than one cow, by herd size:

Percent Operations				
<b>Herd Size</b> (Number Dairy Cows)	<b>Dairy 2002</b>	<b>Std. Error</b>	<b>Dairy 2007</b>	<b>Std. Error</b>
Small (fewer than 100)	22.1	(1.4)	16.0	(1.7)
Medium (100 to 499)	37.4	(2.0)	26.0	(2.4)
Large (500 or more)	70.6	(2.4)	56.9	(3.1)
All operations	27.0	(1.1)	21.0	(1.3)

The percentage of operations by storage methods for colostrum was essentially unchanged between 2002 and 2007, with the largest percentage of operations not storing colostrum. Approximately 6 of 10 operations did not store colostrum in 2002 and 2007.

d. For operations that hand-fed colostrum, percentage of operations by primary method of storing colostrum:

Percent Operations				
Method	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Stored without refrigeration	4.4	(0.6)	3.9	(0.7)
Stored in refrigerator	7.8	(0.6)	11.1	(0.9)
Stored in freezer	27.7	(1.1)	28.2	(1.6)
Other	0.5	(0.2)	0.0	(--)
Not stored	59.6	(1.3)	56.8	(1.8)
Total	100.0		100.0	

The percentage of operations that pasteurized colostrum did not change from 2002 to 2007.

e. For operations that hand-fed colostrum, percentage of operations that pasteurized colostrum, by herd size:

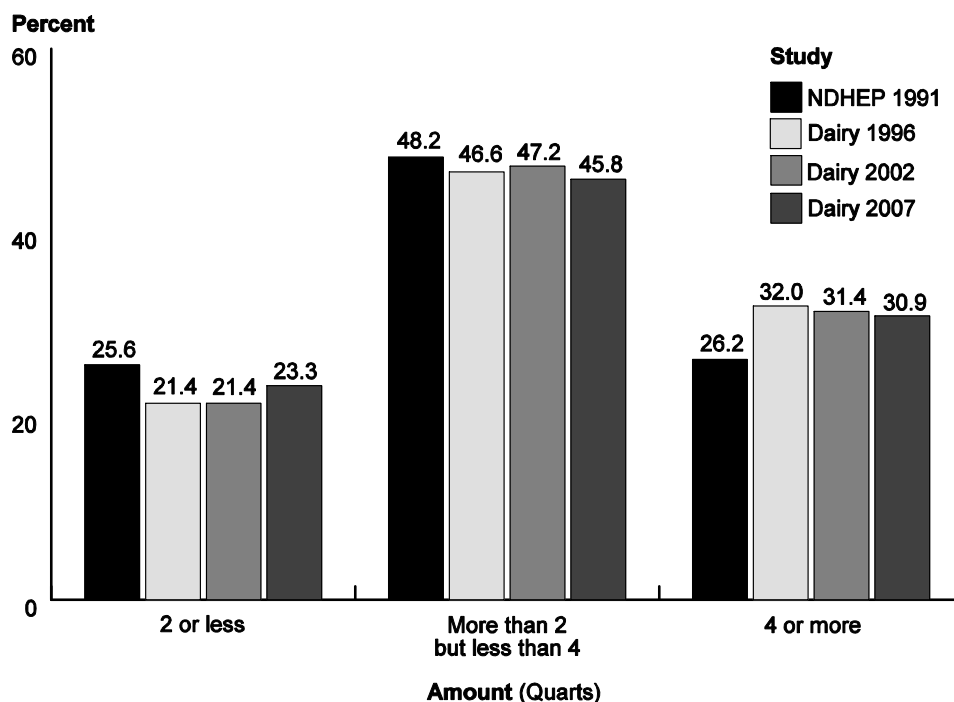
Percent Operations				
Herd Size (Number Dairy Cows)	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Small (fewer than 100)	0.4	(0.2)	0.2	(0.2)
Medium (100 to 499)	0.8	(0.3)	0.9	(0.4)
Large (500 or more)	3.6	(0.9)	6.4	(1.6)
All operations	0.6	(0.2)	0.8	(0.2)

Operations provided calves approximately the same amount of colostrum during the first 24 hours of life from 1991 to 2007, with approximately one-quarter of operations feeding 2 quarts or less and about one-third feeding 4 or more quarts.

f. For operations that hand-fed colostrum, percentage of operations by amount of colostrum normally fed during the first 24 hours:

Percent Operations								
Amount (Quarts)	NDHEP 1991	Std. Error	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
2 or less	25.6	(1.8)	21.4	(1.3)	21.4	(1.4)	23.3	(1.6)
More than 2 but less than 4	48.2	(2.1)	46.6	(1.6)	47.2	(1.7)	45.8	(1.9)
4 or more	26.2	(1.9)	32.0	(1.5)	31.4	(1.5)	30.9	(1.7)
Total	100.0		100.0		100.0		100.0	

**For Operations that Normally Hand-fed Colostrum, Percentage of Operations by Amount of Colostrum Normally Fed During the First 24 Hours**



#### 4. Medicated milk replacer

Approximately 56 percent of operations fed medicated milk replacer in 2002 and 2007.

a. Percentage of operations that fed medicated milk replacer, by herd size:

<b>Herd Size</b> (Number Dairy Cows)	<b>Percent Operations</b>			
	<b>Dairy 2002</b>	<b>Std. Error</b>	<b>Dairy 2007</b>	<b>Std. Error</b>
Small (fewer than 100)	54.4	(1.6)	55.2	(1.8)
Medium (100 to 499)	64.1	(1.9)	68.2	(2.1)
Large (500 or more)	37.7	(2.5)	43.6	(3.1)
All operations	55.7	(1.3)	57.5	(1.4)



Photo by Judy Rodriguez

Although the percentage of operations that fed milk replacer remained unchanged between 2002 and 2007, the percentage of operations that fed each specific medication listed increased from 2002 to 2007.

b. For operations that fed a medicated milk replacer, percentage of operations by medication used:

<b>Medication Used</b>	<b>Percent Operations</b>			
	<b>Dairy 2002</b>	<b>Std. Error</b>	<b>Dairy 2007</b>	<b>Std. Error</b>
Chlortetracycline (CTC)	7.1	(0.7)	12.1	(1.1)
Oxytetracycline (OTC)	13.7	(0.8)	21.9	(1.5)
Oxytetracycline in combination with Neomycin (OxyNEO)	25.6	(1.2)	49.5	(1.9)
Decoquinat	12.8	(0.9)	18.8	(1.4)
Lasalocid	3.2	(0.4)	7.2	(0.9)
Other	3.6	(0.5)	5.4	(0.9)

### 5. Weaning age

The age at weaning for both the operation and heifer averages has remained relatively steady since 1996.

a. Operation average age of heifers at weaning (weeks):

<b>NDHEP 1991</b>		<b>Dairy 1996</b>		<b>Dairy 2002</b>		<b>Dairy 2007</b>	
<b>Op. Avg.</b>	<b>Std. Error</b>	<b>Op. Avg.</b>	<b>Std. Error</b>	<b>Op. Avg.</b>	<b>Std. Error</b>	<b>Op. Avg.</b>	<b>Std. Error</b>
7.9	(0.1)	8.4	(0.1)	8.0	(0.1)	8.2	(0.1)



b. Heifer average age at weaning (weeks):

NDHEP 1991		Dairy 1996		Dairy 2002		Dairy 2007	
Heifer Avg.	Std. Error	Heifer Avg.	Std. Error	Heifer Avg.	Std. Error	Heifer Avg.	Std. Error
8.2	(0.1)	8.7	(0.1)	8.4	(0.1)	8.6	(0.1)

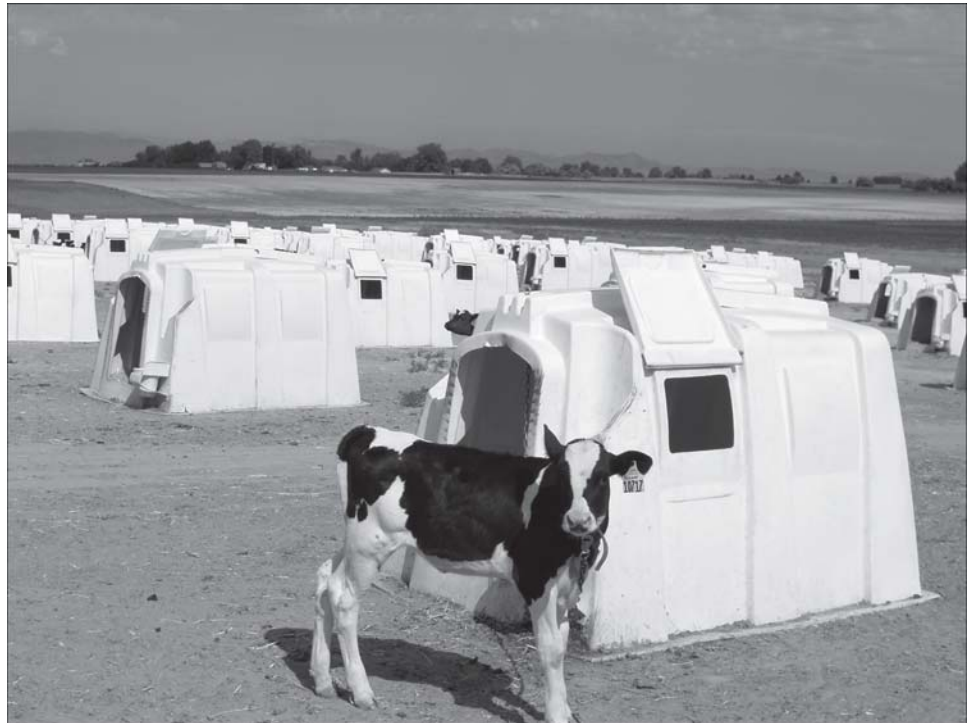


Photo by Dr. Jason Lombard

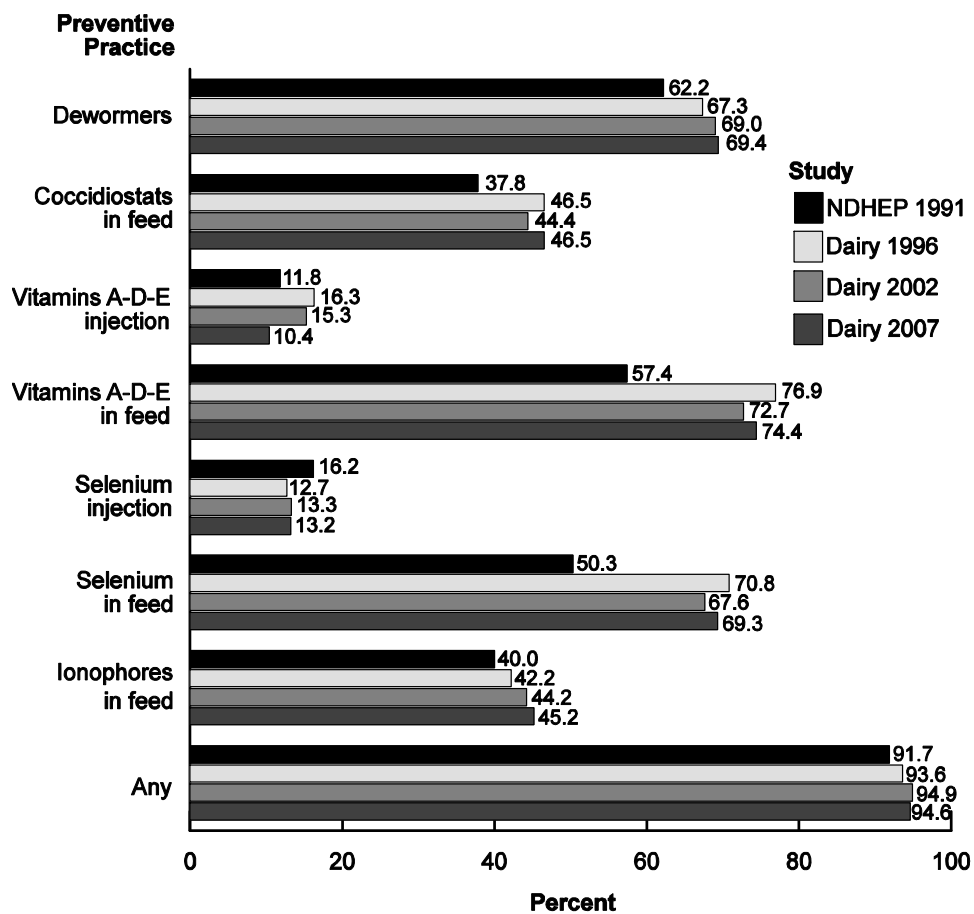
## 6. Preventive practices

Operation use of specific preventive practices for heifers has remained stable or increased since 1991. The largest increases in the use of preventive practices were observed for vitamins A-D-E in feed and selenium in feed.

Percentage of operations by preventive practices normally used for heifers:

Percent Operations								
Preventive Practice	NDHEP 1991	Std. Error	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Dewormers	62.2	(2.2)	67.3	(1.3)	69.0	(1.2)	69.4	(1.3)
Coccidiostats in feed	37.8	(2.0)	46.5	(1.2)	44.4	(1.3)	46.5	(1.4)
Vitamins A-D-E injection	11.8	(1.3)	16.3	(1.0)	15.3	(1.0)	10.4	(0.7)
Vitamins A-D-E in feed	57.4	(2.2)	76.9	(1.1)	72.7	(1.2)	74.4	(1.2)
Selenium injection	16.2	(1.8)	12.7	(0.8)	13.3	(0.9)	13.2	(0.9)
Selenium in feed	50.3	(2.2)	70.8	(1.2)	67.6	(1.3)	69.3	(1.3)
Ionophores in feed (e.g., Rumensin®, Bovatec®)	40.0	(2.2)	42.2	(1.2)	44.2	(1.3)	45.2	(1.4)
Probiotics	NA		13.1	(0.9)	14.2	(0.9)	20.0	(1.1)
Anionic salts in feed	NA		NA		20.6	(1.1)	20.9	(1.1)
Other	NA		4.8	(0.6)	3.8	(0.5)	4.6	(0.7)
Any	91.7	(1.1)	93.6	(0.7)	94.9	(0.6)	94.6	(0.7)

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**Percentage of Operations by Preventive Practices Normally Used for Heifers**


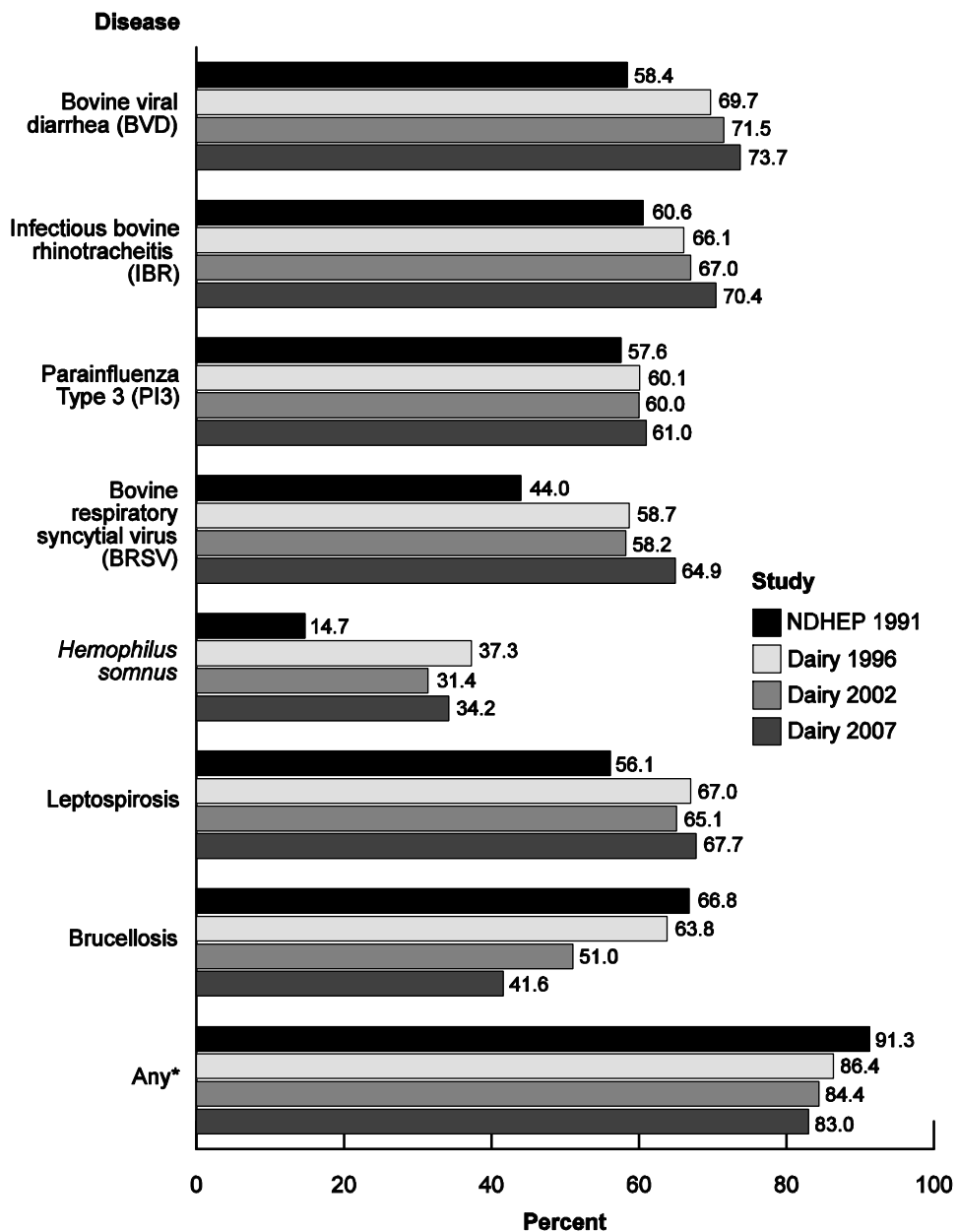
## 7. Vaccination practices

The percentage of operations administering any vaccine decreased from 91.3 percent in 1991 to 83.0 percent in 2007. With the exceptions of parainfluenza, brucellosis, and Johne's disease vaccines, vaccine use for all other diseases increased. The percentage of operations that vaccinated heifers against brucellosis decreased from 63.8 percent in 1996 to 41.6 percent in 2007. This decrease may be due to the fact that many States switched from a mandatory to a voluntary brucellosis vaccination program from 1996 to 2007. In addition, the number of States that were certified brucellosis-free increased from 34 in 1996 to 49 in 2007, which may have impacted how many operations vaccinated against brucellosis.

Percentage of operations that normally vaccinated heifers against the following diseases:

Disease	Percent Operations							
	NDHEP 1991	Std. Error	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Bovine viral diarrhea (BVD)	58.4	(2.1)	69.7	(1.3)	71.5	(1.2)	73.7	(1.3)
Infectious bovine rhinotracheitis (IBR)	60.6	(2.1)	66.1	(1.3)	67.0	(1.3)	70.4	(1.3)
Parainfluenza Type 3 (PI3)	57.6	(2.1)	60.1	(1.3)	60.0	(1.3)	61.0	(1.4)
Bovine respiratory syncytial virus (BRSV)	44.0	(2.1)	58.7	(1.3)	58.2	(1.3)	64.9	(1.4)
<i>Haemophilus somnus</i>	14.7	(1.4)	37.3	(1.3)	31.4	(1.2)	34.2	(1.3)
Leptospirosis	56.1	(2.2)	67.0	(1.3)	65.1	(1.3)	67.7	(1.3)
<i>Salmonella</i>	NA		18.9	(1.0)	16.8	(1.0)	21.5	(1.1)
<i>E. coli</i> mastitis	NA		18.1	(0.9)	21.3	(1.0)	24.1	(1.1)
Clostridia (blackleg/malignant edema)	20.7	(1.4)	32.3	(1.1)	32.8	(1.1)	34.6	(1.3)
Brucellosis	66.8	(1.9)	63.8	(1.3)	51.0	(1.3)	41.6	(1.3)
<i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> (Johne's disease)	NA		5.4	(0.6)	4.6	(0.5)	5.0	(0.6)
<i>Neospora</i>	NA		NA		3.6	(0.4)	6.3	(0.6)
Other	NA		7.3	(0.6)	6.9	(0.6)	6.8	(0.7)
Any	91.3	(1.3)	86.4	(1.0)	84.4	(1.1)	83.0	(1.1)

### Percentage of Operations that Normally Vaccinated Heifers Against the Following Diseases



\*Includes vaccines for the diseases listed above plus *Salmonella*, *E. coli* mastitis, clostridia, Johne's disease, *Neospora*, and "Other."

### 8. Types of BVD vaccine

The majority of operations that administered BVD vaccines to heifers switched from giving killed vaccines in 1996 (58.4 percent of operations) to modified-live vaccines in 2007 (62.2 percent of operations).

For operations that gave BVD vaccinations to heifers, percentage of operations by type of BVD vaccine given:

Percent Operations						
Type of BVD Vaccine	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Killed	58.4	(1.5)	50.6	(1.6)	43.1	(1.6)
Modified live	40.7	(1.5)	49.2	(1.6)	62.2	(1.5)

**D. Heifer Health****1. Calves born alive**

The number of calves born alive as a percentage of cow inventory decreased from 93.4 percent in 1996 to 86.0 percent in 2007.

Number of calves born and alive\*, as a percentage of January 1 cow inventory:

Dairy 1996		Dairy 2002		Dairy 2007	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
93.4	(0.5)	88.8	(0.5)	86.0	(0.6)

\*In Dairy 2007, included "alive at 48 hours."

**2. Mortality**

The percentages of unweaned and weaned heifer calves that died decreased from 1996 to 2007. The percentage of unweaned calves that died decreased from 10.5 percent in 2002 to 7.8 percent in 2007. Weaned heifer calf deaths increased from 2.2 percent in 1991 to 2.8 percent in 2002 and then decreased to 1.8 percent in 2007.

a. Number of unweaned and weaned heifer deaths, as a percentage of heifers born alive...

Heifer Type	...or moved onto the operation NDHEP 1991		Dairy 1996		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Unweaned	8.4	(0.4)	10.8	(0.4)	10.5	(0.3)	7.8	(0.2)
Weaned	2.2	(0.1)	2.4	(0.1)	2.8	(0.1)	1.8	(0.1)

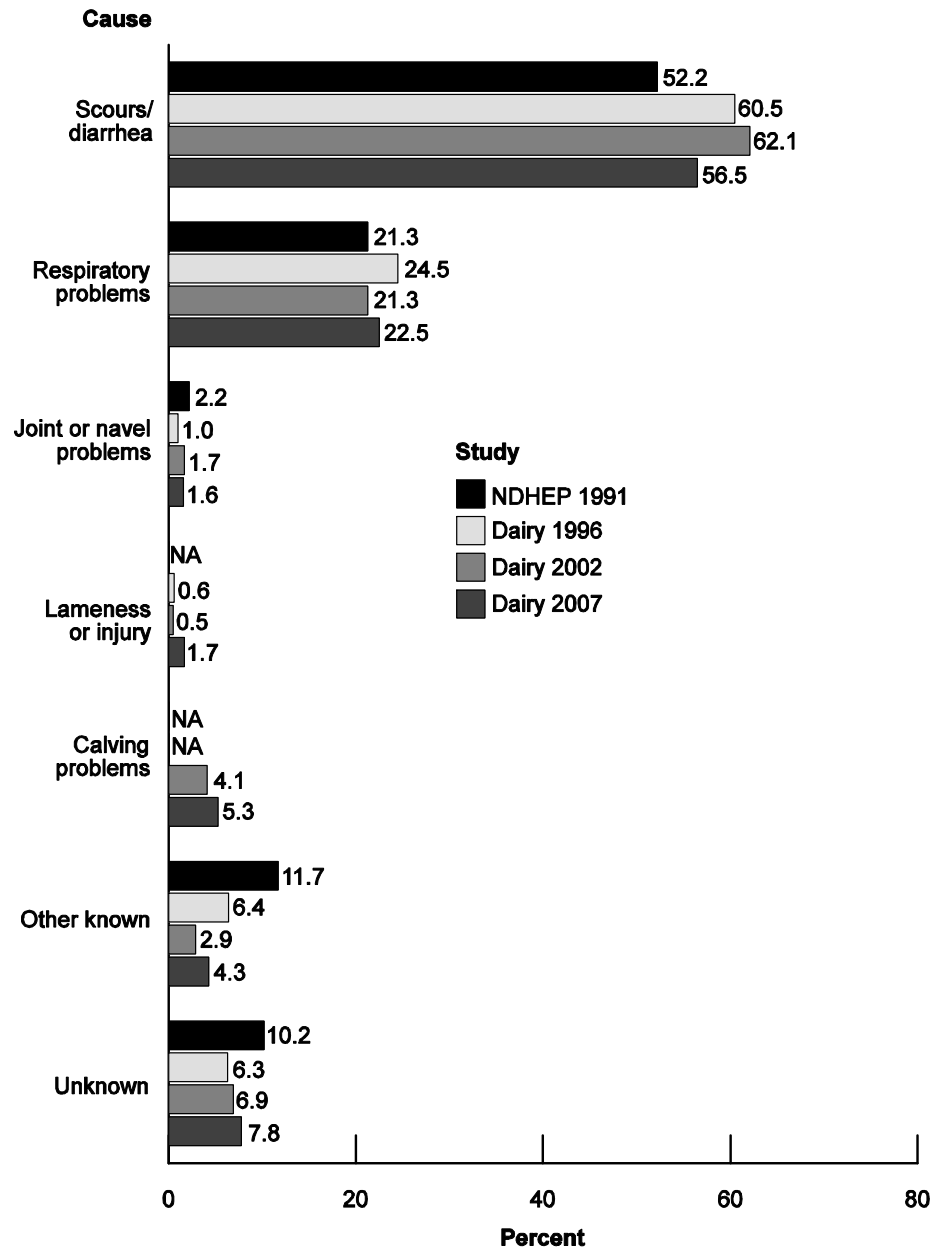
Scours/diarrhea accounted for more than 50 percent of unweaned heifer deaths in each study year since 1991, while respiratory problems accounted for 20 to 25 percent of deaths during the same period.

b. Percentage of *unweaned heifer* deaths by cause:

Percent Deaths								
Cause	NDHEP 1991	Std. Error	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Scours/ diarrhea	52.2	(2.6)	60.5	(1.2)	62.1	(1.1)	56.5	(1.3)
Respiratory problems	21.3	(1.6)	24.5	(1.0)	21.3	(0.9)	22.5	(0.9)
Joint or navel problems	2.2	(0.7)	1.0	(0.1)	1.7	(0.2)	1.6	(0.3)
Lameness or injury	NA		0.6	(0.1)	0.5	(0.1)	1.7	(0.3)
Trauma	2.4	(0.8)	NA		NA		NA	
Lack of coordination/ severe depression	NA		0.4	(0.1)	0.4	(0.1)	0.3	(0.1)
Poison	NA		0.3	(0.1)	0.1	(0.0)	0.0	(0.0)
Calving problems	NA		NA		4.1	(0.6)	5.3	(0.7)
Other known	11.7	(1.8)	6.4	(1.1)	2.9	(0.4)	4.3	(0.7)
Unknown	10.2	(1.4)	6.3	(0.9)	6.9	(0.8)	7.8	(0.9)
Total	100.0		100.0		100.0		100.0	



### Percentage of Unweaned Heifer Deaths by Cause

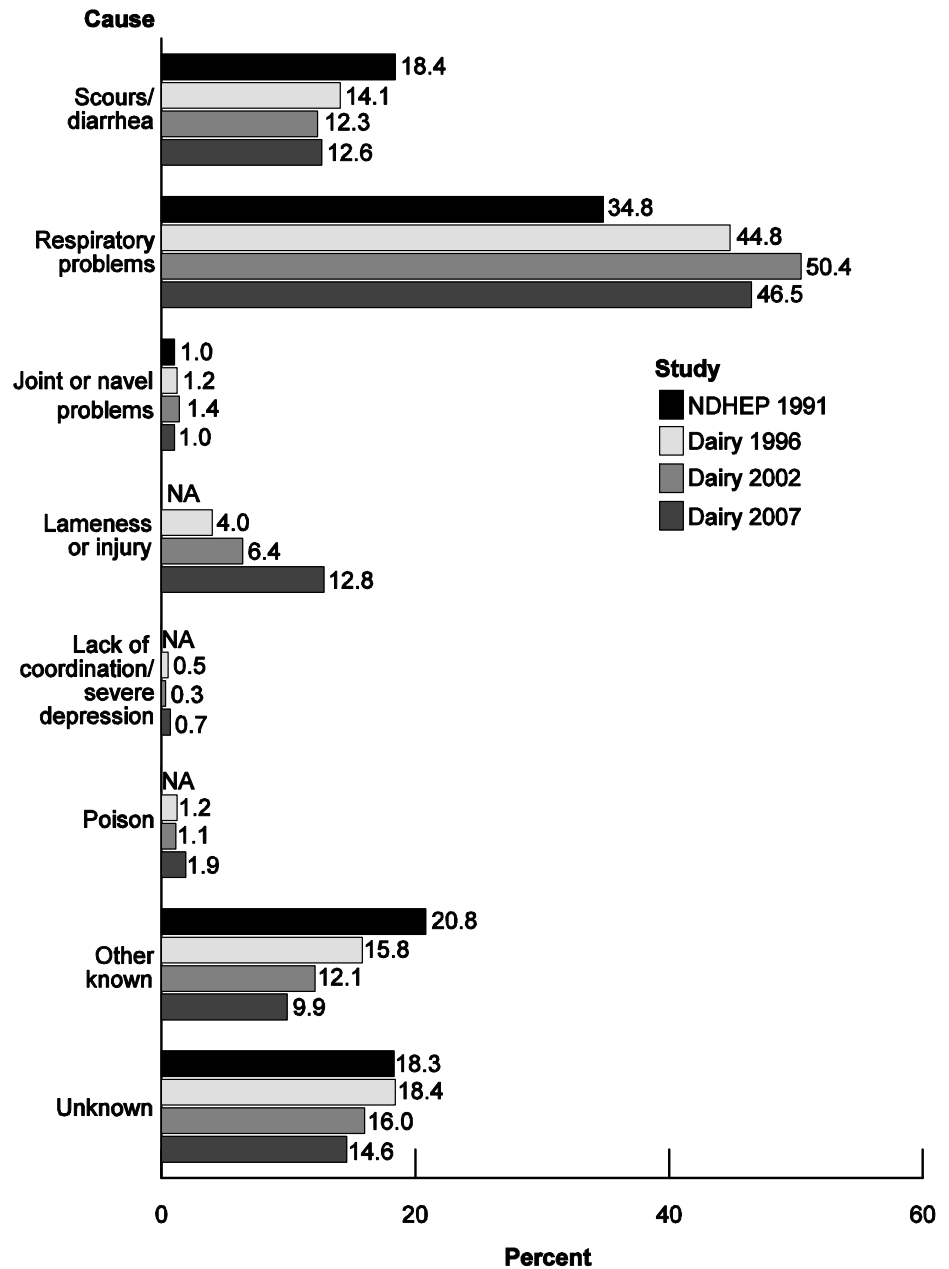


The percentage of weaned heifer deaths caused by respiratory problems increased from 34.8 percent of deaths in 1991 to 46.5 percent in 2007. Weaned heifer deaths caused by lameness or injury increased from 4.0 percent of deaths in 1996 to 12.8 percent in 2007.

c. Percentage of **weaned heifer** deaths by cause:

Percent Deaths								
Cause	NDHEP 1991	Std. Error	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Scours/ diarrhea	18.4	(2.6)	14.1	(1.6)	12.3	(1.0)	12.6	(1.0)
Respiratory problems	34.8	(3.5)	44.8	(2.1)	50.4	(1.6)	46.5	(1.7)
Joint or navel problems	1.0	(0.4)	1.2	(0.5)	1.4	(0.3)	1.0	(0.3)
Lameness or injury	NA		4.0	(0.5)	6.4	(0.6)	12.8	(1.0)
Trauma	6.7	(0.9)	NA		NA		NA	
Lack of coordination/ severe depression	NA		0.5	(0.1)	0.3	(0.1)	0.7	(0.2)
Poison	NA		1.2	(0.3)	1.1	(0.4)	1.9	(0.9)
Other known	20.8	(2.0)	15.8	(2.4)	12.1	(1.2)	9.9	(1.0)
Unknown	18.3	(2.1)	18.4	(1.4)	16.0	(1.1)	14.6	(1.2)
Total	100.0		100.0		100.0		100.0	

### Percentage of Weaned Heifer Deaths by Cause



### 3. Carcass disposal

The percentage of operations that used rendering to dispose of dead calves decreased from 43.8 percent in 2002 to 36.5 percent in 2007, while the percentage of operations that composted dead calves increased from 10.1 to 24.2 percent during the same period.

Percentage of operations by primary method used to dispose of dead calves:

Percent Operations				
Method of Disposal	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Buried	35.3	(1.3)	32.6	(1.3)
Burned/incinerated	2.8	(0.4)	2.0	(0.4)
Rendered	43.8	(1.3)	36.5	(1.3)
Composted	10.1	(0.8)	24.2	(1.2)
Landfill	2.4	(0.4)	1.7	(0.3)
Other	5.6	(0.6)	3.0	(0.5)
Total	100.0		100.0	

## E. Cow Management

### 1. Home-raised replacements

The percentage of operations that home-raised more than 40 percent of their cow inventory increased threefold from 2002 to 2007 (8.2 and 24.2 percent, respectively).

Percentage of operations by percentage of adult-cow inventory that was home-raised:

Percent Operations				
Percent of Home-Raised Replacements	Dairy 2002	Std. Error	Dairy 2007	Std. Error
0	8.4	(0.8)	10.2	(0.8)
0.1 to 10.0	3.9	(0.6)	3.5	(0.6)
10.1 to 20.0	23.2	(1.2)	15.8	(1.1)
20.1 to 30.0	33.1	(1.3)	23.3	(1.2)
30.1 to 40.0	23.2	(1.1)	22.8	(1.2)
40.1 or more	8.2	(0.7)	24.4	(1.3)
Total	100.0		100.0	

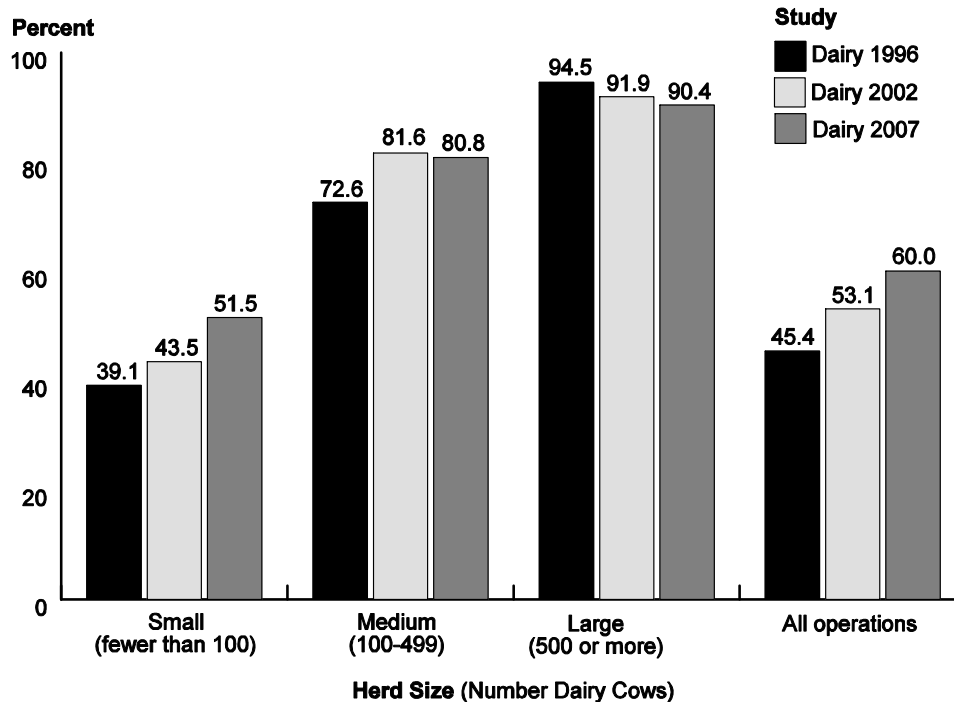
### 2. Housing

A higher percentage of small and medium operations housed maternity cows separate from lactating cows in 2007 compared with 1996. For all operations, the use of separate maternity housing increased from 45.4 percent in 1996 to 60.0 percent in 2007.

Percentage of operations in which maternity housing was separate from housing used for ***lactating*** cows, by herd size:

Percent Operations						
Herd Size (Number Dairy Cows)	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Small (fewer than 100)	39.1	(1.3)	43.5	(1.6)	51.5	(1.7)
Medium (100 to 499)	72.6	(2.1)	81.6	(1.7)	80.8	(1.8)
Large (500 or more)	94.5	(1.8)	91.9	(1.5)	90.4	(2.0)
All operations	45.4	(1.2)	53.1	(1.3)	60.0	(1.3)

### Percentage of Operations in Which Maternity Housing was Separate from Housing Used for Lactating Cows, by Herd Size



### 3. Milking facilities

The percentage of operations that used a parlor as a primary milking facility increased from 28.8 percent in 1996 to 39.5 percent in 2007, while the percentage of operations that used a tiestall or stanchion decreased from 69.5 to 60.3 percent during the same period. A larger shift was observed in the percentage of cows, as 54.9 percent of cows were milked in parlors in 1996 compared with 78.2 percent in 2007.

Percentage of operations (and percentage of cows on these operations) by primary milking<sup>1</sup> facility used:

Facility Type	Percent Operations						Percent Cows <sup>2</sup>					
	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Parlor	28.8	(0.9)	37.1	(1.0)	39.5	(1.0)	54.9	(1.0)	70.0	(0.8)	78.2	(0.6)
Tie stall or stanchion	69.5	(0.9)	61.9	(1.0)	60.3	(1.0)	43.9	(1.0)	28.9	(0.8)	21.8	(0.6)
Other	2.9	(0.5)	1.0	(0.2)	0.2	(0.1)	4.3	(0.7)	1.1	(0.2)	0.0	(0.0)

<sup>1</sup>Dairy 1996 did not ask about primary milking facilities; therefore, the column totals for 1996 are greater than 100 percent.

<sup>2</sup>As a percentage of January 1 cow inventory.

**Percentage of Operations (and Percentage of Cows on These Operations) by Primary Milking Facility Used**

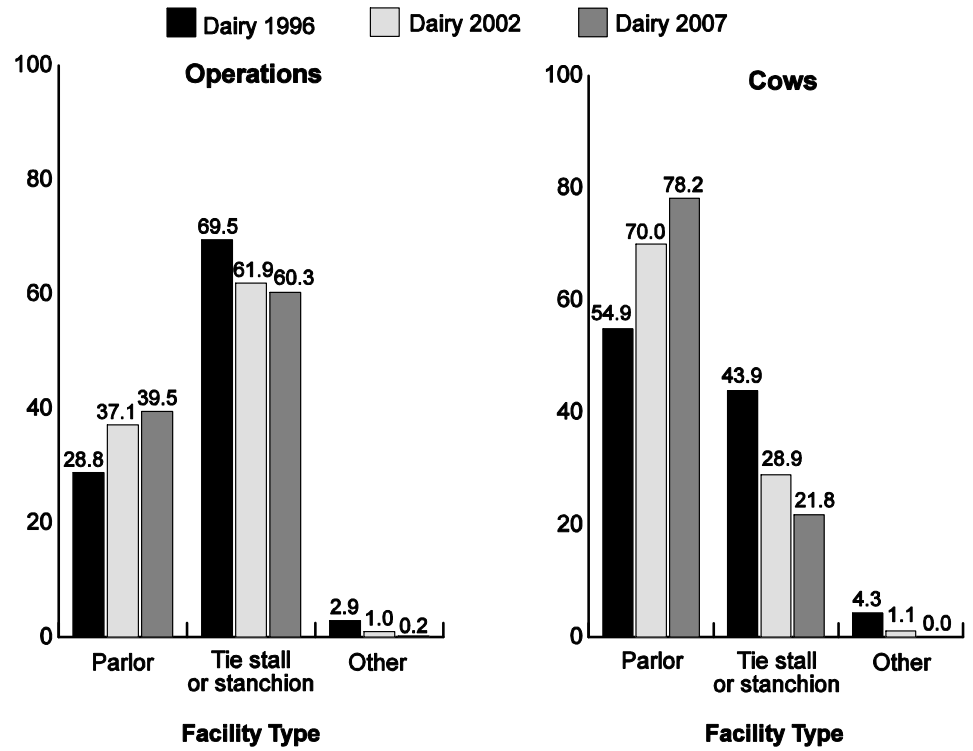


Photo by Dr. Jason Lombard

#### 4. Nutrition

The percentage of operations that fed a total mixed ration increased for all herd sizes from 1996 to 2007.

a. Percentage of operations that fed a total mixed ration, by herd size:

Percent Operations						
<b>Herd Size</b> (Number Dairy Cows)	<b>Dairy</b> <b>1996</b>	<b>Std.</b> <b>Error</b>	<b>Dairy</b> <b>2002</b>	<b>Std.</b> <b>Error</b>	<b>Dairy</b> <b>2007</b>	<b>Std.</b> <b>Error</b>
Small (fewer than 100)	28.2	(1.3)	36.6	(1.6)	37.8	(1.6)
Medium (100 to 499)	68.8	(2.0)	78.3	(1.7)	84.7	(1.7)
Large (500 or more)	84.1	(3.0)	90.2	(1.7)	94.1	(1.4)
All operations	35.6	(1.1)	47.0	(1.3)	51.1	(1.3)

The percentage of operations with an RHA milk production of 16,000 pounds or more that fed a total mixed ration increased from 1996 to 2002 but was similar between 2002 and 2007.

b. Percentage of operations that fed a total mixed ration, by RHA milk production:

Percent Operations						
<b>RHA Milk</b> <b>Production (Pounds)</b>	<b>Dairy</b> <b>1996</b>	<b>Std.</b> <b>Error</b>	<b>Dairy</b> <b>2002</b>	<b>Std.</b> <b>Error</b>	<b>Dairy</b> <b>2007</b>	<b>Std.</b> <b>Error</b>
Less than 16,000	28.9	(2.0)	25.4	(2.3)	23.5	(2.4)
16,000 to 19,999	33.2	(1.7)	45.0	(2.2)	42.7	(2.3)
20,000 or more	55.4	(2.5)	65.7	(2.1)	70.7	(1.9)



The percentages of operations that used forage test results to balance feed rations were similar for individual herd sizes from 1996 to 2007, although a higher percentage of all operations tested forage in 2007 than in 1996 (75.5 and 67.8 percent, respectively).

c. Percentage of operations that used forage test results to balance feed rations, by herd size:

Percent Operations						
<b>Herd Size</b> (Number Dairy Cows)	<b>Dairy 1996</b>	<b>Std. Error</b>	<b>Dairy 2002</b>	<b>Std. Error</b>	<b>Dairy 2007</b>	<b>Std. Error</b>
Small (fewer than 100)	64.1	(1.4)	66.1	(1.6)	70.1	(1.7)
Medium (100 to 499)	84.8	(1.3)	87.1	(1.3)	89.9	(1.4)
Large (500 or more)	89.2	(2.7)	88.8	(1.8)	90.7	(1.8)
All operations	67.8	(1.2)	71.2	(1.2)	75.5	(1.2)

The percentage of operations and percentage of cows on these operations that relied on pasture during the growing season to provide part of the ration forage component has increased since 2002.

d. Percentage of operations (and percentage of cows on these operations) that relied on pasture during the growing season to provide part of the ration forage component for cows:

Percent Operations				Percent Cows			
<b>Dairy 2002</b>	<b>Std. Error</b>	<b>Dairy 2007</b>	<b>Std. Error</b>	<b>Dairy 2002</b>	<b>Std. Error</b>	<b>Dairy 2007</b>	<b>Std. Error</b>
47.6	(1.3)	58.9	(1.3)	24.7	(0.8)	33.0	(1.3)

### 5. Number of bulls

The percentage of operations with bulls has remained stable since 1996. Approximately half of dairy operations (48.3 percent) did not house bulls in 2007.

Percentage of operations by the number of bulls in the January 1 inventory used for breeding dairy cows or heifers:

Percent Operations						
Number Bulls	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
0	45.4	(1.3)	45.1	(1.4)	48.3	(1.4)
1	34.8	(1.3)	31.1	(1.3)	28.5	(1.3)
2 to 4	16.9	(0.8)	19.1	(1.0)	18.6	(1.0)
5 or more	2.9	(0.2)	4.7	(0.3)	4.6	(0.3)
Total	100.0		100.0		100.0	

### 6. Preventive practices

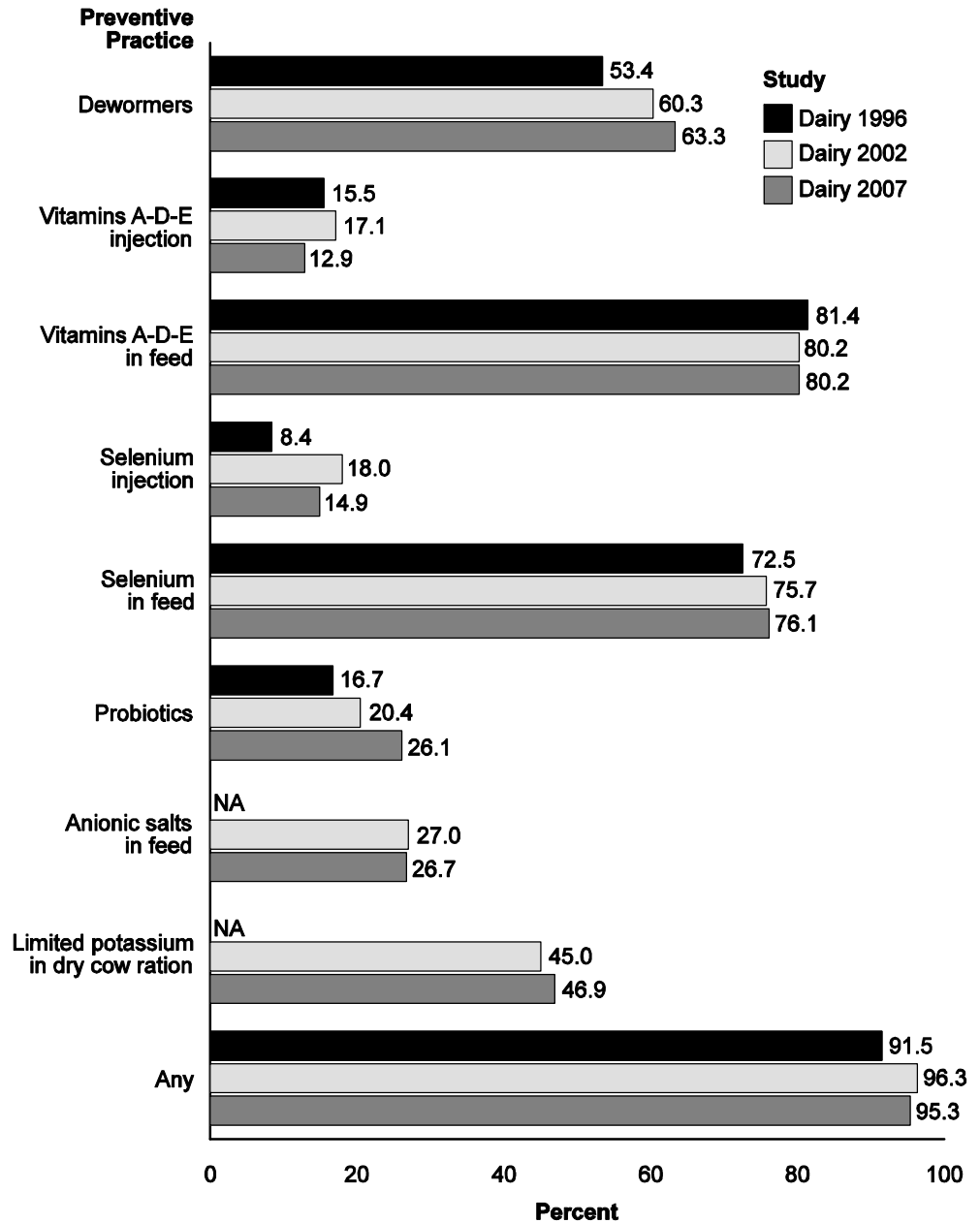
Since 1996, the use of dewormers, selenium injections, and probiotics increased while vitamin A-D-E injections decreased. In 2007, 95.3 percent of operations administered any preventive compared with 91.5 percent in 1996.

Percentage of operations by preventive practices normally used for cows:

Percent Operations						
Preventive Practice	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Dewormers	53.4	(1.3)	60.3	(1.3)	63.3	(1.4)
Vitamins A-D-E injection	15.5	(0.9)	17.1	(1.0)	12.9	(0.8)
Vitamins A-D-E in feed	81.4	(1.1)	80.2	(1.1)	80.2	(1.2)
Selenium injection	8.4*	(0.6)	18.0	(1.0)	14.9	(0.9)
Selenium in feed	72.5*	(1.2)	75.7	(1.1)	76.1	(1.2)
Probiotics	16.7	(0.9)	20.4	(1.0)	26.1	(1.2)
Anionic salts in feed	NA		27.0	(1.2)	26.7	(1.2)
Limited potassium in dry cow ration	NA		45.0	(1.3)	46.9	(1.4)
Ionophores in feed	NA		NA		26.8	(1.1)
Other	4.4	(0.5)	5.4	(0.6)	3.6	(0.6)
Any	91.5	(0.8)	96.3	(0.6)	95.3	(0.7)

\*Lactating cows only.

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**Percentage of Operations by Preventive Practices Normally Used for Cows**


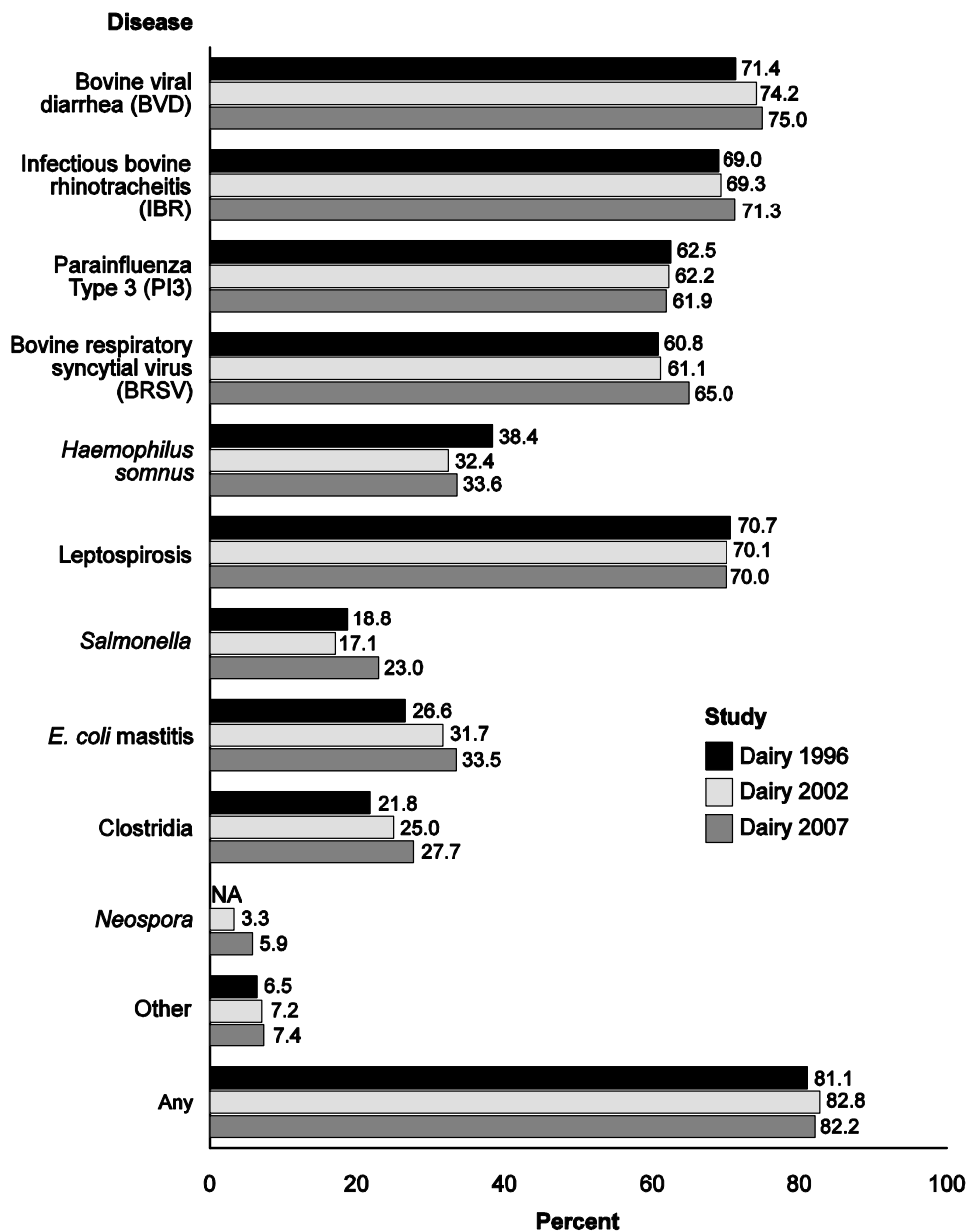
## 7. Vaccination practices

The use of *Salmonella*, *E. coli*, and clostridia vaccines has increased since 1996, while the use of *Haemophilus somnus* vaccine decreased. Use of the most common vaccines (BVD, IBR, PI3, BRSV, and Leptospirosis) has remained steady since 1996.

Percentage of operations that normally vaccinated cows against the following diseases:

Percent Operations						
Disease	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Bovine viral diarrhea (BVD)	71.4	(1.3)	74.2	(1.2)	75.0	(1.3)
Infectious bovine rhinotracheitis (IBR)	69.0	(1.3)	69.3	(1.3)	71.3	(1.3)
Parainfluenza Type 3 (PI3)	62.5	(1.3)	62.2	(1.3)	61.9	(1.4)
Bovine respiratory syncytial virus (BRSV)	60.8	(1.3)	61.1	(1.3)	65.0	(1.4)
<i>Haemophilus somnus</i>	38.4	(1.3)	32.4	(1.2)	33.6	(1.3)
Leptospirosis	70.7	(1.3)	70.1	(1.3)	70.0	(1.3)
<i>Salmonella</i>	18.8	(1.0)	17.1	(1.0)	23.0	(1.1)
<i>E. coli</i> mastitis	26.6	(1.1)	31.7	(1.2)	33.5	(1.2)
Clostridia	21.8	(1.0)	25.0	(1.1)	27.7	(1.2)
<i>Neospora</i>	NA		3.3	(0.4)	5.9	(0.6)
Other	6.5	(0.6)	7.2	(0.6)	7.4	(0.7)
Any	81.1	(1.1)	82.8	(1.1)	82.2	(1.1)

### Percentage of Operations that Normally Vaccinated Cows Against the Following Diseases



### 8. Types of BVD vaccine

Although the majority of operations administered killed BVD vaccine to cows, the percentage of operations that used modified-live vaccine increased from 29.3 percent in 1991 to 48.9 percent in 2007. The use of killed BVD vaccine decreased slightly during the same period.

a. For operations that gave BVD vaccinations to cows, percentage of operations by type of BVD vaccine given:

Percent Operations						
Type of BVD	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Killed	65.4	(1.4)	61.9	(1.5)	56.3	(1.6)
Modified live	29.3	(1.3)	36.7	(1.5)	48.9	(1.6)

A higher percentage of operations used a combination of Type I and Type II vaccines in 2007 compared to 2002 (60.8 and 39.4 percent, respectively). Producers are becoming more aware of the type of BVD vaccine they used, as the percentage of operations that did not know which vaccine was used decreased from 47.6 percent in 2002 to 27.2 percent in 2007.

b. For operations that gave any BVD vaccinations, percentage of operations by strain of BVD contained in vaccine administered:

Percent Operations				
BVD Strain	Dairy 2002	Standard Error	Dairy 2007	Standard Error
Type I only	5.4	(0.6)	4.3	(0.6)
Type II only	7.6	(0.9)	7.7	(0.8)
Combination (Type I and Type II)	39.4	(1.4)	60.8	(1.5)
Did not know	47.6	(1.5)	27.2	(1.4)
Total	100.0		100.0	

The percentages of operations that gave annual BVD booster injections were similar in 1996, 2002, and 2007, with about 80 percent of operations giving booster injections.

c. For operations that gave BVD vaccinations to cows, percentage of operations that gave annual BVD booster injections:

Percent Operations					
Dairy 1996	Standard Error	Dairy 2002	Standard Error	Dairy 2007	Standard Error
77.4	(1.3)	82.9	(1.2)	80.2	(1.3)

### 9. Bovine somatotropin (bST)

With the exception of small operations, the percentage of operations that used bST and the percentage of cows that received bST increased from 1996 to 2002. From 2002 to 2007, the percentage of large operations that used bST decreased from 54.4 percent to 42.7 percent. Overall, the percentage of operations that used bST remained the same in 2002 and 2007 (15.2 percent for both study years). The percentage of cows that received bST on medium and large operations decreased from 24.5 and 34.1 percent, respectively, in 2002 to 17.7 and 22.6 percent, respectively, in 2007. Overall, the percentage of cows that received bST decreased from 22.3 percent in 2002 to 17.2 percent in 2007.

Percentage of operations (and percentage of cows milked on January 1) that used bST in cows during the current lactation (at the time of interview), by herd size:

Herd Size (Number Dairy Cows)	Dairy 1996 (All Cows in Inventory January 1)				Dairy 2002 (Cows Milked January 1)				Dairy 2007 (Cows Milked January 1)			
	Pct. Ops.	Std. Error	Pct. Cows	Std. Error	Pct. Ops.	Std. Error	Pct. Cows	Std. Error	Pct. Ops.	Std. Error	Pct. Cows	Std. Error
Small (fewer than 100)	6.5	(0.6)	3.7	(0.4)	8.8	(0.8)	6.2	(0.7)	9.1	(0.9)	6.2	(0.7)
Medium (100 to 499)	21.0	(1.7)	13.2	(1.3)	32.2	(1.9)	24.5	(1.5)	28.8	(2.0)	17.7	(1.4)
Large (500 or more)	38.7	(3.9)	17.9	(2.3)	54.4	(2.6)	34.1	(1.8)	42.7	(2.5)	22.6	(1.5)
All operations	9.4	(0.6)	10.1	(0.7)	15.2	(0.8)	22.3	(0.8)	15.2	(0.8)	17.2	(0.8)

**F. Cow Health****1. Abortions**

Abortion percentage for cows and heifers combined increased from 3.5 percent in 1996 to 4.5 percent in 2007.

a. Percentage of heifers, cows, and heifers and cows combined that aborted:

<b>Percent Heifers/Cows</b>						
	<b>Dairy 1996</b>	<b>Std. Error</b>	<b>Dairy 2002</b>	<b>Std. Error</b>	<b>Dairy 2007</b>	<b>Std. Error</b>
Heifers	NA		NA		3.3 <sup>1</sup>	(0.2)
Cows	NA		NA		5.0 <sup>2</sup>	(0.2)
Both heifers and cows	3.5	(0.1)	4.0	(0.1)	4.5 <sup>3</sup>	(0.2)

<sup>1</sup>Breeding age or older heifers on January 1, 2007

<sup>2</sup>Cow inventory minus breeding age and older heifers on January 1, 2007

<sup>3</sup>Cow inventory on January 1, 2007.

The percentages of operations by abortion percentage were similar across study years.

b. Percentage of operations by reported abortion percentage:

<b>Percent Operations</b>						
<b>Abortion Percent</b>	<b>Dairy 1996</b>	<b>Std. Error</b>	<b>Dairy 2002</b>	<b>Std. Error</b>	<b>Dairy 2007</b>	<b>Std. Error</b>
Less than 2.0	42.7	(1.3)	39.3	(1.3)	38.2	(1.4)
2.0 to 4.9	36.2	(1.2)	34.6	(1.2)	34.3	(1.3)
5.0 to 9.9	16.2	(0.9)	20.3	(1.1)	20.6	(1.1)
10.0 to 14.9	3.2	(0.5)	4.7	(0.7)	4.9	(0.6)
15.0 or more	1.7	(0.4)	1.1	(0.3)	2.0	(0.4)
Total	100.0		100.0		100.0	



## 2. Cow morbidity

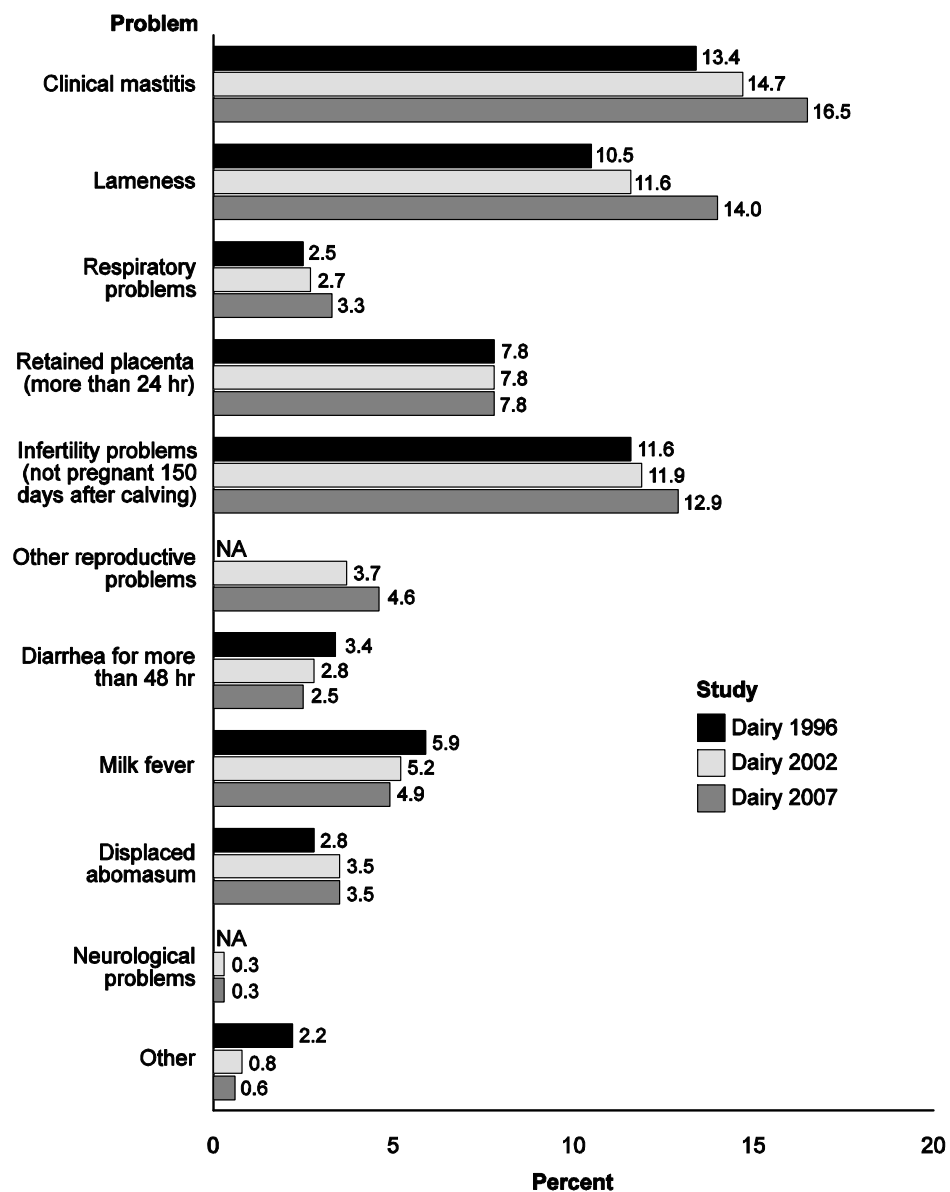
The percentage of cows with clinical mastitis, lameness, respiratory problems, infertility problems, or displaced abomasum increased from 1996 to 2007. The percentage of cows with diarrhea for more than 48 hours or milk fever decreased from 1996 to 2007.

Percentage of cows by health problem:

Problem	Percent Cows*					
	Dairy 1996		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Clinical mastitis	13.4	(0.3)	14.7	(0.3)	16.5	(0.5)
Lameness	10.5	(0.3)	11.6	(0.3)	14.0	(0.4)
Respiratory problems	2.5	(0.1)	2.7	(0.1)	3.3	(0.1)
Retained placenta (more than 24 hours)	7.8	(0.2)	7.8	(0.2)	7.8	(0.2)
Infertility problems (not pregnant 150 days after calving)	11.6	(0.3)	11.9	(0.3)	12.9	(0.3)
Other reproductive problems (e.g., dystocia, metritis)	NA		3.7	(0.2)	4.6	(0.3)
Diarrhea for more than 48 hours	3.4	(0.2)	2.8	(0.2)	2.5	(0.2)
Milk fever	5.9	(0.1)	5.2	(0.1)	4.9	(0.1)
Displaced abomasum	2.8	(0.1)	3.5	(0.1)	3.5	(0.1)
Neurological problems	NA		0.3	(0.0)	0.3	(0.0)
Other health-related problems	2.2	(0.2)	0.8	(0.1)	0.6	(0.1)

\*As a percentage of January 1 respective-year cow inventory.

### Percentage of Cows\* by Health Problem



\*As a percentage of January 1 respective-year cow inventory.

### 3. Permanently removed cows

The percentage of cows removed from medium operations increased from 21.6 percent in 1996 to 23.7 percent in 2007, while the percentage of cows removed from large operations decreased from 27.4 percent in 1996 to 23.4 percent in 2007. For all operations, there were no differences in the percentages of cows permanently removed from operations.

a. Percentage of cows permanently removed\* as a percentage of January 1 inventory, by herd size:

Percent Cows						
Herd Size (Number Dairy Cows)	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Small (fewer than 100)	23.9	(0.7)	24.9	(0.6)	24.1	(0.6)
Medium (100 to 499)	21.6	(0.4)	23.9	(0.5)	23.7	(0.5)
Large (500 or more)	27.4	(0.8)	27.5	(0.6)	23.4	(0.7)
All operations	24.0	(0.4)	25.5	(0.3)	23.6	(0.4)

\*Permanently removed cows include those that permanently left the herd but excludes those that died.

There were no changes in the destination of permanently removed cows from 1996 to 2007, with about 75 percent of cows being sent to market, auction, or stockyard in all three study years.

b. For operations that permanently removed\* cows, percentage of permanently removed cows by destination:

Percent Cows						
Destination	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Sent directly to another dairy	4.5	(1.0)	5.7	(0.6)	5.5	(0.7)
Sent to market, auction, or stockyard	74.0	(1.4)	74.0	(1.1)	76.2	(1.1)
Sent directly to packer or slaughter plant	21.0	(1.2)	19.6	(1.0)	17.5	(1.3)
Sent elsewhere	0.5	(0.1)	0.7	(0.1)	0.8	(0.3)
Total	100.0		100.0		100.0	

\*Permanently removed cows include those that permanently left the herd but excludes those that died.

The reasons cows were permanently removed remained fairly constant from 1996 to 2007, although a lower percentage of cows were removed due to poor production in 2007 (16.1 percent) than in 1996 (21.4 percent).

c. For operations that permanently removed cows, percentage of cows removed, by reason:

Reason	Percent Removals					
	Dairy 1996	Standard Error	Dairy 2002	Standard Error	Dairy 2007	Standard Error
Udder or mastitis problems	25.3	(0.6)	25.4	(0.5)	23.0	(0.6)
Lameness or injury	14.4	(0.6)	15.5	(0.4)	16.0	(0.4)
Reproductive problems	25.5	(0.8)	25.0	(0.5)	26.3	(0.7)
Poor production not related to above	21.4	(0.8)	18.3	(0.7)	16.1	(0.7)
Aggressiveness or belligerence	1.0	(0.1)	0.9	(0.1)	0.7	(0.1)
Other diseases	4.1	(0.5)	5.6	(0.2)	3.7	(0.2)
Sold as replacements to another dairy	4.4	(1.0)	5.5	(0.6)	5.8	(0.7)
Other	3.9	(0.3)	3.8	(0.4)	8.4	(1.1)
Total	100.0		100.0		100.0	

#### 4. Mortality

The percentage of cows that died increased across herd sizes from 1996 to 2007. The overall percentage of cows that died increased from 3.8 percent in 1996 to 5.7 percent in 2007.

a. Percentage of cows that died as a percentage of January 1 inventory, by herd size:

Percent Cows						
<b>Herd Size</b> (Number Dairy Cows)	<b>Dairy 1996</b>	<b>Std. Error</b>	<b>Dairy 2002</b>	<b>Std. Error</b>	<b>Dairy 2007</b>	<b>Std. Error</b>
Small (fewer than 100)	3.6	(0.1)	4.4	(0.1)	4.8	(0.1)
Medium (100 to 499)	3.9	(0.1)	5.0	(0.1)	5.8	(0.2)
Large (500 or more)	4.0	(0.2)	4.9	(0.1)	6.1	(0.2)
All operations	3.8	(0.1)	4.8	(0.1)	5.7	(0.1)

The percentage of cow deaths due to lameness or injury increased from 12.7 percent in 1996 to 20.0 percent in 2007. Conversely, the percentage of cow deaths due to calving problems and other known reasons decreased from 1996 to 2007.

b. Percentage of cow deaths by cause:

Percent Deaths						
<b>Cause</b>	<b>Dairy 1996</b>	<b>Std. Error</b>	<b>Dairy 2002</b>	<b>Std. Error</b>	<b>Dairy 2007</b>	<b>Std. Error</b>
Scours, diarrhea, or other digestive problems	9.0	(1.0)	8.6	(0.5)	10.4	(0.5)
Respiratory problems	9.6	(0.7)	10.3	(0.5)	11.3	(0.7)
Poison	0.9	(0.2)	0.4	(0.1)	0.4	(0.1)
Put down due to lameness or injury	12.7	(0.7)	13.9	(0.6)	20.0	(0.8)
Lack of coordination or severe depression	1.4	(0.2)	1.4	(0.2)	1.0	(0.1)
Mastitis	16.3	(0.8)	17.1	(0.6)	16.5	(0.7)
Calving problems	18.3	(0.7)	17.4	(0.7)	15.2	(0.7)
Other known reasons	17.0	(0.9)	11.1	(0.6)	10.2	(0.8)
Unknown reasons	14.8	(0.8)	19.8	(0.9)	15.0	(1.1)
Total	100.0		100.0		100.0	

### 5. Carcass disposal

Although rendering remained the primary method of dead-cow disposal, the percentage of operations that used this method decreased from 62.4 percent in 2002 to 56.9 percent in 2007. Conversely, use of composting increased from 6.9 percent of operations in 2002 to 16.8 percent in 2007. These changes in dead-cow disposal are similar to those observed in disposing of dead calves,

Percentage of operations by primary method used to dispose of dead cows:

Percent Operations				
Method of Disposal	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Buried	22.7	(1.1)	20.3	(1.1)
Burned/incinerated	2.2	(0.4)	1.8	(0.4)
Rendered	62.4	(1.2)	56.9	(1.3)
Composted	6.9	(0.7)	16.8	(1.0)
Landfill	1.9	(0.3)	1.7	(0.3)
Other	3.9	(0.5)	2.5	(0.4)
Total	100.0		100.0	

**G. Biosecurity****1. Physical contact with unweaned calves**

The percentage of unweaned calves not exposed to weaned calves, bred heifers, or adult cattle increased from 1996 to 2007.

Percentage of operations where, after separation from the dam, unweaned heifers did not have physical contact\* with the following groups:

Percent Operations								
Age Group	NDHEP 1991	Std. Error	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Weaned calves less than approximately 4 months of age	68.5	(2.0)	67.0	(1.3)	77.2	(1.2)	76.0	(1.2)
Calves from approximately 4 months of age to breeding	89.6	(1.3)						
Bred heifers not yet calved	95.4	(0.9)	81.2	(1.1)	86.7	(0.9)	86.8	(1.0)
Adult cattle	89.8	(1.3)	79.8	(1.1)	84.6	(1.0)	84.3	(1.1)

\*Physical contact = possible nose-to-nose contact or sniffing/touching/licking each other, including through a fence.

## 2. Physical contact with other animals

The percentage of operations in which pigs, sheep, or beef cattle had physical contact with dairy cattle and/or their feed, minerals, or water supply was lower in 2007 than in 1991. Dairy-cattle contact with the other listed animals was unchanged between 1991 and 2007.

Percentage of operations in which the following animals had physical contact with dairy cattle and/or their feed, minerals, or water supply:

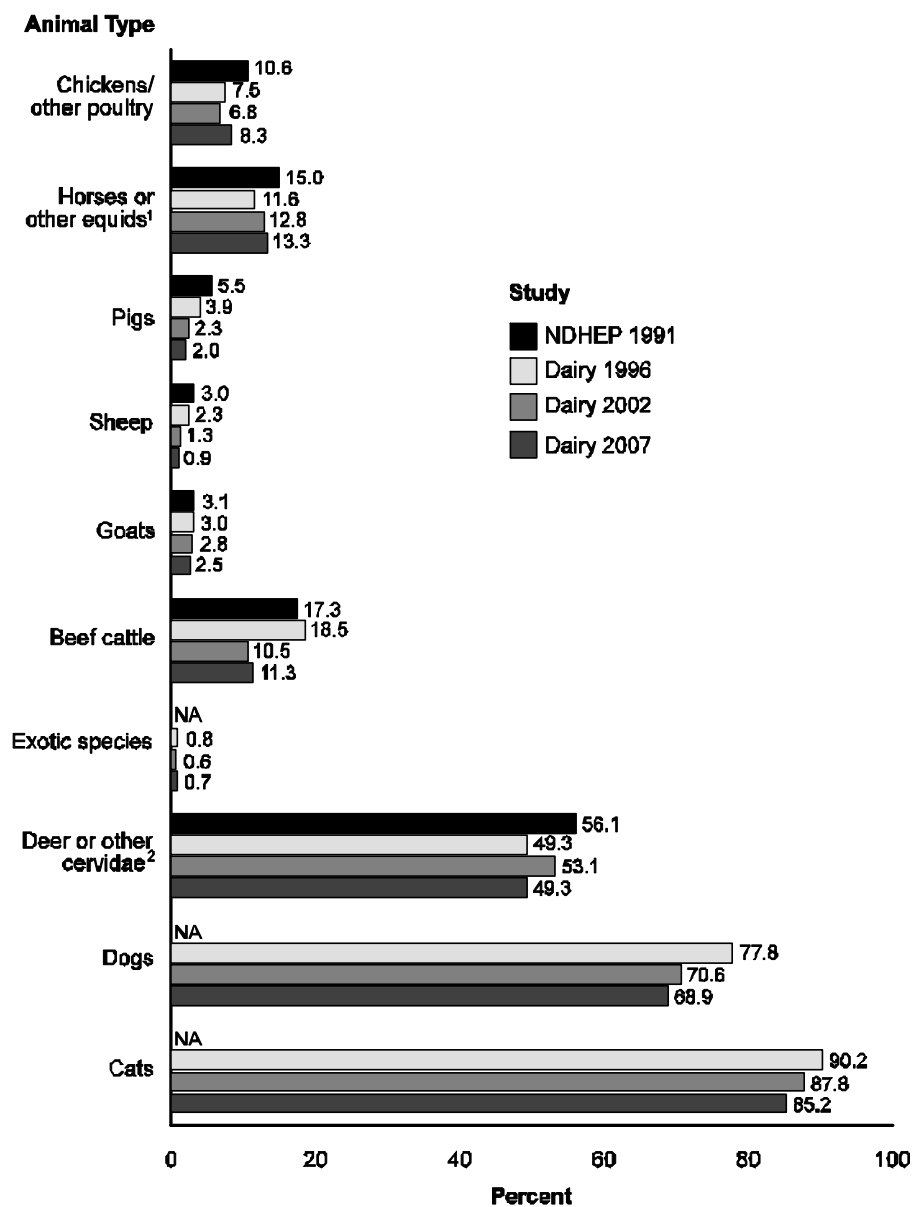
Animal Type	Percent Operations							
	NDHEP 1991	Std. Error	Dairy 1996	Std. Error	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Chickens/other poultry	10.6	(1.4)	7.5	(0.8)	6.8	(0.7)	8.3	(0.8)
Horses or other equids <sup>1</sup>	15.0	(1.6)	11.6	(0.9)	12.8	(0.9)	13.3	(1.0)
Pigs	5.5	(1.0)	3.9	(0.6)	2.3	(0.4)	2.0	(0.4)
Sheep	3.0	(0.6)	2.3	(0.5)	1.3	(0.3)	0.9	(0.3)
Goats	3.1	(0.7)	3.0	(0.5)	2.8	(0.5)	2.5	(0.4)
Beef cattle	17.3	(1.7)	18.5	(1.1)	10.5	(0.8)	11.3	(1.0)
Exotic species	NA		0.8	(0.2)	0.6	(0.2)	0.7	(0.2)
Deer or other cervidae <sup>2</sup>	56.1	(2.2)	49.3	(1.1)	53.1	(1.3)	49.3	(1.4)
Dogs	NA		77.8	(1.1)	70.6	(1.2)	68.9	(1.3)
Cats	NA		90.2	(0.8)	87.8	(0.8)	85.2	(0.9)

<sup>1</sup>In 1991, "horses" was the animal type; "other equids" was not listed.

<sup>2</sup>In 1991, "deer" was the animal type; "other cervidae" was not listed.



**Percentage of Operations in Which the Following Animals had Physical Contact with Dairy Cattle and/or Their Feed, Minerals, or Water Supply**



<sup>1</sup> In 1991, "horses" was the animal type; "other equids" was not listed.

<sup>2</sup> In 1991, "deer" was the animal type; "other cervidae" was not listed.

### 3. Biosecurity for new arrivals

From 1996 to 2007, about 4 of 10 operations brought cattle onto the operation.

Percentage of operations that brought the following classes of cattle onto the operation:

Percent Operations							
Cattle Class	Dairy 1996	Std. Error	Cattle Class	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Calves not yet weaned	5.0	(0.7)	Calves not yet weaned	5.1	(0.7)	3.4	(0.6)
Heifers weaned but not yet bred	7.3	(0.7)	Heifers weaned but not yet bred	6.7	(0.7)	6.4	(0.7)
Bred heifers not yet calved	18.5	(0.9)	Bred heifers not yet calved	15.8	(0.9)	12.2	(0.9)
Lactating cows	19.9	(1.0)	Lactating cows	16.4	(1.0)	13.8	(1.0)
Dry cows	7.1	(0.8)	Dry cows	5.9	(0.6)	4.3	(0.6)
Bulls	8.7	(0.7)	Dairy bulls	13.7	(0.9)	12.5	(0.9)
			Beef bulls	2.3	(0.4)	1.7	(0.3)
Other cattle	1.9	(0.4)	Beef heifers and cows	1.5	(0.3)	1.3	(0.3)
	2.0	(0.3)	Steers	1.1	(0.3)	1.8	(0.4)
Any cattle	43.9	(1.3)	Any cattle	45.7	(1.4)	38.9	(1.4)

### 4. Quarantine

There were no differences in the percentages of operations that quarantined new arrivals between 1996 and 2007 or in the number of days that new additions were quarantined.

a. For operations that brought the following classes of cattle onto the operation, percentage of operations that quarantined the following cattle classes upon arrival\*:

Percent Operations							
Cattle Class	Dairy 1996	Std. Error	Cattle Class	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Calves not yet weaned	26.9	(5.2)	Calves not yet weaned	37.0	(7.3)	44.2	(8.3)
Heifers weaned but not yet bred	24.9	(4.7)	Heifers weaned but not yet bred	23.9	(3.9)	23.0	(4.7)
Bred heifers not yet calved	16.0	(2.0)	Bred heifers not yet calved	19.6	(2.3)	14.5	(2.3)
Lactating cows	6.2	(1.7)	Lactating cows	9.5	(1.6)	12.1	(2.4)
Dry cows	17.9	(4.8)	Dry cows	7.1	(2.2)	15.9	(4.8)
Bulls	11.2	(2.4)	Dairy bulls	15.9	(2.4)	17.1	(2.9)
			Beef bulls	23.6	(6.5)	20.3	(6.5)
Other heifers/cows	15.7	(6.0)	Beef heifers and cows	24.0	(8.5)	30.1	(9.8)
Steers	21.0	(6.6)	Steers	40.0	(11.4)	30.0	(9.6)

\*Producers were asked for the number of head brought on and number of head quarantined.

b. For operations that quarantined new arrivals, average number of days new arrivals were quarantined, by cattle class:

Average Number of Days							
Cattle Class	Dairy 1996	Std. Error	Cattle Class	Dairy 2002	Std. Error	Dairy 2007	Std. Error
Calves not yet weaned	40.8	(5.7)	Calves not yet weaned	49.2	(9.3)	42.4	(4.8)
Heifers weaned but not yet bred	21.5	(4.2)	Heifers weaned but not yet bred	28.2	(6.0)	20.0	(3.6)
Bred heifers not yet calved	16.8	(2.3)	Bred heifers not yet calved	23.7	(4.0)	22.0	(3.1)
Lactating cows	11.7	(2.3)	Lactating cows	20.1	(4.1)	15.6	(2.5)
Dry cows	8.9	(2.1)	Dry cows	21.4	(4.3)	16.5	(4.3)
Bulls	21.0	(3.1)	Dairy bulls	19.0	(2.5)	25.3	(3.5)
			Beef bulls	32.0	(12.9)	31.9	(12.6)
Other heifers/cows	24.3	(9.1)	Beef heifers and cows	31.1	(6.6)	33.3	(12.1)
Steers	41.5	(22.0)	Steers	41.3	(14.0)	40.7	(18.7)

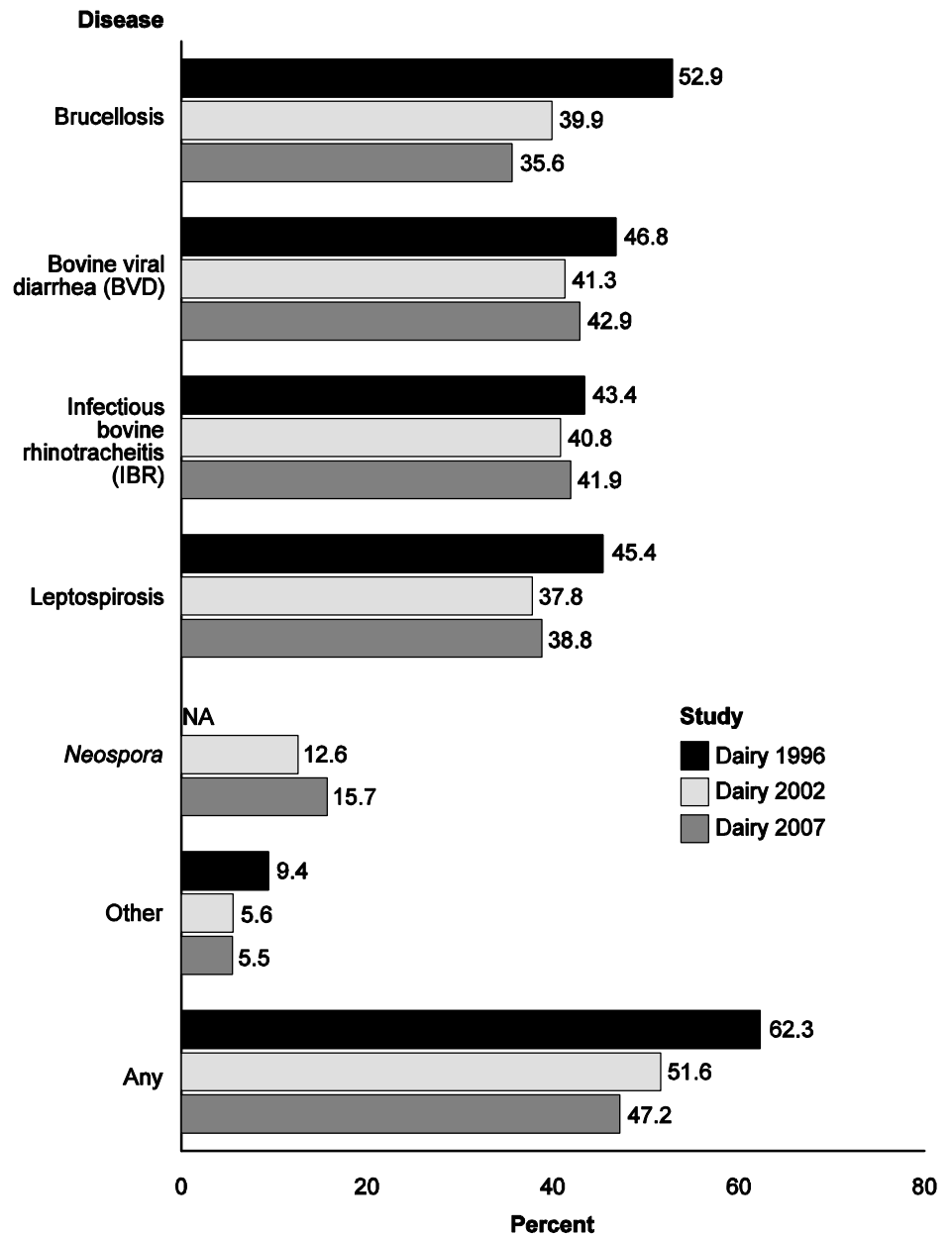
### 5. Vaccine requirements

No changes occurred from 1996 to 2007 in the percentage of operations that vaccinated new additions for BVD, IBR, and leptospirosis before the cattle were brought onto the operation. Approximately one-third to one-half of operations vaccinated for the diseases mentioned above. The percentages of operations that vaccinated for brucellosis decreased for each herd size from 1996 to 2007. Since many different ages of cattle are brought onto operations, the lower brucellosis vaccination percentages may be due partially to cattle too old or already vaccinated for brucellosis at the time of purchase. *Neospora* vaccination has remained unchanged in purchased cattle since 2002. The percentages of operations vaccinating for any disease decreased for small, large, and all operations.

For operations that brought any dairy cattle onto the operation, percentage of operations that normally required vaccination against the following diseases before bringing animals onto the operation, by herd size:

Percent Operations												
Herd Size (Number Dairy Cows)												
Disease	Small (Fewer than 100)			Medium (100-499)			Large (500 or More)			All Operations		
	Dairy 1996	Dairy 2002	Dairy 2007	Dairy 1996	Dairy 2002	Dairy 2007	Dairy 1996	Dairy 2002	Dairy 2007	Dairy 1996	Dairy 2002	Dairy 2007
Brucellosis	48.9 (2.5)	33.4 (2.5)	28.0 (2.6)	63.6 (2.9)	51.3 (2.7)	50.2 (3.5)	85.2 (3.0)	60.0 (3.1)	52.2 (3.9)	52.9 (2.0)	39.9 (1.9)	35.6 (2.0)
Bovine viral diarrhea (BVD)	43.1 (2.4)	36.2 (2.5)	34.8 (2.8)	59.4 (2.9)	51.2 (2.7)	59.9 (3.4)	58.8 (4.8)	53.9 (3.2)	56.7 (3.7)	46.8 (2.0)	41.3 (1.9)	42.9 (2.1)
Infectious bovine rhinotracheitis (IBR)	39.2 (2.3)	35.8 (2.6)	34.2 (2.8)	57.9 (2.9)	50.5 (2.7)	57.3 (3.4)	57.4 (4.8)	51.2 (3.2)	57.1 (3.7)	43.4 (1.9)	40.8 (1.9)	41.9 (2.1)
Leptospirosis	41.9 (2.4)	32.5 (2.5)	32.0 (2.7)	57.7 (2.9)	48.5 (2.7)	53.6 (3.4)	54.3 (4.8)	47.5 (3.2)	48.4 (3.8)	45.4 (2.0)	37.8 (1.8)	38.8 (2.1)
<i>Neospora</i>	NA	11.1 (1.6)	10.8 (1.7)	NA	15.5 (1.8)	26.6 (3.1)	NA	16.1 (2.3)	22.4 (3.3)	NA	12.6 (1.2)	15.7 (1.5)
Other	8.2 (1.1)	4.3 (0.8)	4.2 (1.1)	12.8 (2.2)	8.4 (1.4)	8.7 (1.8)	16.5 (3.6)	7.7 (1.5)	6.5 (1.6)	9.4 (1.0)	5.6 (0.7)	5.5 (0.9)
Any	58.0 (2.5)	44.6 (2.7)	37.7 (2.9)	74.8 (2.6)	64.0 (2.7)	65.2 (3.3)	88.8 (2.9)	71.9 (3.0)	68.5 (3.2)	62.3 (2.0)	51.6 (2.0)	47.2 (2.2)

**For Operations that Brought any Dairy Cattle onto the Operation, Percentage of Operations that Normally Required Vaccination Against the Following Diseases Before Bringing Animals onto the Operation**



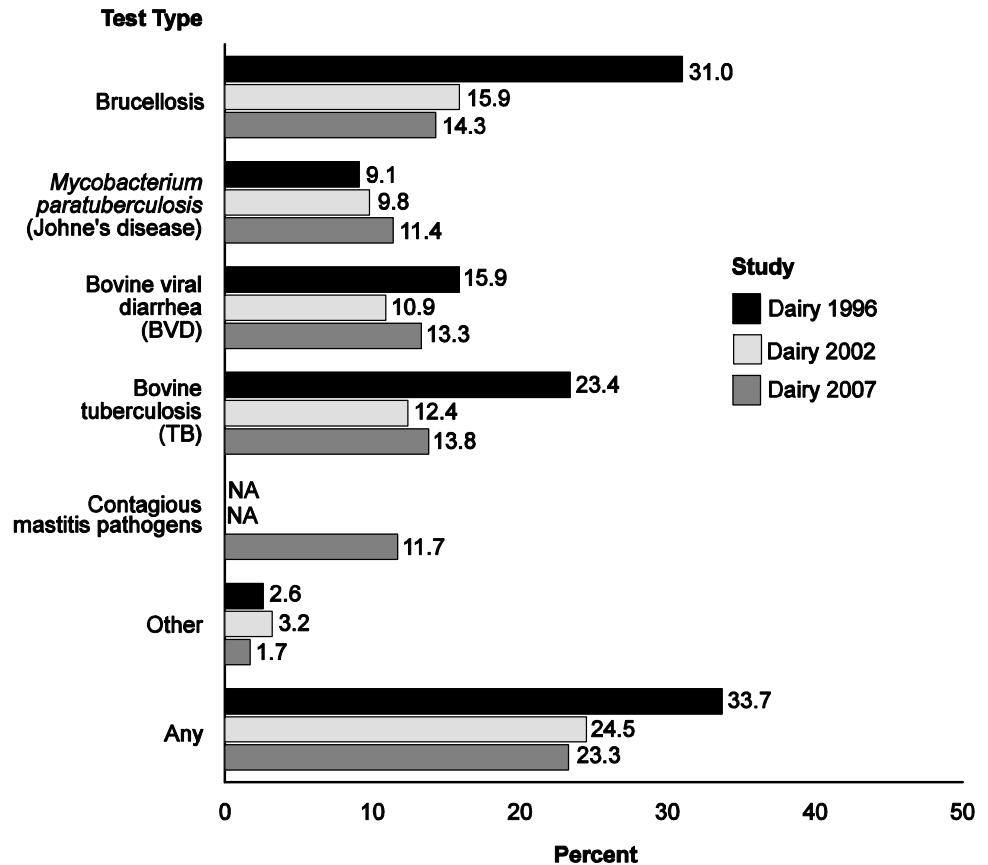
## 6. Testing requirements

Brucellosis testing for new additions decreased across herd sizes between 1996 and 2007. Tuberculosis testing has also decreased for small, large, and all operations since 1996. Testing for *Mycobacterium avium* subspecies *paratuberculosis* and BVD remained unchanged from 1996 to 2007. The percentage of operations that performed any testing decreased for small, large, and all operations since 1996, with less than 1 in 4 operations that purchased new additions (23.3 percent) performing any testing during 2007.

a. For operations that brought any dairy cattle onto the operation, percentage of operations that tested individual animals brought onto the operation, by testing normally required and by herd size:

Percent Operations												
Test Type	Herd Size (Number Dairy Cows)											
	Small (Fewer than 100)			Medium (100-499)			Large (500 or More)			All Operations		
	Dairy 1996	Dairy 2002	Dairy 2007	Dairy 1996	Dairy 2002	Dairy 2007	Dairy 1996	Dairy 2002	Dairy 2007	Dairy 1996	Dairy 2002	Dairy 2007
Brucellosis	28.5 (2.1)	13.1 (1.8)	11.6 (1.9)	38.3 (2.9)	19.5 (2.1)	19.8 (2.8)	50.6 (4.4)	29.9 (2.7)	19.0 (3.0)	31.0 (1.7)	15.9 (1.3)	14.3 (1.5)
<i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> (Johne's disease)	8.5 (1.3)	8.3 (1.4)	9.9 (1.8)	11.0 (2.3)	12.7 (1.9)	16.6 (2.7)	9.6 (2.9)	12.2 (1.9)	7.2 (1.8)	9.1 (1.1)	9.8 (1.1)	11.4 (1.4)
Bovine viral diarrhea (BVD)	15.1 (1.6)	8.6 (1.4)	10.7 (1.8)	18.4 (2.5)	15.6 (2.1)	19.4 (2.8)	19.4 (3.9)	15.0 (2.1)	15.8 (2.7)	15.9 (1.3)	10.9 (1.1)	13.3 (1.4)
Bovine tuberculosis (TB)	22.3 (1.9)	10.8 (1.5)	12.0 (1.8)	26.8 (2.7)	14.3 (1.7)	17.8 (2.7)	31.4 (4.2)	20.7 (2.3)	15.8 (2.3)	23.4 (1.6)	12.4 (1.1)	13.8 (1.4)
Contagious mastitis pathogens	NA	NA	10.5 (1.8)	NA	NA	13.1 (2.3)	NA	NA	16.3 (3.3)	NA	NA	11.7 (1.4)
Other	2.3 (0.5)	2.8 (0.8)	1.6 (0.6)	3.6 (1.4)	4.3 (1.3)	2.2 (1.0)	3.9 (2.1)	3.5 (1.1)	0.4 (0.2)	2.6 (0.5)	3.2 (0.6)	1.7 (0.5)
Any	31.3 (2.1)	21.2 (2.2)	20.2 (2.4)	40.0 (2.9)	29.4 (2.5)	28.2 (3.2)	54.3 (4.5)	38.8 (2.9)	34.7 (3.8)	33.7 (1.8)	24.5 (1.6)	23.3 (1.8)

**For Operations that Brought any Dairy Cattle Onto the Operation, Percentage of Operations that Tested Individual Animals Brought Onto the Operation, by Testing Normally Required**



A higher percentage of operations in 2007 (13.0 percent) required a bulk-tank milk culture before bringing animals onto the operation than did operations in 1996 (5.8 percent). While the percentage of all operations that required proof of bulk-tank somatic cell count was unchanged from 1996 to 2007, the percentage of large operations that required a count decreased from 45.7 percent in 1996 to 19.8 percent in 2007.

b. For operations that brought any dairy cows onto the farm, percentage of operations that normally required testing or proof of udder health before bringing animals onto the farm, by herd size:

<b>Percent Operations</b>												
<b>Type of Proof</b>	<b>Herd Size (Number Dairy Cows)</b>											
	<b>Small</b>			<b>Medium</b>			<b>Large</b>			<b>All Operations</b>		
	<b>(Fewer than 100)</b>			<b>(100-499)</b>			<b>(500 or More)</b>					
	<b>1996</b>	<b>2002</b>	<b>2007</b>	<b>1996</b>	<b>2002</b>	<b>2007</b>	<b>1996</b>	<b>2002</b>	<b>2007</b>	<b>1996</b>	<b>2002</b>	<b>2007</b>
Individual-cow milk somatic cell count	24.7 (2.7)	26.7 (3.7)	NA	30.1 (4.1)	26.7 (4.0)	NA	27.9 (8.7)	29.5 (5.2)	NA	25.7 (2.3)	26.8 (2.8)	NA
Bulk-tank milk somatic cell count	13.4 (2.0)	14.3 (2.9)	18.8 (2.4)	21.3 (3.1)	19.2 (3.4)	24.4 (3.1)	45.7 (9.0)	34.1 (5.9)	19.8 (2.9)	15.3 (1.7)	16.6 (2.2)	20.3 (1.8)
Individual-cow milk culture	9.1 (1.7)	10.7 (2.5)	NA	8.4 (1.8)	10.6 (2.6)	NA	9.4 (4.1)	18.8 (4.8)	NA	9.0 (1.4)	11.0 (1.8)	NA
Bulk-tank milk culture	3.9 (0.9)	9.5 (2.4)	10.1 (1.7)	11.8 (2.4)	10.0 (2.6)	17.8 (2.8)	35.7 (8.4)	31.0 (6.0)	20.9 (2.9)	5.8 (0.9)	10.6 (1.8)	13.0 (1.4)



## Appendix I: Methodology Overview

NAHMS Dairy Studies				
	1991	1996	2002	2007
Data collection dates	4/1991-7/1992	1/1-1/26 1996	12/31/2001-2/12/2002	1/1-1/31 2007
Minimum number of dairy cattle	30	1	1	1
Number of States	28	20	21	17
Data collectors	National Agricultural Statistics Service enumerators			
States as a percentage of U.S. population coverage				
Operations	76.3	80.4	83.0	79.5
Cows	81.3	83.1	85.7	82.5
Respondent Sample profile (herd size)				
Small (fewer than 100 cows)	931	1,480	1,131	1,028
Medium (100-499 cows)	705	873	820	691
Large (500 or more cows)	175	189	510	475
Response category				
Survey complete	1,811	2,542	2,461	2,194
Percent of total	54.1	56.3	63.5	61.7
No milk cows	NA	646	227	214
Out of business/ no milk sold in 1995		179	183	111
Out of scope		16	45	6
Refused		969	821	785
Did not contact		NA	2	126
Inaccessible		164	137	118
Total	3346	4,516	3,876	3,554

## Appendix II: Study Objectives and Related Outputs

1. Describe trends in dairy cattle health and management practices
  - **Part II: Changes in the U.S. Dairy Cattle Industry 1991-2007, February 2008**
  - Part V: Changes in Dairy Cattle Health and Management in the United States, 1991-2007, expected summer 2008
2. Evaluate management factors related to cow comfort and removal rates
  - Dairy Facilities and Cow Comfort on U.S Dairy Operations, 2007 interpretive report, expected spring 2008
  - Info sheets, expected spring 2008
3. Describe dairy calf health and nutrition from birth to weaning and evaluate heifer disease prevention practices
  - Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, October 2007
  - Off-Site Heifer Raising info sheet, November 2007
  - Colostrum Management info sheet, February 2008
  - Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, expected spring 2008
  - Calf Health and Management Practices on U.S. Dairy Operations, 2007 interpretive report, expected spring 2008
  - Additional info sheets, expected spring 2008
4. Estimate the prevalence of herds infected with bovine viral diarrhea virus (BVD)
  - Info sheets, expected spring 2008.
5. Describe current milking procedures and estimate the prevalence of contagious mastitis pathogens
  - Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, expected spring 2008.
  - Info sheets, expected spring 2008.
6. Estimate the herd-level prevalence and associated costs of *Mycobacterium avium* subspecies *paratuberculosis*
  - Info sheets, expected spring 2008.
7. Describe current biosecurity practices and determine producer motivation for implementing or not implementing biosecurity practices
  - Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, October 2007
  - Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, expected spring 2008







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September 2008



# Dairy 2007

## Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007



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## Introduction

The National Animal Health Monitoring System (NAHMS) is a nonregulatory program of the U.S. Department of Agriculture's (USDA) Animal and Plant Health Inspection Service. NAHMS is designed to help meet the Nation's animal-health information needs and has collected data on dairy health and management practices through three previous studies.

The NAHMS 1991-92 National Dairy Heifer Evaluation Project (NDHEP) provided the dairy industry's first national baseline information on the health and management of dairy cattle in the United States. Just months after the study's first results were released in 1993, cases of acute bovine viral diarrhea (BVD) surfaced in the United States following a 1993 outbreak in Canada. NDHEP information on producer vaccination and biosecurity practices helped officials address the risk of disease spread and target educational efforts on vaccination protocols. An outbreak of human illness was reported in 1993 in the Pacific Northwest, this time related to *Escherichia coli* 0157:H7. NDHEP data on the bacteria's prevalence in dairy cattle helped officials define public risks as well as research needs. This baseline picture of the industry also helped identify additional research and educational efforts in various production areas, such as feed management and weaning age.

Information from the NAHMS Dairy 1996 study helped the U.S. dairy industry identify educational needs and prioritize research efforts on such timely topics as antibiotic usage and Johne's disease, as well as digital dermatitis, bovine leukosis virus, and potential foodborne pathogens, including *E. coli*, *Salmonella*, and *Campylobacter*.

A major focus of the Dairy 2002 study was to describe management strategies that prevent and reduce Johne's disease and to determine management factors associated with *Mycoplasma* and *Listeria* in bulk-tank milk. Additionally, levels of participation in quality assurance programs, the incidence of digital dermatitis, a profile of animal-waste handling systems used on U.S. dairy operations, and industry changes since the NDHEP in 1991 and Dairy 1996 were examined.

The Dairy 2007 study was conducted in 17 of the Nation's major dairy States (see map on next page) and provides participants, stakeholders, and the industry as a whole with valuable information representing 79.5 percent of U.S. dairy operations and 82.5 percent of U.S. dairy cows.

Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007 (October 2007) was the first in a series of reports containing national information from the NAHMS Dairy 2007 study. This report contains information collected from 2,194 dairy operations.

Part II: Changes in the United States Dairy Industry, 1991-2007 (March 2008) provides national estimates of animal health management practices for comparable populations from the NAHMS 1991 NDHEP, Dairy 1996, Dairy 2002, and Dairy 2007.

Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007 is the third in a series of reports containing national information from the NAHMS Dairy 2007 study. Data from this report were collected from 582 operations with 30 or more dairy cows. State and Federal veterinary medical officers (VMOs) and animal health technicians (AHTs) collected the data between February 26 and August 3, 2007.

All Dairy 2007 study reports as well as reports from previous NAHMS dairy studies are available online at <http://nahms.aphis.usda.gov>.

#### Dairy 2007 Participating States and Number of Respondents by State



## Terms Used In This Report

**Antibiotics:** Substances produced by microorganisms that kill or inhibit the growth of other microorganisms. For the purpose of this report, antibiotics are synonymous with antimicrobials.

**Antimicrobial:** Any substance that kills or inhibits the growth of microorganisms.

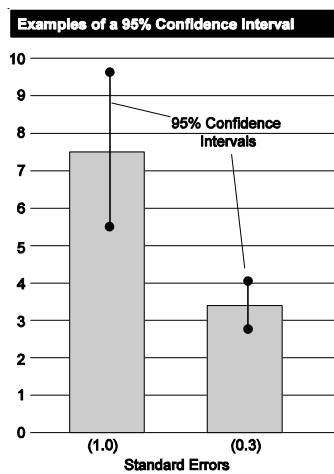
**Cow:** Female dairy bovine that has calved at least once.

**Heifer:** Female dairy bovine that has not yet calved.

**Herd size:** Herd size is based on January 1, 2007, dairy cow inventory. Small herds are those with fewer than 100 head; medium herds are those with 100 to 499 head; and large herds are those with 500 or more head.

**Operation:** Premises with at least 30 dairy cows on January 1, 2007.

**Operation average:** The average value for all operations. A single value for each operation is summed over all operations reporting divided by the number of operations reporting. For example, the operation average number of employees (see table 4b on p 11) is calculated by dividing the total number of employees by the total number of operations.



**Population estimates:** Estimates in this report are provided with a measure of precision called the standard error. A 95-percent confidence interval can be created with bounds equal to the estimate, plus or minus two standard errors. If the only error is sampling error, the confidence intervals created in this manner will contain the true population mean 95 out of 100 times. In the example to the left, an estimate of 7.5 with a standard error of 1.0 results in limits of 5.5 to 9.5 (two times the standard error above and below the estimate). The second estimate of 3.4 shows a standard error of 0.3 and results in limits of 2.8 and 4.0. Alternatively, the 90-percent confidence interval would be created by multiplying the standard error by 1.65 instead of 2. Most estimates in this report are rounded to the nearest tenth. If rounded to 0, the standard error was reported (0.0). If there were no reports of the event, no standard error was reported (—).

### Regions:

**West:** California, Idaho, New Mexico, Texas, and Washington

**East:** Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Vermont, Virginia, and Wisconsin

**Sample profile:** Information that describes characteristics of the operations from which Dairy 2007 data were collected.

**Usual calving area:** An area separate from housing for lactating cows designated specifically for calving.

## Section I: Population Estimates

### A. Disease Familiarity and Biosecurity Practices

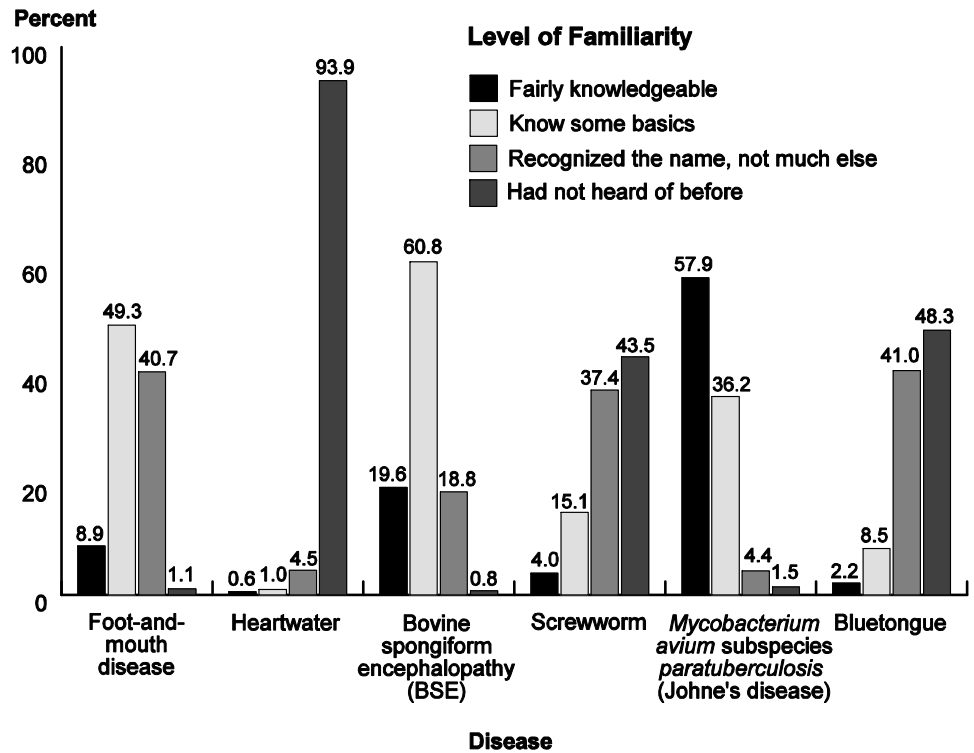
#### 1. Producer familiarity with disease

Almost half of producers (49.3 percent) knew some basics about foot-and-mouth disease, while an additional 8.9 percent were fairly knowledgeable about the disease. More than 8 of 10 producers (80.4 percent) knew some basics or were fairly knowledgeable about bovine spongiform encephalopathy (BSE). Almost 60 percent of producers (57.9 percent) were fairly knowledgeable about Johne's disease, while an additional 36.2 percent knew some basics about the disease. Additionally, more than 50 percent of producers at least knew some basics about *Mycobacterium mastitis*, bovine viral diarrhea (BVD), and *Leptospira hardjo bovis*. Almost all producers (93.9 percent) had not heard of heartwater, which is a ruminant disease not present in the United States. More than 8 of 10 producers (80.9 percent) either only recognized the name screwworm or had not heard of it before. The United States has been free of screwworm since 1966.

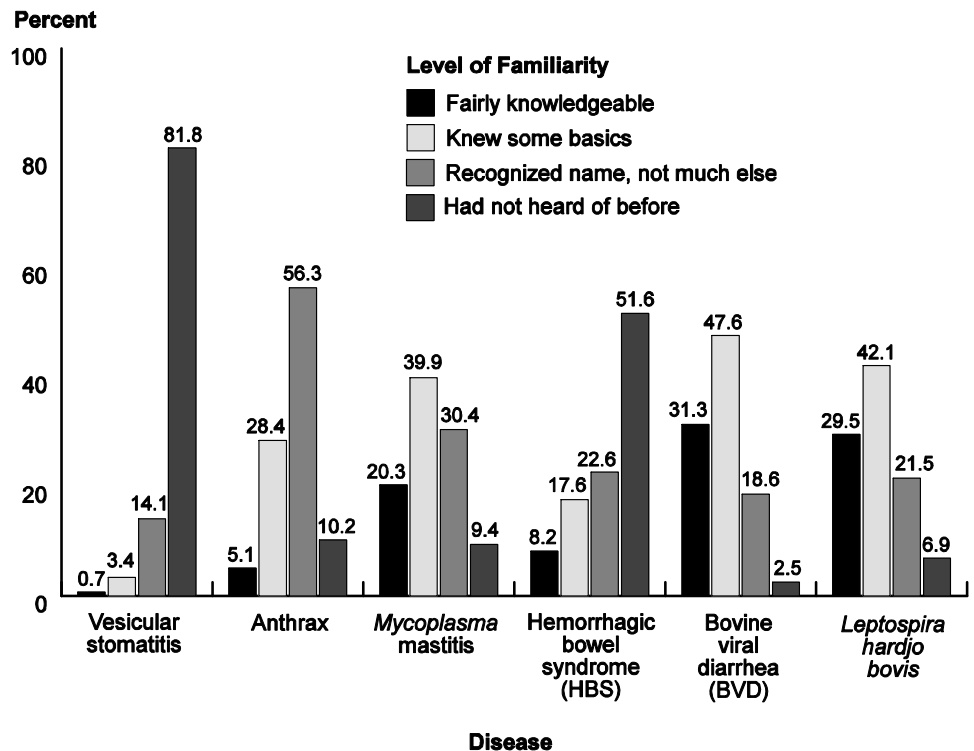
a. Percentage of operations by level of familiarity with specific cattle diseases:

	Percent Operations								Total
	Level of Familiarity								
	Fairly Knowledgeable		Knew Some Basics		Recognized Name, Not Much Else		Had Not Heard of Before		
Disease	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	
Foot-and-mouth disease	8.9	(1.2)	49.3	(2.9)	40.7	(2.9)	1.1	(0.7)	100.0
Heartwater	0.6	(0.3)	1.0	(0.4)	4.5	(1.0)	93.9	(1.1)	100.0
Bovine spongiform encephalopathy (BSE)	19.6	(2.0)	60.8	(2.7)	18.8	(2.2)	0.8	(0.6)	100.0
Screwworm	4.0	(0.8)	15.1	(1.9)	37.4	(2.6)	43.5	(2.7)	100.0
<i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> (Johne's disease)	57.9	(2.9)	36.2	(2.8)	4.4	(1.2)	1.5	(0.6)	100.0
Bluetongue	2.2	(0.9)	8.5	(1.2)	41.0	(2.8)	48.3	(2.8)	100.0
Vesicular stomatitis	0.7	(0.3)	3.4	(0.8)	14.1	(1.7)	81.8	(1.9)	100.0
Anthrax	5.1	(1.2)	28.4	(2.6)	56.3	(2.8)	10.2	(1.8)	100.0
<i>Mycoplasma</i> mastitis	20.3	(1.8)	39.9	(2.8)	30.4	(2.8)	9.4	(1.8)	100.0
Hemorrhagic bowel syndrome (HBS)	8.2	(1.1)	17.6	(1.9)	22.6	(2.3)	51.6	(2.7)	100.0
Bovine viral diarrhea (BVD)	31.3	(2.5)	47.6	(2.9)	18.6	(2.4)	2.5	(1.1)	100.0
<i>Leptospira hardjo bovis</i>	29.5	(2.4)	42.1	(2.9)	21.5	(2.4)	6.9	(1.5)	100.0

**Percentage of Operations by Level of Familiarity with Specific Cattle Diseases**



**Percentage of Operations by Level of Familiarity with Specific Cattle Diseases**



When producers that were fairly knowledgeable or knew some basics about each disease were combined and evaluated by region, differences in familiarity were observed for screwworm, bluetongue, vesicular stomatitis, and *Mycoplasma*. Producers in the West region were more familiar with the above diseases than producers in the East region. A higher percentage of producers in the West region (17.9 percent) at least knew some basics about vesicular stomatitis than operations in the East region (2.7 percent). Almost 9 of 10 producers in the West region (90.2 percent) at least knew some basics about *Mycoplasma* mastitis compared with producers in the East region (57.3 percent).

b. Percentage of operations that were fairly knowledgeable or knew some basics about specific cattle diseases:

	Percent Operations					
	Region					
	West		East		All Operations	
Disease	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
Foot-and-mouth disease	71.0	(4.7)	57.0	(3.1)	58.2	(2.8)
Heartwater	4.7	(2.1)	1.3	(0.6)	1.6	(0.5)
Bovine spongiform encephalopathy (BSE)	82.6	(4.1)	80.1	(2.5)	80.4	(2.3)
Screwworm	34.5	(5.5)	17.6	(2.2)	19.1	(2.0)
<i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> (Johne's disease)	85.9	(3.9)	94.9	(1.4)	94.1	(1.3)
Bluetongue	25.2	(4.5)	9.3	(1.5)	10.7	(1.4)
Vesicular stomatitis	17.9	(4.0)	2.7	(0.8)	4.1	(0.8)
Anthrax	41.7	(5.9)	32.7	(2.9)	33.5	(2.7)
<i>Mycoplasma</i> mastitis	90.2	(3.8)	57.3	(3.1)	60.2	(2.9)
Hemorrhagic bowel syndrome (HBS)	38.5	(5.4)	24.5	(2.2)	25.8	(2.1)
Bovine viral diarrhea (BVD)	85.7	(4.5)	78.2	(2.7)	78.9	(2.5)
<i>Leptospira hardjo bovis</i>	77.8	(5.1)	71.0	(2.9)	71.6	(2.7)



## 2. Information sources in case of a foreign animal disease outbreak

Almost all operations (93.6 percent) would very likely use a private veterinarian for information regarding a foreign animal disease outbreak in the United States. Approximately 4 of 10 operations would very likely seek information from other dairy producers or magazines (41.4 and 39.0 percent, respectively). The Internet was not a likely source of information for 48.1 percent of operations.

Percentage of operations by likelihood of using the following information sources if an outbreak of foreign animal disease occurred in the United States (e.g., foot-and-mouth disease):

Percent Operations							
Information Source	Likelihood						Total
	Very Likely		Somewhat Likely		Not Likely		
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	
Other dairy producers	41.4	(2.8)	37.8	(2.7)	20.8	(2.3)	100.0
Private veterinarian	93.6	(1.3)	5.4	(1.3)	1.0	(0.5)	100.0
Extension agent	32.5	(2.7)	38.9	(2.9)	28.6	(2.5)	100.0
Dairy organization or cooperative	30.7	(2.6)	42.3	(2.8)	27.0	(2.6)	100.0
Magazines	39.0	(2.8)	49.4	(2.8)	11.6	(1.5)	100.0
Internet	23.1	(2.2)	28.8	(2.6)	48.1	(2.8)	100.0
State Veterinarian's office	26.7	(2.4)	37.4	(2.8)	35.9	(2.9)	100.0
USDA	22.6	(2.4)	42.5	(2.8)	34.9	(2.7)	100.0
Television/ newspapers	25.8	(2.5)	38.8	(2.8)	35.4	(2.6)	100.0
Other	4.7	(1.2)	2.4	(1.0)	92.9	(1.6)	100.0

### 3. Resource contacts

If a foreign animal disease was introduced into the United States, infected animals would need to be identified and diagnosed quickly to stop the spread of disease. Most operations (98.6 percent) would contact a private veterinarian if an animal on the operation was suspected of having a foreign animal disease.

a. Percentage of operations that would contact the following resources if an animal on the operation was suspected of having foot-and-mouth disease or another foreign animal disease:

Resource	Percent Operations	Standard Error
Extension agent/university	20.8	(2.3)
State Veterinarian's office	35.7	(2.6)
USDA	21.8	(2.3)
Private veterinarian	98.6	(0.5)
Feed company or milk cooperative representative	25.7	(2.3)
Other	4.1	(1.3)



Photo courtesy of Chuck Greiner, Agricultural Research Service

Decreased milk production, cows with fever, deaths, and/or abortions could indicate that a new disease has been introduced into the herd. On average, an operation would have to have a 20.6 percent decrease in milk production before a veterinarian would be contacted for assistance or consultation. Large operations had a lower threshold (12.9 percent reduction) compared with small operations (22.3 percent reduction). Operations reported that a veterinarian would be contacted if 9.6 percent of cows exhibited a fever, 5.8 percent of cows died within a short period, or 6.8 percent of cows aborted.

b. Operation average percentage change at which a veterinarian would be contacted for assistance, by potential problem sign and by herd size:

<b>Operation Average Percent Change</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Potential Problem Sign</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Decline in total daily milk production	22.3	(1.2)	18.0	(1.1)	12.9	(1.2)	20.6	(0.9)
Milk cows exhibiting fever within a short time period	10.7	(1.2)	7.3	(0.9)	6.0	(1.8)	9.6	(0.9)
Milk cows dying within a short time period	6.8	(1.1)	3.2	(0.7)	4.2	(1.9)	5.8	(0.8)
Milk cows aborting within a short time period	8.1	(1.1)	3.9	(0.7)	4.6	(1.8)	6.8	(0.8)

Operations in the West region would seek veterinary assistance if daily milk production declined by 14.1 percent, while operations in the East region would do so at a 21.3 percent decline. For the other three potential problem signs, there were no regional differences in the average percentage change at which operations would seek assistance from a veterinarian.

c. Operation average percentage change at which a veterinarian would be contacted for assistance, by potential problem sign and by region:

Operation Average Percent Change				
Potential Problem Sign	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Decline in total daily milk production	14.1	(1.1)	21.3	(1.0)
Milk cows exhibiting fever within a short time period	5.7	(1.3)	10.0	(0.9)
Milk cows dying within a short time period	3.8	(1.3)	5.9	(0.9)
Milk cows aborting within a short time period	4.5	(1.3)	7.0	(0.9)

#### 4. Employees and visitors

Not surprisingly, a lower percentage of small operations (65.6 percent) had employees compared with medium and large operations (95.0 and 98.0 percent, respectively).

a. Percentage of operations that had employees\* during the previous 12 months, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
65.6	(4.1)	95.0	(2.0)	98.0	(1.9)	75.7	(2.8)

\*Excludes owners and family members.

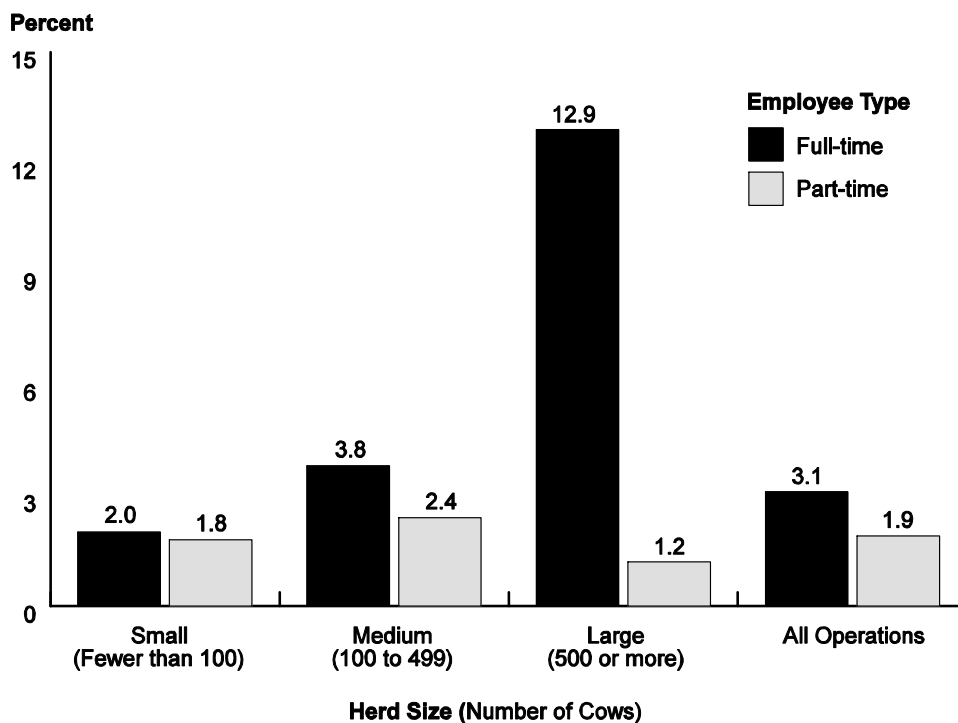
The number of full-time employees increased as herd size increased. Small operations averaged 2.0 full-time employees, compared with 3.8 and 12.9 full-time employees on medium and large operations, respectively. Medium operations employed more part-time people on average than large operations (2.4 and 1.2, respectively).

b. Operation average number of employees, by employee type and by herd size:

Operation Average Number Employees*								
Herd Size (Number of Cows)								
Employee Type	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error
Full-time	2.0	(0.1)	3.8	(0.1)	12.9	(0.8)	3.1	(0.1)
Part-time	1.8	(0.1)	2.4	(0.2)	1.2	(0.2)	1.9	(0.1)

\*Paid and unpaid, including owners and family members assigned work duties directly related to the dairy's operation.

**Operation Average Number of Employees\*, by Employee Type and by Herd Size**



\*Paid and unpaid, including owners and family members assigned work duties directly related to the dairy's operation.

Operations in the West region averaged more full-time employees (7.8) compared with operations in the East region (2.7). Operations in the East region averaged more part-time employees. These differences were likely related to the larger herd sizes in the West region.

c. Operation average number of employees, by employee type and by region:

Operation Average Number Employees*				
Employee Type	Region			
	West		East	
	Average	Std. Error	Average	Std. Error
Full-time	7.8	(0.7)	2.7	(0.1)
Part-time	1.0	(0.1)	2.0	(0.1)

\*Paid and unpaid, including owners and family members assigned work duties directly related to the dairy's operation.

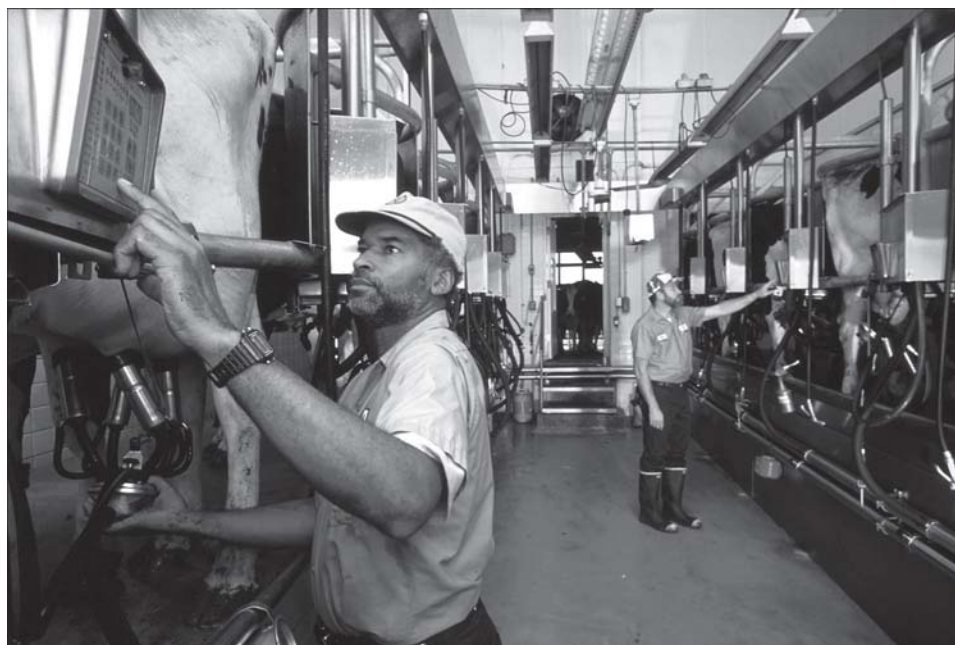


Photo courtesy of Keith Weller, Agricultural Research Service

Implementing biosecurity practices reduces the introduction of disease.

Employees and visitors are potential sources of disease, and operations should have restrictions and guidelines—for both employees and visitors—designed to limit the introduction of disease.

A higher percentage of large operations (47.3 percent) trained employees in performing biosecurity practices compared with small and medium operations (17.8 and 23.7 percent, respectively). Other than employee training, less than 20 percent of all operations implemented the other biosecurity practices listed.

d. For operations with employees, percentage of operations by biosecurity practices used and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Biosecurity Practice</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Restrictions on employee livestock ownership outside this operation	17.4	(3.7)	18.6	(3.5)	20.1	(4.7)	18.1	(2.5)
Guidelines regarding foreign travel by employees	9.7	(2.7)	16.0	(3.6)	14.7	(3.7)	12.0	(2.0)
Written standard operating procedures (other than milking procedures)	10.9	(2.7)	13.2	(2.9)	23.0	(4.8)	12.2	(2.0)
Training for employees in performing biosecurity practices	17.8	(3.4)	23.7	(3.6)	47.3	(6.2)	21.9	(2.5)

Nearly all operations, regardless of herd size, allowed visitors in the animal area.

e. Percentage of operations in which visitors were allowed in the animal area:

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<b>Percent Operations</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
98.6	(0.8)	95.9	(1.8)	97.9	(1.6)	97.9	(0.7)

---

About one of three operations (30.4 percent) had guidelines regarding which visitors were allowed in animal areas, and 51.3 percent of operations had restrictions on vehicles entering animal areas. A lower percentage of small operations (22.7 percent) provided disposable or clean boots for visitors entering animal areas compared with medium operations (42.1 percent).

f. For operations that allowed visitors in the animal area, percentage of operations by biosecurity practices used and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Biosecurity Practice	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Guidelines regarding which visitors are allowed in animal areas	28.0	(3.4)	35.2	(4.3)	39.9	(5.9)	30.4	(2.6)
Footbaths for visitors entering animal areas	6.3	(1.7)	7.2	(1.9)	12.1	(3.5)	6.9	(1.3)
Disposable or clean boots for visitors entering animal areas	22.7	(3.3)	42.1	(4.2)	36.3	(5.5)	28.3	(2.6)
Restrictions on vehicles entering animal areas	51.0	(3.8)	54.5	(4.1)	41.9	(6.1)	51.3	(2.9)



Employees, veterinarians, nutritionists, and milk and cattle haulers routinely come onto dairy operations. Employees and visitors, who may or may not have contact with cattle on the operation, are potential sources of disease introduction. As expected, the number of visits per week increased as herd size increased; 72.2 percent of large operations had 29 or more visits per week compared with 47.6 and 20.0 percent of medium and small operations, respectively.

g. Percentage of operations by number of visits\* to the operation per week and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Number of Visits (Per Week)</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
1 to 7	35.6	(3.7)	13.7	(3.0)	1.2	(0.7)	28.0	(2.7)
8 to 14	28.4	(3.6)	16.5	(3.3)	0.8	(0.5)	23.6	(2.6)
15 to 21	9.0	(2.0)	12.5	(2.8)	13.7	(4.8)	10.2	(1.6)
22 to 28	7.0	(1.7)	9.7	(2.6)	12.1	(4.0)	8.0	(1.4)
29 or more	20.0	(3.1)	47.6	(4.1)	72.2	(5.3)	30.2	(2.4)
Total	100.0		100.0		100.0		100.0	

\*Includes employees, veterinarians, neighbors, nutritionists, milk haulers, etc.

Of operations that had visits, more than 9 of 10 (93.6 percent) had visits that involved contact with animals on the operation.

h. For operations that had visits, percentage of operations in which visits involved contact with animals on the operation:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Percent	Std. Error	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
91.3	(1.9)	98.5	(0.7)	100.0	(0.0)	93.6	(1.3)

For operations in which any visits to the operation involved contact with animals on the operation, about half of operations (54.2 percent) reported one to seven visits per week that involved contact with animals on the operation. About 1 of 6 operations (17.1 percent) had 29 or more visits that resulted in contact with animals. The number of visits that involved animal contact increased as herd size increased.

i. For operations in which any visits to the operation involved contact with animals on the operation, percentage of operations by number of visits per week that involved animal contact, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Number of Visits (Per Week)</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
1 to 7	67.1	(3.8)	31.4	(3.9)	10.3	(3.7)	54.2	(2.8)
8 to 14	7.9	(2.0)	13.3	(2.9)	10.9	(3.8)	9.5	(1.6)
15 to 21	11.5	(2.6)	13.8	(3.2)	7.9	(3.4)	11.8	(1.9)
22 to 28	6.5	(2.0)	9.9	(2.3)	6.2	(3.1)	7.4	(1.5)
29 or more	7.0	(1.9)	31.6	(3.7)	64.7	(5.4)	17.1	(1.7)
Total	100.0		100.0		100.0		100.0	

**For Operations in Which Any Visits to the Operation Involved Contact with Animals on the Operation, Percentage of Operations by Number of Visits Per Week that Involved Animal Contact, and by Herd Size**

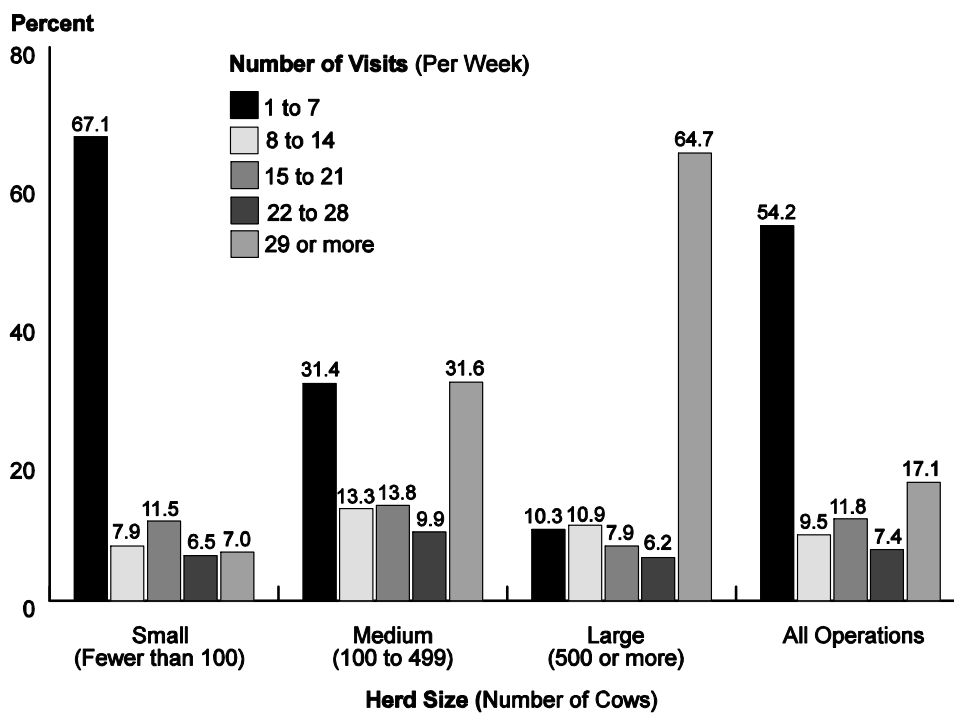




Photo courtesy of Keith Weller, Agricultural Research Service

### 5. Specific animal exclusion practices

In order to effectively exclude specific diseases from an operation, all potential disease sources should be considered. Many diseases are initially introduced into a herd through the purchase of an infected animal. Knowing the source of purchased cattle may provide the buyer the opportunity to inquire directly about any diseases on the source operation or any testing that may have been done. About 6 of 10 operations (64.2 percent) did not introduce cattle into their herds during the previous 12 months. Only 2.6 percent of operations did not know the source of any new cattle, while 24.2 percent knew the source of all cattle introduced. The percentage of operations that had no incoming cattle decreased as herd size increased.

a. Percentage of operations in which the producer was aware of the source and geographic origin of all, some, or none of the incoming cattle during the previous 12 months, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Knew the Source and Geographic Origin of . . .</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
All	22.0	(3.3)	28.0	(3.8)	32.0	(5.2)	24.2	(2.4)
Some	8.6	(2.3)	7.8	(2.3)	19.1	(3.7)	9.0	(1.7)
None	2.0	(1.2)	3.6	(1.6)	5.4	(2.9)	2.6	(0.9)
No incoming cattle*	67.4	(3.7)	60.6	(4.2)	43.5	(5.7)	64.2	(2.8)
Total	100.0		100.0		100.0		100.0	

\*If the operation sent heifers off-site but cattle were not commingled with cattle from other operations, these operations were considered to have had no incoming cattle.

There were no regional differences in the percentage of operations by producer knowledge of the source and geographic origin of incoming cattle.

b. Percentage of operations in which the producer was aware of the source and geographic origin of all, some, or none of the incoming cattle during the previous 12 months, by region:

	Percent Operations			
	Region			
	West		East	
<b>Knew the Source and Geographic Origin of . . .</b>	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
All incoming cattle	16.5	(3.6)	24.9	(2.7)
Some incoming cattle	10.9	(3.0)	8.9	(1.9)
None	7.3	(2.8)	2.1	(1.0)
No incoming cattle*	65.3	(4.7)	64.1	(3.0)
Total	100.0		100.0	

\*If the operation sent heifers off-site but cattle were not commingled with cattle from other operations, these operations were considered to have had no incoming cattle.

The majority of operations used insect and rodent control practices, and maintained a closed herd. There were no differences across herd sizes in the percentages of operations that implemented specific biosecurity practices.

c. Percentage of operations that used the following biosecurity practices to prevent disease during the previous 12 months, by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Biosecurity Practice</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Insect control	86.5	(2.7)	88.3	(2.7)	93.6	(3.0)	87.4	(2.0)
Rodent control	95.7	(1.4)	91.8	(2.0)	90.3	(3.4)	94.4	(1.1)
Bird control	29.4	(3.6)	44.3	(4.2)	41.4	(5.6)	33.8	(2.7)
Limit cattle contact with other livestock, elk, and deer	44.8	(3.8)	55.7	(4.2)	59.6	(5.6)	48.5	(2.8)
Control access to cattle feed by other livestock and wildlife	52.0	(3.9)	46.8	(4.2)	40.1	(5.4)	49.9	(2.9)
Closed herd*	60.1	(3.9)	49.5	(4.2)	40.6	(5.6)	56.2	(2.9)

\*All replacements are from the operation; no contact with cattle from other operations.

## 6. Equipment handling for manure and feeding

Manure is a source of bacteria that can cause disease in animals if feedstuffs are contaminated. It is generally recommended that equipment used for manure handling not be used for handling feed. If the equipment is used to handle manure, it should be cleaned and disinfected before handling feed.

Approximately the same percentages of operations (one-third) routinely, rarely, or never used the same equipment for manure and feed, and no differences were observed across herd sizes.

a. Percentage of operations by frequency that the same equipment was used to handle manure and feed cattle during the previous 12 months, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Frequency</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Routinely	34.1	(3.6)	29.8	(3.9)	20.3	(4.7)	32.2	(2.7)
Rarely	34.4	(3.6)	36.4	(4.0)	46.0	(5.6)	35.6	(2.7)
Never	31.5	(3.6)	33.8	(3.9)	33.7	(5.5)	32.2	(2.7)
Total	100.0		100.0		100.0		100.0	



For operations that used the same equipment to handle manure and feed cattle, the majority (61.0 percent) washed equipment with water or steam after handling manure and before handling feed. The majority of the approximately one of four operations (23.2 percent) that used “other” procedures reported using separate loader buckets.

b. For operations that used the same equipment to handle manure and feed cattle, percentage of operations by procedure that best describes what is usually done with equipment after handling manure:

Procedure	Percent Operations	Standard Error
Wash equipment with water or steam only	61.0	(3.4)
Chemically disinfect only	0.1	(0.1)
Wash equipment and chemically disinfect	4.6	(1.5)
Other	23.2	(3.1)
No procedures done	11.1	(2.3)
Total	100.0	

## 7. Equipment sharing with other livestock operations

Sharing equipment between operations can spread disease from one operation to another. Ideally, equipment should be disinfected before it is transported and used on another operation. A lower percentage of operations in the West region (13.6 percent) shared equipment compared with operations in the East region (38.4 percent).

a. Percentage of operations that shared any heavy equipment (tractors, feeding equipment, manure spreaders, trailers, etc.) with other livestock operations during the previous 12 months, by region:

Percent Operations					
West		East		All Operations	
Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
13.6	(3.5)	38.4	(3.0)	36.2	(2.8)

The majority of operations, regardless of herd size, had not shared any heavy equipment with other livestock operations during the previous 12 months. Overall, 63.8 percent of operations had not shared equipment. More than 12 percent of operations across all herd sizes shared equipment at least six times during the previous 12 months.

b. Percentage of operations by number of times heavy equipment was shared during the previous 12 months, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Number of Times</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
0	64.1	(3.7)	59.0	(4.1)	78.7	(4.3)	63.8	(2.8)
1 to 2	11.1	(2.6)	15.5	(3.1)	5.3	(2.3)	11.8	(2.0)
3 to 5	12.6	(2.5)	7.0	(2.4)	3.1	(1.1)	10.6	(1.8)
6 or more	12.2	(2.3)	18.5	(3.4)	12.9	(3.8)	13.8	(1.8)
Total	100.0		100.0		100.0		100.0	



Photo courtesy of Keith Weller, Agricultural Research Service

The majority of producers that shared equipment with other operations (63.0 percent) performed no cleaning procedures prior to using the equipment on their own operations, while 26.6 percent washed equipment with water or steam.

c. For operations that shared equipment with other livestock operations, percentage of operations by cleaning procedure usually performed on equipment shared with other operations prior to use on the operation:

Procedure	Percent Operations	Standard Error
Wash equipment with water or steam only	26.6	(3.9)
Chemically disinfect only	0.0	(--)
Wash equipment and chemically disinfect	0.5	(0.3)
Other	9.9	(3.2)
No procedures done	63.0	(4.6)
Total	100.0	

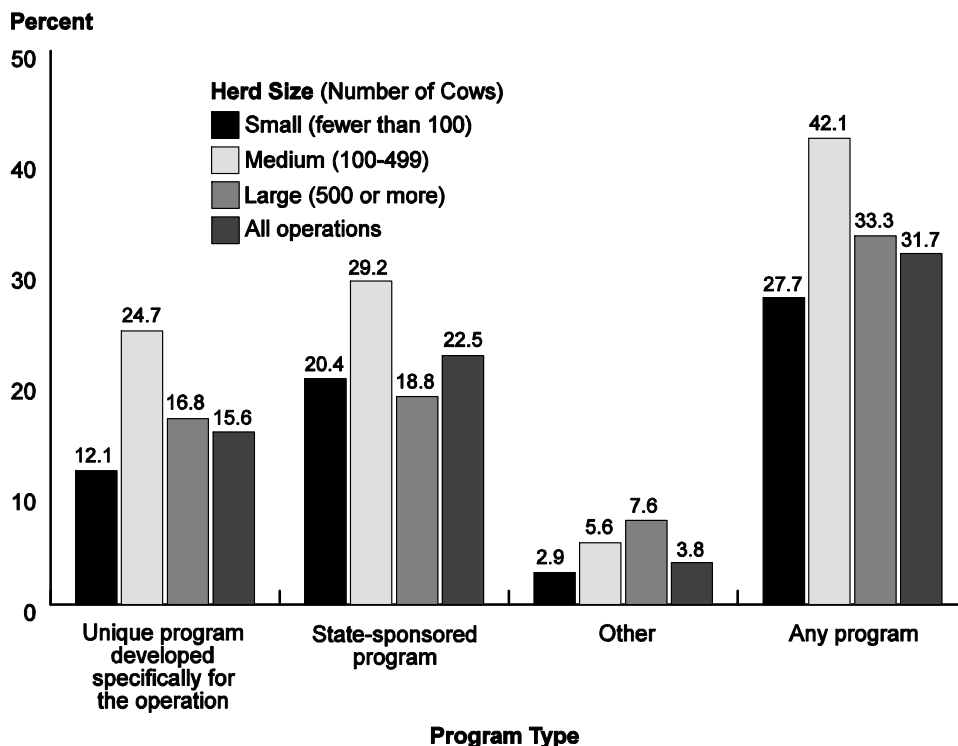
### 8. Johne's disease

Herd-level control programs on operations infected with *Mycobacterium avium* subspecies *paratuberculosis* (the causative agent of Johne's disease) are critical in controlling the disease. Almost one of three operations (31.7 percent) participated in some type of Johne's disease control program. A higher percentage of medium operations (24.7 percent) had a unique Johne's disease program developed specifically for the operation compared with small operations (12.1 percent). There were no differences across herd sizes in the percentage of operations that used the other program types.

a. Percentage of operations that participated in Johne's disease control or certification programs, by type of program and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Program Type	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Unique program developed specifically for the operation	12.1	(2.4)	24.7	(3.6)	16.8	(3.8)	15.6	(1.9)
State-sponsored program	20.4	(3.0)	29.2	(3.8)	18.8	(2.9)	22.5	(2.2)
Other	2.9	(1.1)	5.6	(2.0)	7.6	(2.8)	3.8	(0.9)
Any program	27.7	(3.3)	42.1	(4.1)	33.3	(4.5)	31.7	(2.5)

**Percentage of Operations that Participated in Johne's Disease Control or Certification Programs, by Type of Program and by Herd Size**



A higher percentage of operations in the East region (33.0 percent) participated in any Johne's disease control program compared with operations in the West region (18.3 percent).

b. Percentage of operations that participated in a Johne's disease control or certification program, by type of program and by region:

Program Type	Percent Operations			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Unique program developed specifically for this operation	11.0	(3.3)	16.0	(2.1)
State-sponsored program	8.0	(2.1)	23.9	(2.5)
Other	2.6	(1.6)	4.0	(1.0)
Any	18.3	(3.8)	33.0	(2.7)

A Johne's disease control program may include testing individual animals in order to identify those that are shedding *Mycobacterium avium* subspecies *paratuberculosis* and are, therefore, presenting a risk to noninfected animals on the operation. More than one-third of operations (35.3 percent) tested for Johne's disease. A higher percentage of medium operations tested for Johne's disease compared with small operations (47.6 and 30.7 percent, respectively).

c. Percentage of operations that tested for Johne's disease, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
30.7	(3.4)	47.6	(4.1)	37.5	(5.7)	35.3	(2.6)

## 9. Calving areas

Ideally, calving areas are clean, dry, quiet, and provide enough room for a cow to comfortably lie down and deliver a calf. The majority of operations (70.0 percent) used a multiple-animal calving area/pen. A lower percentage of small operations (65.6 percent) used a multiple-animal calving area compared with medium operations (79.8 percent). Approximately one-quarter of operations used an individual calving area that was either cleaned between each calving or cleaned after two or more calvings (25.5 and 26.2 percent, respectively). A higher percentage of small operations (30.6 percent) used an individual-animal pen that was cleaned between each calving compared with medium and large operations (14.6 and 13.5 percent, respectively).

a. Percentage of operations by area usually used for calving and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Calving Area								
Multiple animal area/pen	65.6	(3.5)	79.8	(3.5)	78.5	(4.3)	70.0	(2.6)
Individual animal area/pen cleaned between each calving	30.6	(3.4)	14.6	(3.3)	13.5	(3.9)	25.5	(2.5)
Individual animal area/pen cleaned after two or more calvings	25.4	(3.3)	27.4	(3.7)	30.3	(5.6)	26.2	(2.5)
Other	5.1	(1.7)	3.6	(1.4)	3.1	(1.7)	4.6	(1.2)

The percentage of operations with a usual calving area ranged from 62.5 percent of small operations to 98.2 percent of large operations.

b. Percentage of operations that had a usual calving area:

<b>Percent Operations</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
62.5	(3.8)	83.7	(3.3)	98.2	(1.2)	70.1	(2.7)

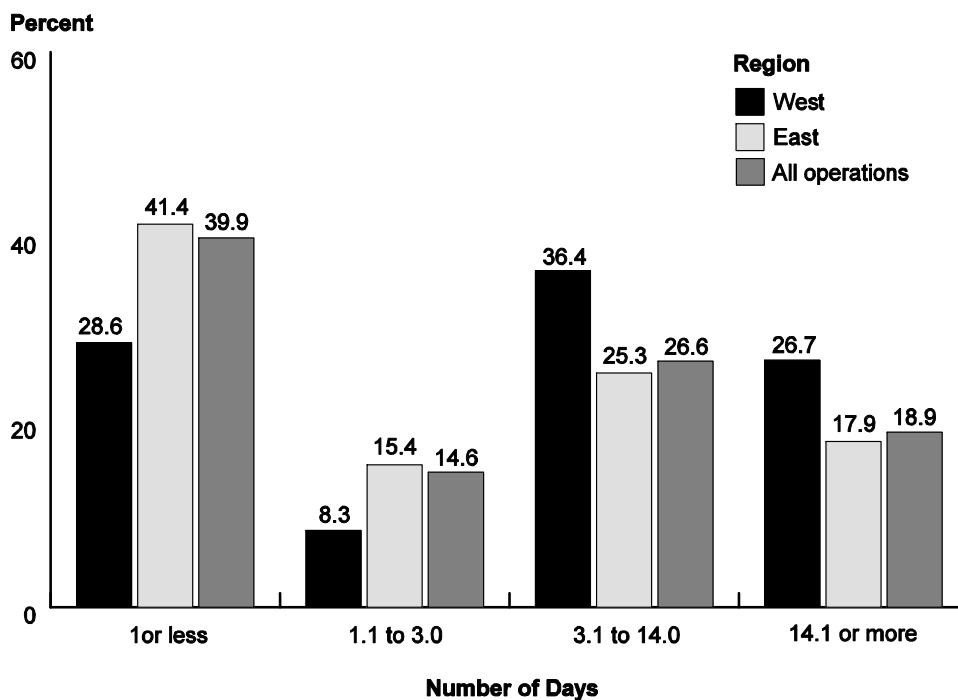
For operations with a usual calving area, 4 of 10 operations (39.9 percent) moved cows into the calving area within a day prior to calving. There were no regional differences. Cows were kept in the calving area prior to calving for 3.1 to 14.0 days on 26.6 percent of operations and for 14.1 or more days on 18.9 percent of operations.

c. For operations with a usual calving area, percentage of operations by number of days cows remained in the usual calving area/pen *prior* to calving, and by region:

Percent Operations						
Region						
West		East		All Operations		
Number of Days	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
1 or less	28.6	(4.9)	41.4	(3.6)	39.9	(3.2)
1.1 to 3.0	8.3	(2.9)	15.4	(2.6)	14.6	(2.3)
3.1 to 14.0	36.4	(5.6)	25.3	(3.1)	26.6	(2.8)
14.1 or more	26.7	(4.9)	17.9	(2.5)	18.9	(2.3)
Total	100.0		100.0		100.0	



**For Operations with a Usual Calving Area, Percentage of Operations by Number of Days Cows were in the Usual Calving Area/Pen *Prior* to Calving, and by Region**



For operations with a usual calving area, few operations (12.9 percent) removed cows from the calving area in the first hour after calving. A lower percentage of large operations (6.2 percent) allowed cows to remain in the usual calving area for 14.1 or more hours compared with small operations (25.0 percent).

d. For operations with a usual calving area, percentage of operations by number of hours cows remained in the usual calving area/pen **after** calving, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Number of Hours</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Removed immediately	4.4	(1.8)	2.7	(1.3)	7.2	(3.0)	4.2	(1.2)
.25 to 1.0	8.0	(2.3)	7.8	(2.1)	16.5	(3.8)	8.7	(1.6)
1.1 to 3.0	22.5	(4.0)	26.1	(4.0)	28.0	(5.4)	24.1	(2.8)
3.1 to 14.0	40.1	(4.6)	44.0	(4.4)	42.1	(5.5)	41.4	(3.2)
14.1 or more	25.0	(4.2)	19.4	(3.9)	6.2	(3.2)	21.6	(2.8)
Total	100.0		100.0		100.0		100.0	

There were no regional differences by length of time that cows remained in the usual calving area after calving.

e. For operations with a usual calving area, percentage of operations by number of hours cows remained in the usual calving area/pen **after** calving, and by region:

Percent Operations				
Region				
West			East	
Number of Hours	Percent	Std. Error	Percent	Std. Error
Removed immediately	6.7	(2.7)	3.9	(1.3)
.25 to 1.0	7.3	(2.7)	8.9	(1.7)
1.1 to 3.0	22.6	(4.9)	24.3	(3.1)
3.1 to 14.0	44.6	(5.8)	41.0	(3.5)
14.1 or more	18.8	(4.9)	21.9	(3.2)
Total	100.0		100.0	

Allowing sick cows into the calving area is a potential source of disease for other cows and newborn calves. A higher percentage of small and medium operations (37.3 and 33.0 percent, respectively) allowed sick cows in calving areas than large operations (16.5 percent). Approximately half of operations (51.6 percent) allowed lame cows into the calving area. A lower percentage of large operations (28.6 percent) allowed lame cows into the calving area than medium and small operations (57.9 and 51.8 percent, respectively).

f. For operations with a usual calving area, percentage of operations that allowed sick/lame cows in the usual calving area, by cattle class and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Cattle Class</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Sick cows	37.3	(4.6)	33.0	(4.5)	16.5	(4.4)	34.2	(3.2)
Lame cows	51.8	(4.6)	57.9	(4.4)	28.6	(4.5)	51.6	(3.1)
Other	5.4	(2.0)	5.8	(2.3)	4.1	(2.2)	5.4	(1.4)
Any of the above	56.4	(4.6)	62.3	(4.2)	30.7	(4.6)	55.8	(3.1)

Cows that test positive for Johne's disease present a risk of contaminating the usual calving area and transmitting the disease to newborn calves. To prevent calving-area contamination and the potential for infecting calves, test-positive animals should not be allowed in the calving area or other calf areas. There were no differences by operation size in the percentage of operations that allowed Johne's disease test-positive animals in the calving area; 15.5 percent of operations that tested for Johne's disease allowed test-positive cows in the calving area.

g. For operations with a usual calving area and that tested for Johne's disease, percentage of operations that allowed Johne's test-positive cows in the usual calving area, by herd size:

<b>Percent Operations</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
12.0	(4.5)	18.0	(5.0)	30.2	(8.3)	15.5	(3.2)

The percentage of calves born in the usual calving area increased as herd size increased. Overall, 89.8 percent of calves were born in the usual calving area.

h. For operations with a usual calving area, percentage of calves born in the usual calving area, by herd size:

<b>Percent Calves</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
79.9	(2.0)	89.0	(1.3)	93.6	(1.3)	89.8	(0.9)



Photo courtesy of Judy Rodriguez

A higher percentage of small operations than large operations reported that less than three-fourths of their calves were born in the usual calving area. A higher percentage of large operations (45.8 percent) reported that 91 to 99 percent of calves were born in the calving area compared to 16.6 percent of small operations.

i. Percentage of operations by percentage of calves born in the usual calving area/pen, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Percent Calves	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
0 to 50	19.3	(3.8)	8.4	(2.5)	3.7	(2.0)	14.7	(2.5)
51 to 75	18.3	(3.9)	6.5	(2.3)	3.6	(2.0)	13.5	(2.5)
76 to 90	28.6	(4.3)	29.0	(4.2)	24.0	(4.5)	28.3	(3.0)
91 to 99	16.6	(3.2)	38.4	(4.5)	45.8	(5.7)	25.6	(2.5)
100	17.2	(3.3)	17.7	(3.3)	22.9	(5.5)	17.9	(2.3)
Total	100.0		100.0		100.0		100.0	

Colostrum from Johne's test-positive cows could transmit the disease to calves. Studies suggest that colostrum is approximately three times as likely as milk to contain *Mycobacterium avium* subspecies *paratuberculosis*. Operations should either use colostrum from a test-negative cow or pasteurize colostrum prior to feeding. Approximately 1 of 20 operations (4.9 percent) fed colostrum from test-positive cows to calves. There were no differences by herd size.

j. For operations that tested for Johne's disease, percentage of operations in which calves were fed colostrum from cows that tested positive for Johne's disease, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
6.0	(2.9)	3.8	(2.8)	0.6	(0.4)	4.9	(2.0)

**B. Source of Replacements**

**NOTE:** Estimates for sources of cow replacements were published in NAHMS Dairy 2007 Part I, p 62. Cow-replacement estimates in this report (Part III) are similar, with the exception of the percentage of operations that had cow replacements born on the operation and raised off-site—which is higher in this report than in Part I.

**1. Cow replacements in the milking herd**

Approximately one-third of the dairy cow inventory (36.2 percent) was replaced (primarily by heifers that calved) during the previous 12 months. There were no differences by herd size.

a. Cow replacements that entered the milking herd during the previous 12 months, as a percentage of cow inventory on the day of interview, by herd size:

---

<b>Percent Cow Inventory</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
33.0	(1.1)	34.5	(1.1)	39.0	(2.6)	36.2	(1.2)

---



Almost 9 of 10 operations (88.0 percent) had cow replacements enter the milking herd that were born and raised on the operation. A lower percentage of large operations (50.7 percent) raised cow replacements on their operations compared with medium and small operations (84.7 and 92.6 percent, respectively). Off-site heifer raising of cow replacements was practiced by 13.9 percent of all operations and was highest for large operations (50.9 percent). Cow replacements were purchased directly from other dairies by 15.3 percent of operations. A higher percentage of large operations (20.2 percent) purchased cow replacements from a dealer compared with medium and small operations (8.9 and 1.7 percent, respectively). Purchasing cow replacements from auction markets was practiced by 7.0 percent of operations.

b. Percentage of operations by source of cow replacements that entered the milking herd during the previous 12 months:

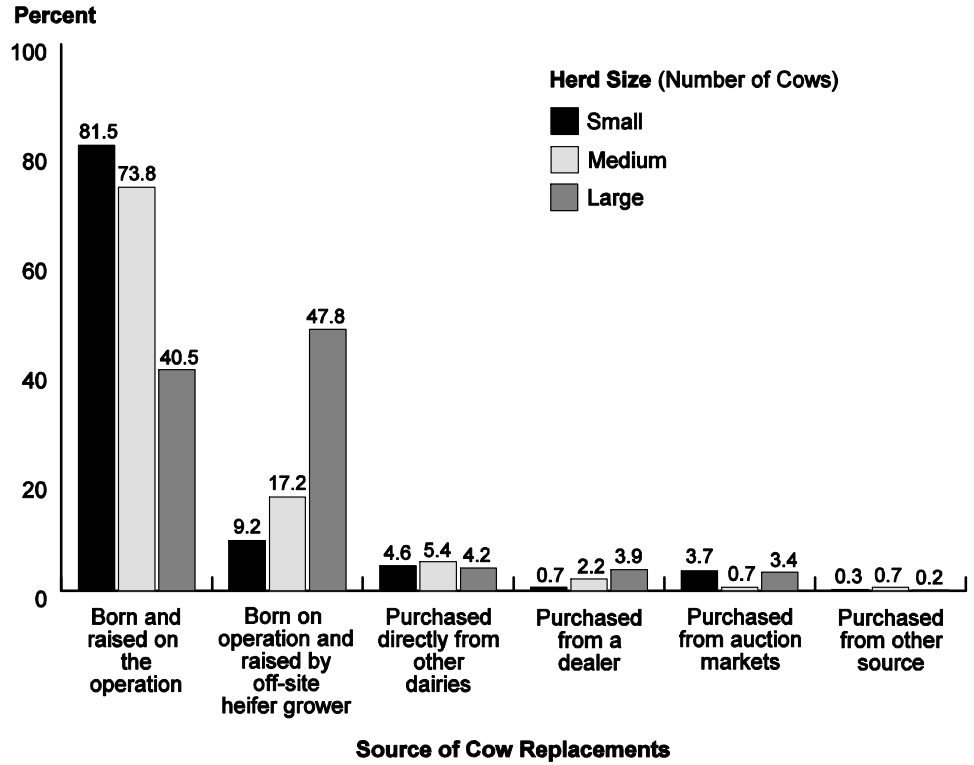
<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Source of Cow Replacements</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Born and raised on the operation	92.6	(1.9)	84.7	(3.2)	50.7	(6.2)	88.0	(1.6)
Born on operation, raised off-site	9.3	(2.2)	17.2	(3.3)	50.9	(5.7)	13.9	(1.8)
Purchased directly from other dairies	12.6	(2.7)	21.5	(3.5)	20.7	(4.5)	15.3	(2.1)
Purchased from a dealer	1.7	(0.7)	8.9	(2.6)	20.2	(4.3)	4.6	(0.9)
Purchased from auction markets	7.3	(2.4)	4.3	(1.6)	14.3	(4.0)	7.0	(1.7)
Purchased from other source	2.7	(1.4)	1.6	(0.7)	6.1	(2.6)	2.6	(1.0)

All operations had cow replacements enter the milking herd during the previous 12 months. The majority of cow replacements for small and medium operations were born and raised on the operation (81.5 and 73.8 percent of replacements, respectively). Cow replacements for large operations were either “home-raised” or born on the operation and raised off-site (40.5 and 47.8 percent of replacements, respectively). Less than 15 percent of all cow replacements were purchased from other dairies, a dealer, auction market, or other source.

c. Percentage of cow replacements that entered the milking herd during the previous 12 months, by source and by herd size:

<b>Percent Cow Replacements</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Source of Cow Replacements</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Born and raised on the operation	81.5	(3.3)	73.8	(3.5)	40.5	(6.3)	58.8	(3.5)
Born on operation, raised off-site	9.2	(2.2)	17.2	(3.4)	47.8	(6.0)	30.8	(3.3)
Purchased directly from other dairies	4.6	(1.6)	5.4	(1.1)	4.2	(1.2)	4.6	(0.8)
Purchased from a dealer	0.7	(0.4)	2.2	(0.6)	3.9	(1.0)	2.7	(0.5)
Purchased from auction markets	3.7	(1.4)	0.7	(0.3)	3.4	(1.9)	2.7	(1.0)
Purchased from other source	0.3	(0.2)	0.7	(0.5)	0.2	(0.1)	0.4	(0.1)
<b>Total</b>	<b>100.0</b>		<b>100.0</b>		<b>100.0</b>		<b>100.0</b>	

**Percentage of Cow Replacements that Entered the Milking Herd During the Previous 12 Months, by Source and by Herd Size**



There were no regional differences in source of cow replacements.

d. Percentage of cow replacements that entered the milking herd during the previous 12 months, by source and by region:

<b>Percent Cow Replacements</b>				
<b>Region</b>				
<b>Source of Cow Replacements</b>	<b>West</b>		<b>East</b>	
	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Born and raised on the operation	50.6	(7.4)	64.3	(3.1)
Born on operation and raised by off-site heifer grower	40.4	(7.1)	24.3	(2.8)
Purchased directly from other dairies	2.3	(1.2)	6.2	(1.0)
Purchased from a dealer	2.2	(0.7)	3.1	(0.7)
Purchased from auction markets	4.2	(2.4)	1.7	(0.6)
Purchased from other source	0.3	(0.2)	0.4	(0.2)
<b>Total</b>	<b>100.0</b>		<b>100.0</b>	

## 2. Replacement shipments

The number of shipments of cow replacements from off-site heifer growers to the operation increased as herd size increased. During the previous 12 months, large operations received an average of 55.9 shipments from off-site heifer growers compared with an average of 5.5 shipments for small operations.

a. Operation average number of shipments by source of cow replacements during the previous 12 months, and by herd size:

Operation Average Number of Shipments								
Herd Size (Number of Cows)								
Source of Cow Replacements	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error
Born on operation and raised by off-site heifer grower	5.5	(1.6)	11.1	(1.3)	55.9	(16.2)	20.9	(5.1)
Purchased directly from other dairies	1.5	(0.2)	2.3	(0.3)	5.3	(1.0)	2.1	(0.2)
Purchased from a dealer	1.4	(0.3)	2.9	(0.5)	6.0	(1.0)	3.3	(0.5)
Purchased from auction markets	3.0	(1.0)	2.0	(0.7)	28.3	(17.1)	7.8	(3.9)
Purchased from other source	4.0	(0.0)	3.0	(1.1)	2.8	(0.8)	3.3	(0.5)
All sources	2.6	(0.6)	6.0	(0.8)	48.1	(12.3)	9.7	(1.9)



Photo courtesy of Peggy Greb, Agricultural Research Service

Operations in the West region had more shipments from off-site heifer growers during the previous 12 months (65.8) compared to operations in the East region (10.9). Shipments from other sources were similar for both the West and East regions. Although the average number of shipments from auction markets was higher in the West region than in the East region, the standard error for the West region is large and suggests variability in the number of shipments among operations in the West region.

b. Operations average number of shipments by source of cow replacements during the previous 12 months, and by region:

Source of Cow Replacement	Operation Average Number of Shipments			
	Region			
	West		East	
	Average	Std. Error	Average	Std. Error
Born on operation and raised by off-site heifer grower	65.8	(24.0)	10.9	(1.3)
Purchased directly from other dairies	5.9	(1.8)	1.9	(0.2)
Purchased from a dealer	5.5	(1.1)	2.7	(0.4)
Purchased from auction markets	28.3	(17.3)	2.9	(0.9)
Purchased from other source	3.7	(1.3)	3.2	(0.6)
All sources	45.5	(14.4)	5.0	(0.5)

## C. Disease Confirmation

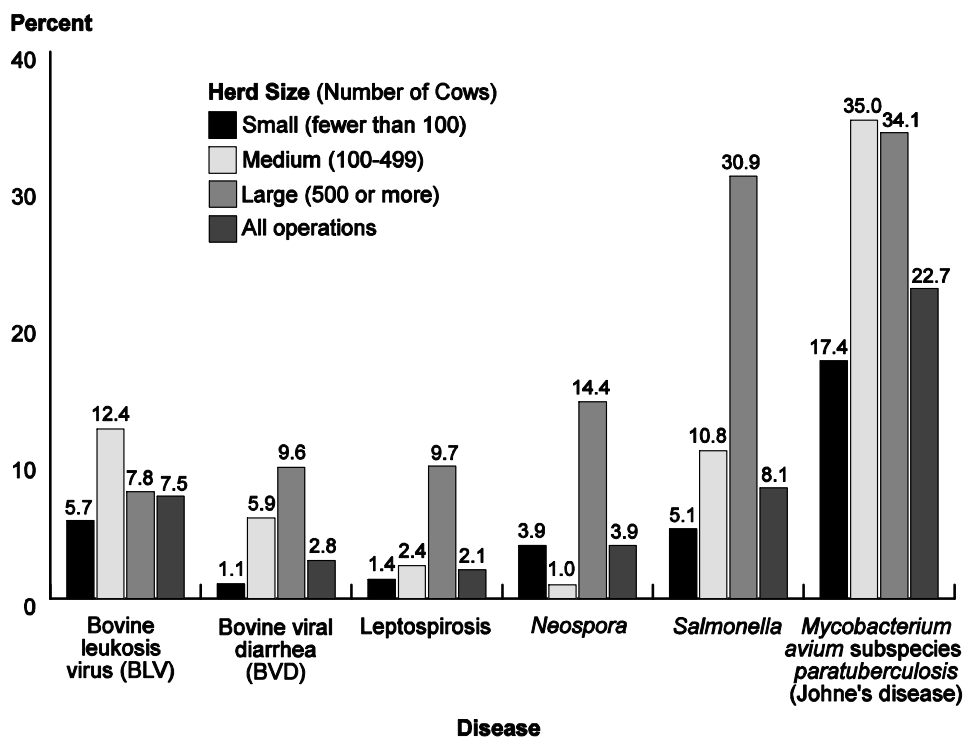
### 1. Laboratory testing

Laboratory testing is essential in determining the cause of many diseases and allows the implementation of appropriate preventive or control measures. More than 20 percent of operations (22.7 percent) reported that Johne's disease was confirmed via laboratory testing during the previous 12 months. A lower percentage of small operations received a laboratory diagnosis for Johne's disease (17.4 percent) compared with medium and large operations (35.0 and 34.1 percent, respectively). Less than 10 percent of all operations reported a laboratory confirmation for the other listed diseases. *Neospora* and *Salmonella* were more frequently diagnosed on large operations via laboratory testing than on medium and small operations.

a. Percentage of operations in which the following diseases in cattle on the operation were confirmed via laboratory testing during the previous 12 months, by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Disease	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Bovine leukosis virus (BLV)	5.7	(1.9)	12.4	(2.9)	7.8	(2.9)	7.5	(1.5)
Bovine viral diarrhea (BVD)	1.1	(0.7)	5.9	(2.0)	9.6	(3.3)	2.8	(0.7)
Leptospirosis	1.4	(0.8)	2.4	(1.1)	9.7	(3.8)	2.1	(0.7)
<i>Neospora</i>	3.9	(1.6)	1.0	(0.6)	14.4	(4.4)	3.9	(1.1)
<i>Salmonella</i>	5.1	(1.8)	10.8	(2.3)	30.9	(5.9)	8.1	(1.4)
<i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> (Johne's disease)	17.4	(3.0)	35.0	(3.9)	34.1	(4.8)	22.7	(2.3)

**Percentage of Operations in which the Following Diseases in Cattle on the Operation were Confirmed Via Laboratory Testing During the Previous 12 Months, by Herd Size**





During the previous 12 months, a higher percentage of operations in the East region received a laboratory confirmation of Johne's disease (23.6 percent) than in the West region (12.8 percent). There were no differences by region in the percentages of operations reporting laboratory confirmation for the other listed diseases.

b. Percentage of operations in which the following diseases in cattle on the operation were confirmed via laboratory testing during the previous 12 months, by region:

Disease	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Bovine leukosis virus (BLV)	4.3	(2.0)	7.8	(1.7)
Bovine viral diarrhea (BVD)	5.3	(2.3)	2.5	(0.7)
Leptospirosis	5.2	(2.4)	1.9	(0.7)
<i>Neospora</i>	10.8	(3.5)	3.2	(1.2)
<i>Salmonella</i>	17.2	(4.2)	7.3	(1.5)
<i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> (Johne's disease)	12.8	(3.2)	23.6	(2.5)

BLV was most frequently diagnosed via blood samples (88.5 percent of operations). Blood, ear notches, tissues at necropsy, and aborted fetuses were the most frequently used samples for diagnosing BVD. Leptospirosis and Johne's disease were most frequently diagnosed via blood samples (69.6 and 70.3 percent, respectively). *Neospora* was confirmed using aborted fetuses, blood, and tissues at necropsy. *Salmonella* was most frequently confirmed using fecal samples (49.3 percent).

c. For operations in which disease was confirmed via laboratory testing, percentage of operations by diagnostic samples used to confirm disease, and by confirmed disease:

Percent Operations												
Confirmed Disease												
Diagnostic Sample	Bovine Leukosis Virus (BLV)		Bovine Viral Diarrhea (BVD)		Lepto-spirosis		Neospora		Salmonella		Johne's disease	
	Pct.	Std. Err.	Pct.	Std. Err.	Pct.	Std. Err.	Pct.	Std. Err.	Pct.	Std. Err.	Pct.	Std. Err.
Aborted fetus			13.9	(6.7)	22.8	(11.2)	59.0	(14.2)	7.9	(4.9)		
Blood	88.5	(4.8)	47.5	(12.9)	69.6	(12.5)	40.6	(14.2)	16.9	(5.5)	70.3	(5.3)
Ear notch			41.3	(12.5)								
Feces			7.5	(4.4)					49.3	(9.1)	36.4	(5.5)
Milk			0.6	(0.4)					20.0	(9.9)	12.4	(3.5)
Tissues at necropsy	6.3	(3.5)	15.7	(7.9)	10.3	(7.4)	18.5	(10.1)	15.4	(4.7)	0.1	(0.1)
Urine					8.8	(5.4)						
Other	15.5	(6.3)	3.0	(2.9)	0.0	(--)	9.0	(8.5)	5.0	(4.2)	1.7	(1.6)



Photo courtesy of Paul Pierlott, Agricultural Research Service

## 2. Abortions

Abortion generally describes the expulsion of a dead fetus at 45 to 265 days of gestation. A goal is to have less than 2 percent of cows and heifers abort each year, although up to 5 percent is considered normal. Across herd sizes, approximately 30 percent of operations reported that 2 percent or less of cows aborted (as a percentage of cow inventory). Few operations (0.7 percent) reported that more than 15.1 percent of cows aborted. No operations had more than 25 percent of cows abort.

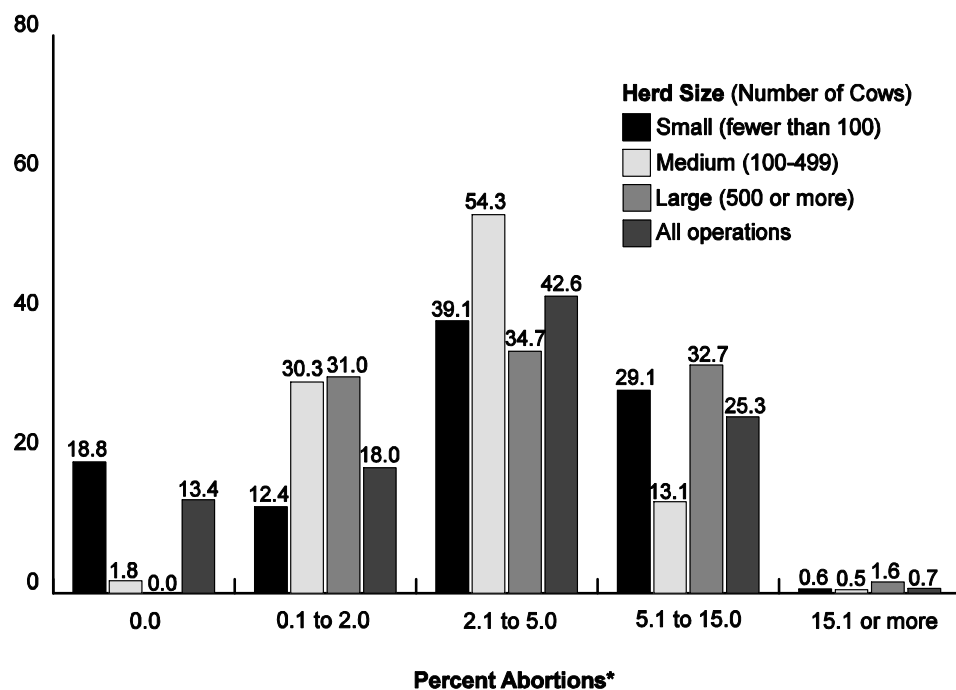
a. Percentage of operations by percentage of abortions during the previous 12 months, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Percent Abortions*	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct. Std. Error
0.0	18.8	(3.1)	1.8	(1.0)	0.0	(--)	13.4 (2.2)
0.1 to 2.0	12.4	(2.3)	30.3	(3.8)	31.0	(4.9)	18.0 (1.9)
2.1 to 5.0	39.1	(3.8)	54.3	(4.2)	34.7	(5.5)	42.6 (2.9)
5.1 to 15.0	29.1	(3.6)	13.1	(2.9)	32.7	(5.1)	25.3 (2.6)
15.1 or more	0.6	(0.5)	0.5	(0.5)	1.6	(1.5)	0.7 (0.4)
Total	100.0		100.0		100.0		100.0

\*As a percentage of cow inventory at time of interview.

**Percentage of Operations by Percentage of Abortions During the Previous 12 Months, and by Herd Size**

Percent



\*As a percentage of cow inventory on day of interview.

Almost 9 of 10 operations (86.6 percent) had at least one cow or heifer abort during the previous 12 months.

b. Percentage of operations that had any abortions:

Percent Operations	Standard Error
86.6	(2.2)

Determining the cause of abortion can be difficult. In many cases, the event that caused the fetus to die occurs days to weeks before the actual abortion. Frequently, the cause of an abortion is no longer detectable, or the fetus is too decomposed to evaluate or never found at all. Generally, a diagnosis is determined in less than 40 percent of samples from abortions submitted to diagnostic laboratories. To improve the chances of diagnosing the cause of abortion, a detailed history and the proper diagnostic specimens should be submitted to the laboratory. Specific samples recommended for submission include sera from the dam, the entire fetus, or specific tissues and placenta. Approximately one of eight operations (12.4 percent) submitted samples to determine the cause of abortion.

c. For operations that had any abortions, percentage of operations that submitted any samples for diagnosis:

<b>Percent Operations</b>	<b>Standard Error</b>
12.4	(1.7)

For operations that submitted samples, 70.2 percent submitted serum from the dam and 32.7 percent submitted the placenta.

d. For operations that submitted samples to determine cause of abortion, percentage of operations by type of sample:

<b>Sample Type</b>	<b>Percent Operations</b>	<b>Standard Error</b>
Placenta	32.7	(6.9)
Entire fetus	53.8	(7.6)
Serum of dam	70.2	(6.6)
Other	4.0	(3.2)

Of the total abortions reported, the placenta was submitted for testing for 1.3 percent of abortions. The entire fetus was submitted for 1.7 percent of abortions, and serum from the dam experiencing the abortion was submitted for 3.1 percent of abortions.

e. For operations that had at least one abortion during the previous 12 months, percentage of abortions by type of sample submitted for laboratory diagnosis:

<b>Sample Type</b>	<b>Percent Abortions Submitted</b>	<b>Standard Error</b>
Placenta	1.3	(0.3)
Entire fetus	1.7	(0.3)
Serum of dam	3.1	(0.6)
Other	0.1	(0.1)

The majority of operations that had any abortions but did not submit samples for diagnosis (69.6 percent) did not perceive abortion as a problem on their operations.

f. For any aborted fetuses that were not submitted for diagnosis, percentage of operations by reason for not submitting fetus:

<b>Reason</b>	<b>Percent Operations</b>	<b>Standard Error</b>
Cost	2.5	(1.0)
Lack of information obtained from previous abortion submissions	6.6	(1.3)
Inconvenience	7.0	(1.7)
Abortion not perceived as a problem on the operation	69.6	(2.7)
Other	14.3	(2.0)
Total	100.0	

Although only 12.4 percent of operations that had abortions submitted samples for diagnosis, more than 8 of 10 operations (82.0 percent) would submit aborted fetuses for diagnosis if testing was performed at no cost, and 48.5 percent of aborted fetuses would be submitted for diagnosis.

g. Percentage of operations that would submit aborted fetuses to a diagnostic laboratory if testing was performed at no cost, and percentage of aborted fetuses that would be submitted:

<b>Percent Operations</b>	<b>Standard Error</b>	<b>Operation Average Percent Aborted Fetuses</b>	<b>Standard Error</b>
82.0	(2.3)	48.5	(4.9)

D. General Management

1. Primary outside access areas

Operations most frequently allowed lactating cows access to pasture (50.9 percent of operations) during summer. No outside access was allowed on 13.1 percent of operations in summer. In winter, the highest percentages of operations allowed lactating cows access to a concrete alley way or pen, dry lot, or allowed no outside access (35.0, 28.9, and 25.2 percent, respectively).

a. Percentage of operations by primary outside area that ***lactating*** cows had routine access to during summer and winter:

Percent Operations				
Primary Outside Area	Summer		Winter	
	Percent	Std. Error	Percent	Std. Error
Pasture	50.9	(2.7)	9.4	(1.5)
Concrete alleyway or pen	12.8	(1.6)	35.0	(2.8)
Dry lot	20.8	(2.2)	28.9	(2.7)
Other	2.4	(0.8)	1.5	(0.6)
None	13.1	(1.7)	25.2	(2.3)
Total	100.0		100.0	

During summer, 39.5 percent of lactating cows were on operations in which the primary outside area was a dry lot, 22.3 percent were on operations in which the primary outside area was pasture, and 19.0 percent were on operations with no outside access. In winter, similar percentages of lactating cows were on operations in which primary outside access was a concrete alleyway or pen, dry lot, or allowed no outside access (32.3, 32.7, and 29.7 percent, respectively).

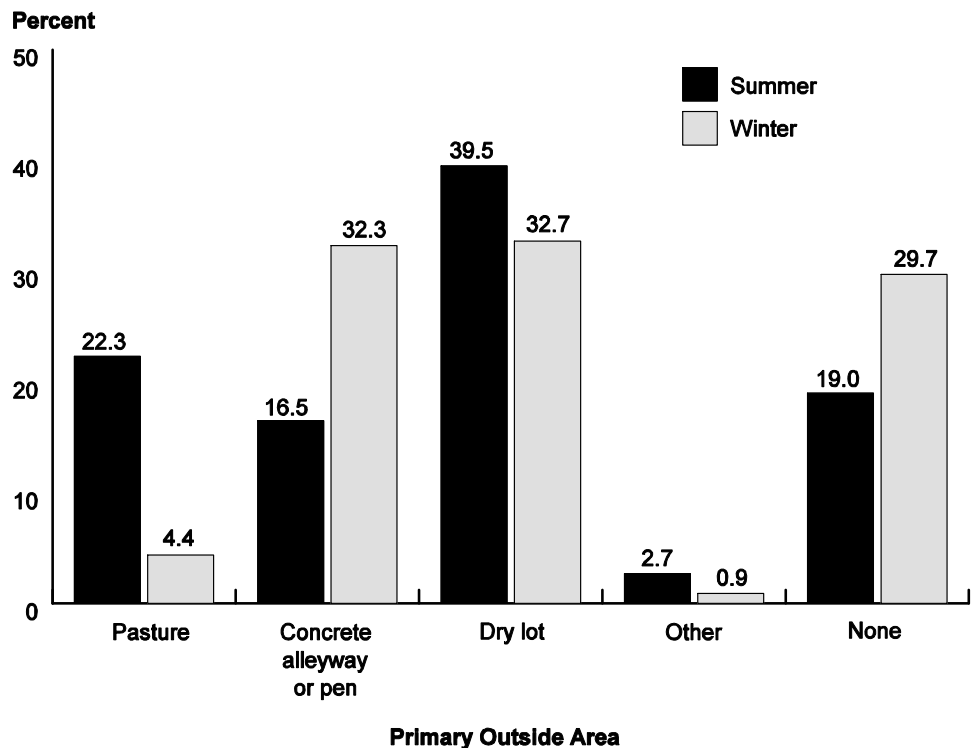


b. Percentage of cow inventory by primary outside area that ***lactating*** cows had routine access to during summer and winter:\*

Primary Outside Area	Percent Cows			
	Summer		Winter	
	Percent	Std. Error	Percent	Std. Error
Pasture	22.3	(1.6)	4.4	(0.7)
Concrete alleyway or pen	16.5	(2.1)	32.3	(3.3)
Dry lot	39.5	(3.0)	32.7	(3.5)
Other	2.7	(1.4)	0.9	(0.3)
None	19.0	(2.0)	29.7	(2.9)
Total	100.0		100.0	

\*It was presumed that all lactating cows had access to the operation's primary outside area.

**Percentage of Cow Inventory by Primary Outside Area that *Lactating* Cows had Routine Access to During Summer and Winter\***



\*It was presumed that all lactating cows had access to the operation's primary outside area

The majority of operations (67.2 percent) allowed dry cows access to pasture during summer. In winter, operations allowed access to pasture, concrete alleyway or pen, dry lot, or allowed no outside access (18.4, 24.1, 34.2, and 18.5 percent, respectively).

c. Percentage of operations by primary outside area that **dry** cows had routine access to during summer and winter:

Primary Outside Area	Percent Operations			
	Summer		Winter	
	Percent	Std. Error	Percent	Std. Error
Pasture	67.2	(2.5)	18.4	(2.2)
Concrete alleyway or pen	5.7	(1.1)	24.1	(2.4)
Dry lot	18.5	(2.0)	34.2	(2.7)
Other	2.1	(0.8)	4.8	(1.3)
None	6.5	(1.2)	18.5	(2.1)
Total	100.0		100.0	

The majority of dry cows were on operations in which pasture (38.5 percent) or dry lot (41.9 percent) were the primary outside access during summer. Dry lot was the most common outside access for dry cows in winter (43.5 percent).

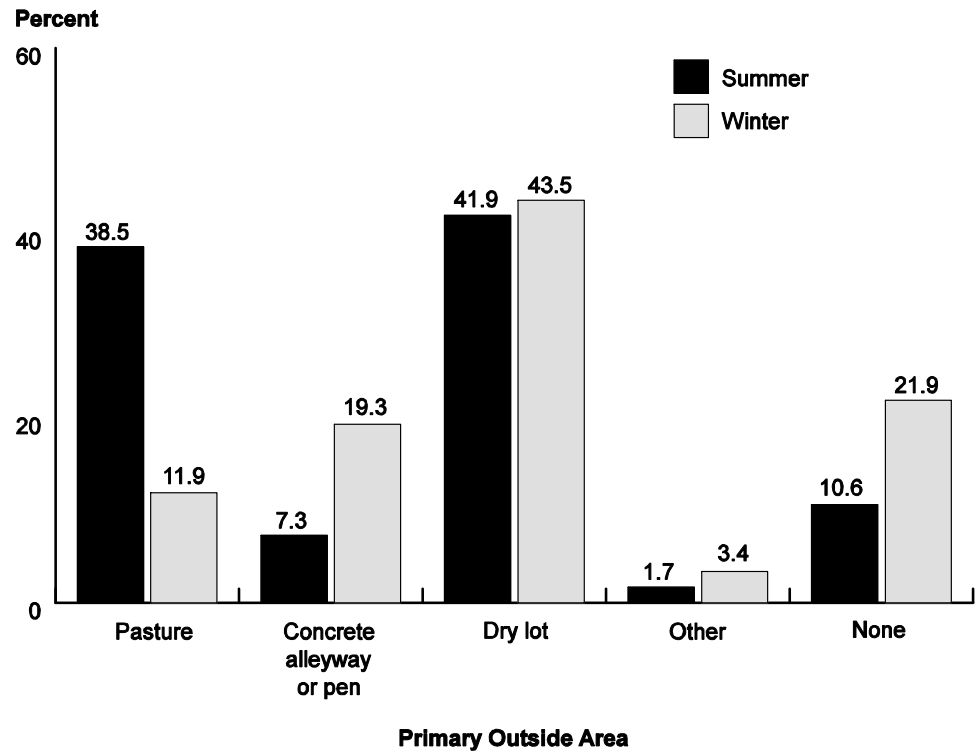
d. Percentage of cow inventory by primary outside area that **dry** cows had routine access to during summer and winter:

Primary Outside Area	Percent Cows			
	Summer		Winter	
	Percent	Std. Error	Percent	Std. Error
Pasture	38.5	(2.4)	11.9	(1.5)
Concrete alleyway or pen	7.3	(1.3)	19.3	(2.3)
Dry lot	41.9	(2.6)	43.5	(3.2)
Other	1.7	(0.5)	3.4	(0.8)
None	10.6	(1.7)	21.9	(2.5)
Total	100.0		100.0	

\*It was presumed that all dry cows had access to the operation's primary outside area.

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**Percentage of Cow Inventory by Primary Outside Area that *Dry* Cows had Routine Access to During Summer and Winter\***



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\*It was presumed that all dry cows had access to the operation's primary outside area.

## 2. Flooring type

Flooring surfaces are important to cow health and longevity. When given an option, cows select flooring that compresses and provides cushion, such as rubber mats, pasture, or dirt. Concrete flooring is associated with increased lameness, injuries, and decreased expression of estrus. On approximately half of operations (51.1 percent), flooring for lactating cows was predominately concrete, representing 55.6 percent of cows. Pasture was the predominant flooring on 10.1 percent of operations but for only 5.1 percent of cows. Dirt was the predominate flooring on 5.4 percent of operations, representing 20.0 percent of cows, which probably reflects the use of dry lots on large operations.

a. Percentage of operations (and percentage of cows on these operations) by predominant flooring type that lactating cows stood or walked on when not being milked:

<b>Flooring Type</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Cows</b>	<b>Standard Error</b>
Concrete—grooved/textured	34.3	(2.4)	48.7	(3.5)
Concrete—slatted	1.3	(0.5)	1.1	(0.5)
Concrete—smooth	15.5	(2.3)	5.8	(0.8)
Rubber mats over concrete	22.9	(2.5)	13.9	(2.2)
Pasture	10.1	(1.7)	5.1	(0.9)
Dirt	5.4	(1.1)	20.0	(3.5)
Other	10.5	(1.8)	5.4	(1.1)
Total	100.0		100.0	



Photo courtesy of Judy Rodriguez

For operations with concrete flooring, the use of rubber belting or a similar material in cow areas reduces the amount of time cows spend on concrete and may decrease lameness and injuries as well as increase time spent at the feed bunk. Any rubber belting was present on 21.2 percent of operations and was accessible to 44.4 percent of cows.

b. For operations that used parlors and in which concrete was the predominant flooring, percentage of operations (and percentage of cows on these operations) that had rubber belting or similar flooring, by location of rubber belting:

<b>Location</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Cows</b>	<b>Standard Error</b>
Immediately in front of feed bunk	11.9	(2.3)	29.2	(5.1)
Walkway to parlor	6.2	(1.4)	18.9	(4.7)
Holding pen	8.1	(1.9)	14.2	(3.1)
Other	7.5	(1.7)	11.1	(1.8)
Any	21.2	(2.8)	44.4	(4.8)

### 3. Surface moisture

Wet flooring can be detrimental to hoof health. Cows on wet surfaces have increased hoof horn moisture and are more prone to infectious hoof diseases. The ground or flooring surface for lactating cows was usually dry on 60.3 percent of operations during summer and 49.5 percent in winter. Lactating cows usually stood in water or slurry on less than 1 percent of operations (0.6 percent).

Percentage of operations by category that best characterizes the surface moisture of the ground or flooring that lactating cows stood on most during summer and winter:

	Percent Operations			
	Summer		Winter	
Flooring Surface Moisture	Percent	Std. Error	Percent	Std. Error
Usually dry	60.3	(2.7)	49.5	(2.6)
Wet about half the time	22.8	(2.4)	21.8	(2.2)
Almost always wet, but no standing water	16.3	(1.7)	28.1	(2.1)
Usually standing water or slurry	0.6	(0.3)	0.6	(0.3)
Total	100.0		100.0	

#### 4. Barn type

The type of freestall barn affects ventilation, feedbunk space, and square footage per cow. Two- and four-row barns require less wind to properly ventilate and provide more feedbunk space per cow and more square footage per cow than three- or six-row barns. Approximately 8 of 10 large and medium operations (83.2 and 81.9 percent, respectively) housed cows in freestalls, compared with about 3 of 10 small operations (27.2 percent). Less than half of all operations (44.3 percent) housed cows in freestall barns.

a. Percentage of operations that used freestall barns:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
27.2	(3.0)	81.9	(3.2)	83.2	(4.2)	44.3	(2.5)

Two-row freestall barns were the predominant setup for small and large freestall operations (48.1 and 49.5 percent, respectively). The percentage of operations with six-row barns increased as herd size increased.

b. For operations that used covered freestall barns to house lactating cows, percentage of operations by type of barn setup that housed the majority of cows, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Freestall Barn Setup	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Two-row	48.1	(6.6)	19.5	(3.5)	49.5	(5.3)	35.2	(3.4)
Three-row	20.7	(5.7)	22.2	(3.8)	8.3	(3.3)	19.9	(3.0)
Four-row	22.7	(5.0)	31.7	(4.4)	22.2	(4.8)	26.7	(3.0)
Six-row	1.1	(0.8)	17.9	(3.7)	19.8	(3.4)	11.0	(1.9)
Other	7.4	(3.7)	8.7	(2.6)	0.2	(0.1)	7.2	(2.0)
Total	100.0		100.0		100.0		100.0	

## 5. Heat abatement

Using methods to cool cows, such as shade, water sprinklers, or increased air circulation is important during summer in almost all areas of the United States. Heat has many deleterious effects on dairy cattle, including decreased feed intake and milk production, reduced estrous behavior, altered formation and ovulation of follicles, and increased susceptibility to mastitis. In most areas of the United States, a combination of sprinklers and fans is recommended. Fans were the most common method of heat abatement provided on small and medium operations (74.3 and 77.7 of operations, respectively), while a similar percentage of large operations provided shade, sprinklers or misters, or fans (55.6, 61.6, and 61.0 percent, respectively). Overall, 94.0 percent of operations provided some form of heat abatement for lactating cows.

a. Percentage of operations that provided heat abatement during summer for *lactating* cows, by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Method	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Shade (other than inside building)	49.2	(3.8)	28.7	(3.4)	55.6	(5.6)	44.5	(2.8)
Sprinklers or misters	12.0	(2.4)	32.9	(3.7)	61.6	(5.8)	20.3	(1.9)
Fans	74.3	(3.2)	77.7	(3.3)	61.0	(5.3)	74.3	(2.4)
Tunnel ventilation	28.3	(3.6)	12.7	(3.0)	3.8	(2.2)	22.9	(2.6)
Other	4.9	(1.8)	6.1	(2.3)	2.5	(1.6)	5.0	(1.3)
Any	96.3	(1.2)	89.1	(2.7)	88.5	(3.7)	94.0	(1.1)

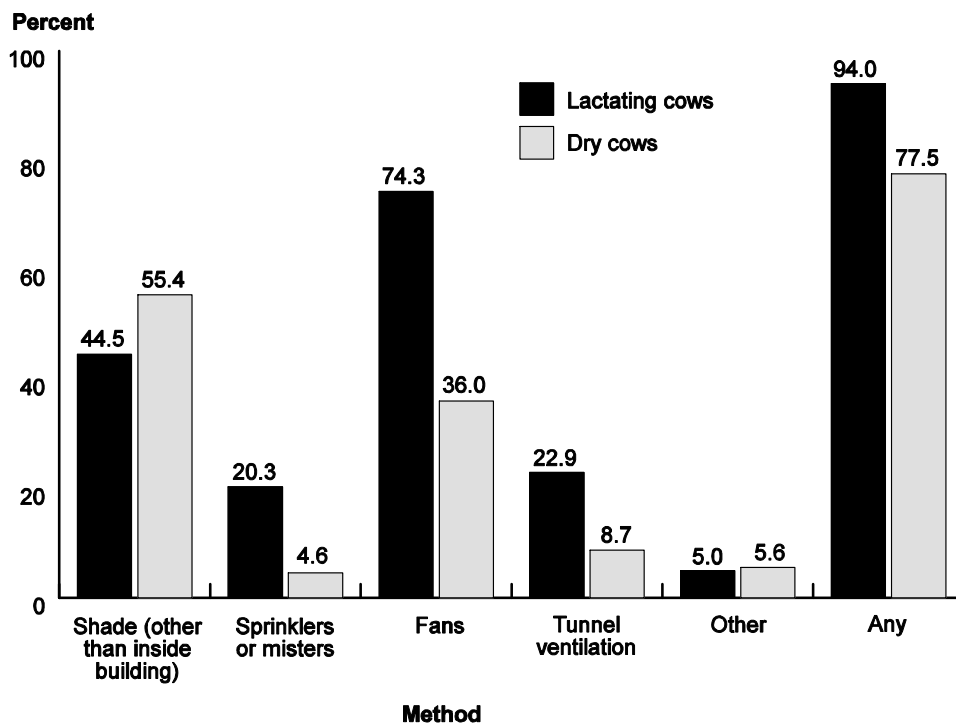


Dry cows were most frequently provided shade on small and large operations (61.0 and 49.8 percent of operations, respectively). Shade and fans were the most common heat abatement methods for dry cows on medium operations (41.0 and 37.8 percent of operations, respectively). More than three of four operations (77.5 percent) provided some method of heat abatement for dry cows.

b. Percentage of operations that provided heat abatement during summer for **dry** cows, by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Method	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Shade (other than inside building)	61.0	(3.6)	41.0	(3.9)	49.8	(5.4)	55.4	(2.7)
Sprinklers or misters	3.8	(1.6)	3.8	(1.7)	16.2	(4.5)	4.6	(1.2)
Fans	36.2	(3.8)	37.8	(4.0)	27.2	(4.3)	36.0	(2.8)
Tunnel ventilation	11.8	(2.7)	1.7	(0.9)	2.0	(1.3)	8.7	(1.9)
Other	6.3	(2.0)	4.7	(2.1)	1.8	(1.6)	5.6	(1.5)
Any	81.4	(2.8)	68.9	(3.9)	69.2	(5.9)	77.5	(2.2)

### Percentage of Operations that Provided Heat Abatement During Summer for Lactating and Dry Cows



## 6. Bedding types

The ideal bedding for lactating cows is dry and clean, provides cushion, and does not support bacterial growth. Sand has these characteristics and is one of the best bedding options for cows, although sand can lead to excessive wear of manure-handling equipment. Straw and/or hay were used on 54.1 percent of operations, representing 33.4 percent of cows. Sawdust/wood products and rubber mats were used on similar percentages of operations (35.0 and 30.2 percent, respectively), although sawdust/wood products were used for a higher percentage of cows (31.2 percent) than were rubber mats (18.5 percent). Sand was used on 21.9 percent of operations and for 30.3 percent of cows.

Straw and/or hay was used as bedding for dry cows by more than 6 of 10 operations (62.2 percent), representing 47.2 percent of cows. Most operations (92.5 percent) provided bedding to dry cows, and most dry cows (92.7 percent) had access to bedding.

a. Percentage of operations (and percentage of cows on these operations) by type of bedding used for ***lactating*** and ***dry*** cows during the previous 90 days:

Bedding Type	Percent Operations				Percent Cows			
	Lactating Cows		Dry Cows		Lactating Cows		Dry Cows	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Straw and/or hay	54.1	(2.7)	62.2	(2.7)	33.4	(2.8)	47.2	(3.2)
Sand	21.9	(2.0)	14.4	(1.7)	30.3	(2.6)	19.0	(2.0)
Sawdust/wood products	35.0	(2.6)	25.2	(2.3)	31.2	(2.8)	28.2	(2.6)
Composted/dried manure	3.9	(0.5)	4.8	(0.8)	24.2	(2.6)	23.5	(2.9)
Rubber mats	30.2	(2.7)	15.2	(2.2)	18.5	(2.1)	11.8	(2.3)
Rubber tires	1.6	(0.6)	1.0	(0.5)	1.1	(0.4)	0.7	(0.3)
Shredded newspaper	5.2	(1.2)	3.6	(1.1)	3.1	(0.7)	2.5	(0.8)
Mattresses	23.7	(2.4)	10.6	(1.8)	20.1	(1.9)	9.5	(1.4)
Corn cobs and stalks	11.0	(1.9)	18.5	(2.2)	5.7	(1.0)	10.7	(1.3)
Waterbeds	1.7	(0.8)	0.3	(0.3)	2.3	(1.0)	0.4	(0.3)
Other	11.7	(1.9)	9.5	(1.7)	13.3	(2.5)	12.4	(2.5)
Any	97.0	(0.8)	92.5	(1.4)	94.9	(1.9)	92.7	(1.9)



Photo courtesy of Judy Rodriguez

The primary bedding types used in the last 90 days for lactating and dry cows were straw and/or hay, sand, sawdust/wood products, or composted/dried manure. Composted/dried manure was used on less than 5 percent of operations but represented almost 25 percent of cows, suggesting that primarily large operations were using this bedding type.

b. For operations that used bedding during the previous 90 days, percentage of operations (and percentage of cows on these operations) by bedding type primarily used for ***lactating*** and ***dry*** cows:

	Percent Operations				Percent Cows			
	Lactating Cows		Dry Cows		Lactating Cows		Dry Cows	
Bedding Type	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Straw and/or hay	37.3	(2.9)	43.1	(3.0)	21.1	(2.6)	27.3	(2.6)
Sand	18.0	(2.0)	13.2	(1.8)	25.8	(2.7)	17.5	(2.1)
Sawdust/wood products	21.1	(2.2)	15.9	(2.1)	16.4	(1.7)	15.6	(2.3)
Composted/dried manure	3.8	(0.5)	4.0	(0.7)	24.9	(2.5)	23.7	(3.0)
Rubber mats	1.7	(0.7)	2.3	(1.0)	0.8	(0.4)	1.8	(0.9)
Rubber tires	0.0	(--)	0.0	(--)	0.0	(--)	0.0	(--)
Shredded newspaper	1.0	(0.4)	1.0	(0.8)	0.5	(0.2)	0.4	(0.3)
Mattresses	5.6	(1.6)	3.8	(1.5)	2.6	(0.7)	1.8	(0.6)
Corn cobs and stalks	2.7	(1.1)	9.3	(1.6)	1.1	(0.4)	5.1	(0.9)
Waterbeds	0.6	(0.4)	0.4	(0.3)	1.2	(0.8)	0.3	(0.3)
Other	8.2	(1.6)	7.0	(1.6)	5.6	(1.3)	6.5	(1.7)
Total	100.0		100.0		100.0		100.0	

## 7. Feedstuffs

Dairy operations use a variety of feedstuffs based on factors such as nutrient content, availability, and cost. More than half of operations fed lactating or dry cows alfalfa hay/haylage, corn silage, whole soybeans or soybean meal, or corn.

Percentage of operations by type of feedstuff fed to ***lactating*** and ***dry*** cows during the previous 90 days:

Percent Operations				
Cow Type				
Feedstuffs	Lactating		Dry	
	Percent	Std. Error	Percent	Std. Error
Alfalfa hay/haylage	92.3	(1.6)	75.9	(2.3)
Corn silage	87.6	(1.8)	80.4	(2.3)
Clover as forage or pasture	23.1	(2.4)	24.1	(2.4)
Whole cottonseed	33.0	(2.5)	8.0	(1.5)
Cottonseed meal or hulls	9.3	(1.5)	3.4	(1.0)
Whole soybeans or soybean meal	84.4	(2.1)	45.7	(2.8)
Bakery byproducts	6.6	(1.0)	1.9	(0.6)
Brewery byproducts	37.1	(2.7)	19.7	(2.3)
Corn	94.2	(1.4)	67.1	(2.7)
Barley	14.1	(1.9)	8.6	(1.6)
Wheat (not silage)	6.7	(1.1)	5.0	(1.0)
Oats (not silage)	17.5	(2.4)	20.4	(2.5)
Green chop	4.9	(1.4)	3.4	(1.1)
Feather/poultry meal	3.2	(0.7)	1.0	(0.3)
Fish meal	4.4	(0.9)	0.8	(0.4)
Fat/tallow	32.7	(2.5)	7.9	(1.4)
Porcine meat and bone meal	8.3	(1.3)	0.8	(0.4)
Blood meal	13.2	(1.7)	2.8	(0.7)

## 8. Feedline and feeding practices

The configuration of the feedline can impact the feeding behavior of dairy cattle. An increased amount of feedbunk space per cow as well as some form of physical separation between cows—such as the use of headlocks—reduce competition and have the greatest positive impact on subordinate cows. The most common feedline for small operations was a tie stall (46.2 percent of operations) while post and rail was the single most common feedline on medium operations (37.1 percent of operations). The majority of large operations (79.6 percent) used headlocks at the feedline.

a. Percentage of operations by feedline used for the majority of lactating cows, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Feedline	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Tie stall	46.2	(3.8)	9.2	(2.8)	0.0	(--)	34.1	(2.8)
Stanchion	14.2	(2.8)	3.9	(1.5)	0.0	(--)	10.7	(1.9)
Post and rail	11.3	(2.2)	37.1	(4.0)	15.7	(4.1)	18.0	(1.9)
Headlocks	3.8	(1.2)	22.2	(3.2)	79.6	(4.7)	13.2	(1.3)
Elevated feed bunk in pen	17.8	(2.7)	20.3	(3.2)	0.1	(0.1)	17.3	(2.0)
Other	6.7	(1.8)	7.3	(2.0)	4.6	(2.5)	6.7	(1.3)
Total	100.0		100.0		100.0		100.0	



Photo courtesy of Judy Rodriguez



Feeding cows based on production or state of lactation can decrease feed costs while providing optimal nutrition. Some operations are limited in their ability to provide separate rations due to facilities or cost constraints. The majority of small and medium operations fed lactating cows the same ration (65.6 and 62.2 percent of operations, respectively), while large operations most frequently fed individuals or groups based on production or stage of lactation (70.5 percent of operations).

b. Percentage of operations by feeding practice used to feed lactating cows, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Feeding Practice	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Feed all cows the same ration	65.6	(3.7)	62.2	(4.0)	27.2	(4.6)	62.3	(2.7)
Feed individuals or groups based on production/stage of lactation	32.9	(3.6)	34.0	(4.0)	70.5	(4.5)	35.6	(2.7)
Feed individuals or groups based on lactation number	1.5	(0.8)	1.6	(0.7)	2.2	(1.2)	1.6	(0.6)
Feed individuals or groups based on criteria other than production/stage of lactation or lactation number	0.0	(--)	2.2	(1.1)	0.1	(0.1)	0.5	(0.3)
Total	100.0		100.0		100.0		100.0	

A higher percentage of operations in the West region (52.9 percent) fed individual cows or groups of cows based on production or stage of lactation compared with operations in the East region (33.9 percent). A higher percentage of operations in the East region (63.8 percent) fed all cows the same ration compared with operations in the West region (45.8 percent).

c. Percentage of operations by feeding practice used to feed lactating cows, and by region:

Feeding Practice	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Feed all cows the same ration	45.8	(4.7)	63.8	(2.9)
Feed individuals or groups based on production/stage of lactation	52.9	(4.6)	33.9	(2.9)
Feed individuals or groups based on lactation number	0.8	(0.8)	1.7	(0.7)
Feed individuals or groups based on criteria other than production/stage of lactation or lactation number	0.5	(0.5)	0.6	(0.3)
Total	100.0		100.0	

Feeding anionic salts reduces the incidence of milk fever, although accurate delivery and palatability are issues associated with feeding anionic salts. Since heifers are at very low risk for milk fever, feeding them anionic salts is generally not recommended. The percentage of operations feeding anionic salts to close-up cows increased as herd size increased. A lower percentage of operations fed anionic salts to springing heifers compared to close-up cows (15.7 and 22.9 percent, respectively). A lower percentage of small operations (11.1 percent) fed anionic salts to heifers compared with medium and large operations (23.1 and 36.1 percent, respectively).

d. Percentage of operations that fed anionic salts (e.g., BioChlor™, SoyChlor®, ammonium chloride, etc.) to prevent milk fever, by cattle class and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Cattle Class	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Close-up cows <sup>1</sup>	16.7	(2.8)	31.4	(3.8)	56.7	(5.5)	22.9	(2.2)
Springing heifers <sup>2</sup>	11.1	(2.4)	23.1	(3.3)	36.1	(5.7)	15.7	(1.9)

<sup>1</sup>Cows 2 to 4 weeks prior to calving.

<sup>2</sup>Springing heifers 2 to 4 weeks prior to calving.

A higher percentage of operations in the West region fed anionic salts to close-up cows or springing heifers compared with operations in the East region.

e. Percentage of operations that fed anionic salts (e.g., BioChlor, SoyChlor, ammonium chloride, etc.) to prevent milk fever, by cattle class and by region:

Percent Operations				
Region				
Cattle Class	West		East	
	Percent	Std. Error	Percent	Std. Error
Close-up cows <sup>1</sup>	49.7	(5.2)	20.3	(2.4)
Springing heifers <sup>2</sup>	33.5	(5.2)	14.0	(2.0)

<sup>1</sup>Cows 2 to 4 weeks prior to calving.

<sup>2</sup>Springing heifers 2 to 4 weeks prior to calving.

Separating close-up cows makes it possible to change feeding strategies, such as increasing energy levels or adding anionic salts to the diet. The percentage of operations that separated close-up cows increased as herd size increased; 57.1 percent of all operations separated close-up cows from other dry cows.

f. Percentage of operations that separated close-up cows from other dry cows, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
47.1	(3.9)	74.9	(3.7)	96.0	(2.1)	57.1	(2.9)

Milk urea nitrogen (MUN) testing provides a measure of energy and protein balance in rations fed to cows. The majority of small operations (58.3 percent) never tested MUN, while 48.6 percent of medium operations tested it routinely. A similar percentage of large operations either tested MUN routinely, only tested if there was a problem, or never tested MUN. Half of operations (49.8 percent) tested MUN.

g. Percentage of operations by frequency of milk urea nitrogen testing to determine ration composition, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Frequency	Std. Pct.	Error	Std. Pct.	Error	Std. Pct.	Error	Std. Pct.	Error
Used routinely	24.0	(3.0)	48.6	(4.2)	37.2	(5.7)	30.9	(2.4)
Use only if had a problem	17.7	(2.8)	20.6	(3.4)	24.8	(5.1)	18.9	(2.2)
Never used	58.3	(3.6)	30.8	(3.8)	38.0	(5.6)	50.2	(2.7)
Total	100.0		100.0		100.0		100.0	

## 9. Water sources

Water is one of the most important nutrients for cows. Lactating cows consume, either directly or in feed, between 20 and 35 gallons of water per day. In addition to providing clean water, cattle water sources should be easy to clean, readily accessible, and always available. The most common water source across all operation sizes was a water tank or trough (93.2 percent of operations).

a. Percentage of operations by source of drinking water for any cows during the previous 12 months, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Water Source	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Single cup/bowl waterer used by one cow only	13.3	(2.8)	8.6	(2.6)	2.4	(1.9)	11.4	(2.0)
Single cup/bowl waterer used by multiple cows	74.5	(3.1)	47.7	(4.2)	15.0	(4.4)	64.1	(2.4)
Water tank or trough (covered or uncovered)	91.8	(2.1)	97.4	(1.6)	92.9	(3.4)	93.2	(1.5)
Lake, pond, stream, river, etc.	37.2	(3.7)	29.2	(3.7)	8.7	(2.9)	33.4	(2.7)
Other source	4.4	(1.7)	3.5	(1.5)	0.6	(0.5)	3.9	(1.3)



Photo courtesy of Judy Rodriguez

A higher percentage of operations in the East region used single cup/bowl waterers used by one or multiple cows compared with operations in the West region.

b. Percentage of operations by source of drinking water for any cows during the previous 12 months, by region:

Percent Operations				
Region				
West		East		
Water Source	Percent	Std. Error	Percent	Std. Error
Single cup/bowl waterer used by one cow only	2.2	(1.6)	12.3	(2.2)
Single cup/bowl waterer used by multiple cows	12.9	(3.5)	69.0	(2.6)
Water tank or trough (covered or uncovered)	94.8	(2.5)	93.1	(1.6)
Lake, pond, stream, river, etc.	21.7	(4.7)	34.6	(2.9)
Other source	2.1	(1.1)	4.1	(1.4)

Cleaning water sources may reduce cattle's exposure to pathogens such as *E. coli* and *Salmonella*. The average number of times per year that dairy operations cleaned water sources varied. About one of three operations cleaned single cup/bowl for one cow or water tank/trough 13 or more times per year. No cleaning was reported on 14.2 percent of operations using a single cup/bowl for one cow, 24.2 percent of operations using single cup/bowl for multiple cows, and 4.6 percent of operations using a water tank/trough.

c. Percentage of operations by average number of times per year water sources are drained **and** cleaned, by water source:

Percent Operations						
Number of Times	Single Cup, One Cow		Water Source Single Cup, Multiple Cows		Water Tank/Trough	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
0	14.2	(7.3)	24.2	(3.9)	4.6	(1.4)
1 to 4	27.0	(10.4)	37.0	(4.3)	37.1	(3.2)
5 to 12	26.2	(10.4)	18.7	(3.4)	24.1	(2.8)
13 or more	32.6	(10.2)	20.1	(3.1)	34.2	(2.8)
Total	100.0		100.0		100.0	

Chlorinated water sources may reduce bacteria counts. Few operations (8.7 percent) reported using chlorinated water for cows. A higher percentage of medium operations (14.9 percent) used chlorinated water compared with small operations (6.0 percent).

d. Percentage of operations by whether usual water source for cows was chlorinated, and by herd size (table revised 3-12-09):

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Chlorinated Water</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Yes	6.0	(1.4)	14.9	(2.9)	13.8	(3.8)	8.7	(1.2)
Don't know	0.9	(0.7)	1.8	(1.0)	0.6	(0.3)	1.1	(0.5)
No	93.1	(1.5)	83.3	(3.0)	85.6	(3.8)	90.2	(1.3)
Total	100.0		100.0		100.0		100.0	

There were no differences by region in the percentages of operations in which cows drank chlorinated water.

e. Percentage of operations by whether usual water source for cows was chlorinated, and by region:

<b>Percent Operations</b>				
<b>Region</b>				
<b>Chlorinated Water</b>	<b>West</b>		<b>East</b>	
	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Yes	16.7	(4.0)	7.9	(1.3)
Don't know	0.4	(0.4)	1.2	(0.6)
No	82.9	(4.0)	90.9	(1.4)
Total	100.0		100.0	



**NOTE:** The estimates in tables a and b were calculated using data collected during Phase II of the study (see Methodology). Similar estimates were generated using data collected during Phase I of the study and are included on p 87 and 88 of Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007. The estimates from Phase I and Phase II are similar and within two standard errors of one another, even though they represent different 12-month periods.

#### **10. Permanently removed cows**

Cows are permanently removed from dairy operations for multiple reasons, including low productivity, clinical disease, and space issues. Excluding those that died, one of four cows (25.8 percent) were removed during the previous 12 months. There were no differences across herd sizes in the percentages of cows removed.

a. Percentage of cows permanently removed from the operation during the previous 12 months (excluding those that died), by herd size:

<b>Percent Cows</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
25.2	(1.1)	24.8	(0.8)	26.7	(1.8)	25.8	(0.9)

The majority of operations that permanently removed cows (87.8 percent) sent cows to a market, auction, or stockyard. No differences were observed across herd sizes in the percentage of operations by destination of permanently removed cows.

b. Percentage of operations by destination for permanently removed cows during the previous 12 months, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Destination</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Another dairy	12.0	(2.4)	11.7	(2.6)	8.3	(3.4)	11.7	(1.8)
Market, auction, or stockyard	86.7	(2.7)	90.3	(2.1)	89.8	(3.6)	87.8	(2.0)
Packer or slaughter plant	23.2	(3.4)	26.2	(3.6)	41.1	(5.8)	25.0	(2.5)
Other	3.7	(1.5)	1.7	(0.7)	2.7	(1.9)	3.2	(1.1)

An average of 1.5 shipments per month was made to transport permanently removed cows to a market, auction, or stockyard. The number of shipments increased as herd size increased. On average, few shipments were reported for cows going to another dairy, packer or slaughter plant, or other destination.

c. Operation average number of shipments required to transport permanently removed cows off the operation during an average month, by destination and by herd size:

<b>Operation Average Number of Shipments (Month)</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Destination</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>No.</b>	<b>Std. Error</b>	<b>No.</b>	<b>Std. Error</b>	<b>No.</b>	<b>Std. Error</b>	<b>No.</b>	<b>Std. Error</b>
Another dairy	0.6	(0.1)	1.0	(0.2)	1.1	(0.4)	0.8	(0.1)
Market, auction, or stockyard	1.1	(0.1)	2.2	(0.1)	3.8	(0.3)	1.5	(0.1)
Packer or slaughter plant	0.8	(0.1)	1.8	(0.3)	2.7	(0.3)	1.3	(0.1)
Other	0.2	(0.1)	1.2	(0.2)	1.9	(0.7)	0.5	(0.1)

Cows permanently removed later in lactation usually represent a lower financial loss than cows removed prior to peak lactation. The majority of permanently removed cows (58.0 percent) were 200 days or more in milk at the time of removal, while less than 20 percent were fewer than 50 days in milk.

d. For operations that permanently removed cows during the previous 12 months, percentage of cows removed, by days in milk and by herd size:

<b>Percent Cows</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Days in Milk</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Fewer than 50	15.9	(1.5)	19.3	(1.3)	14.4	(1.9)	16.2	(1.1)
50 to 199	24.7	(1.7)	23.3	(1.5)	21.1	(2.5)	22.6	(1.3)
200 or more	54.5	(2.1)	53.7	(2.0)	62.5	(3.3)	58.0	(1.8)
Dry cows	4.9	(0.9)	3.7	(0.9)	2.0	(0.4)	3.2	(0.4)
Total	100.0		100.0		100.0		100.0	

Operations in the West region permanently removed a higher percentage of cows 200 days or more in milk (65.7 percent) compared with operations in the East region (53.1 percent). A higher percentage of dry cows in the East region (4.2 percent) were permanently removed compared with dry cows in the West region (1.7 percent).

e. For operations that permanently removed cows during the previous 12 months, percentage of cows removed, by days in milk and by region:

Percent Cows				
Region				
Days in Milk	West		East	
	Percent	Std. Error	Percent	Std. Error
Fewer than 50	13.1	(2.2)	18.1	(1.0)
50 to 199	19.5	(2.6)	24.6	(1.3)
200 or more	65.7	(3.5)	53.1	(1.7)
Dry cows	1.7	(0.3)	4.2	(0.6)
Total	100.0		100.0	

The longer a cow stays in the herd and is productive, the more milk and income she generates. Cows removed during first lactation are not able to generate enough income to cover their rearing costs. Approximately one in six permanently removed cows (16.9 percent) was in its first lactation; there were no differences across herd size in the percentage of cows removed in first lactation. A higher percentage of cows on small operations (32.8 percent) were removed at the fifth lactation or more compared with medium and large operations (26.0 and 19.5 percent of cows, respectively).

f. For operations that permanently removed cows during the previous 12 months, percentage of cows removed, by lactation number and by herd size:

Percent Cows								
Herd Size (Number of Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Lactation Number	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
First	17.5	(1.1)	16.4	(0.9)	17.0	(2.2)	16.9	(1.1)
2 to 4	49.7	(1.8)	57.6	(1.8)	63.5	(2.6)	58.5	(1.4)
5 or more	32.8	(1.9)	26.0	(1.7)	19.5	(2.4)	24.6	(1.4)
Total	100.0		100.0		100.0		100.0	

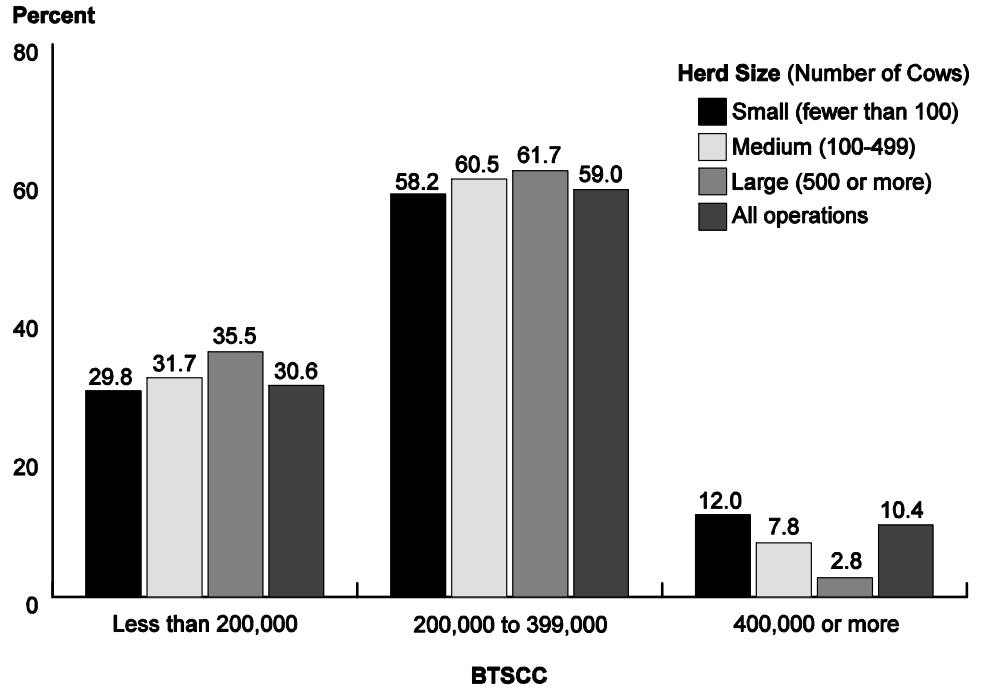
## E. Milk Quality and Milking Procedures

### 1. Bulk tank somatic cell count

Bulk tank somatic cell count (BTSCC) refers to the number of white blood cells (leukocytes) and secretory cells per milliliter of raw milk and is used as a measure of milk quality and udder health. Increased BTSCCs are generally associated with increased intramammary infection and decreased milk production. The current regulatory limit for BTSCC in the United States is 750,000 cells/ml. Although the U.S. regulatory limit is 750,000 cells/ml, producers may lose quality premiums or receive less money for their milk if it does not meet the quality guidelines determined by the processor who purchases their milk. Almost 9 of 10 operations (89.6 percent) reported an average BTSCC below 400,000 cells/ml, and 70.9 percent reported less than 300,000 cells/ml. Herd-size differences were minimal, with a lower percentage of medium operations having a BTSCC of less than 100,000 cells/ml compared with small and large operations.

a. Percentage of operations by average BTSCC for milk shipped during the previous 12 months, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
BTSCC (cells/ml)	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Less than 100,000	3.7	(1.4)	0.3	(0.2)	3.2	(1.8)	2.8	(1.0)
100,000 to 199,000	26.1	(3.5)	31.4	(4.0)	32.3	(5.5)	27.8	(2.6)
200,000 to 299,000	38.4	(3.7)	43.5	(4.3)	47.6	(6.2)	40.3	(2.8)
300,000 to 399,000	19.8	(2.7)	17.0	(3.0)	14.1	(4.1)	18.7	(2.0)
400,000 to 499,000	9.6	(2.6)	7.8	(2.3)	2.3	(1.2)	8.7	(1.9)
500,000 or more	2.4	(1.5)	0.0	(--)	0.5	(0.5)	1.7	(1.0)
Total	100.0		100.0		100.0		100.0	

**Percentage of Operations by Average BTSCC for Milk Shipped During the Previous 12 Months, and by Herd Size**

There were no substantial differences by region in the percentages of operations by average BTSCC.

b. Percentage of operations by average BTSCC for milk shipped during the previous 12 months, and by region:

Percent Operations				
Region				
West		East		
BTSCC (cells/ml)	Percent	Std. Error	Percent	Std. Error
Less than 100,000	2.7	(1.4)	2.8	(1.1)
100,000 to 199,000	34.6	(5.1)	27.2	(2.8)
200,000 to 299,000	38.2	(4.9)	40.5	(3.0)
300,000 to 399,000	18.9	(4.5)	18.7	(2.2)
400,000 to 499,000	4.7	(2.1)	9.1	(2.1)
500,000 or more	0.9	(0.6)	1.7	(1.1)
Total	100.0		100.0	

## 2. Milking personnel and training

Owners of large operations are usually more involved with the overall management of the operation than with specific labor-intensive procedures such as milking cows. The percentage of owners/operators that milked the majority of cows decreased from 74.8 percent for small operations to 0.0 percent of large operations. Family members milked the majority of cows on 17.4 percent of small operations and on 14.3 percent of medium operations. No large operations reported family members performing the majority of milking. The number of employees increased as herd size increased. Large operations averaged almost 13 full-time employees, while small operations averaged 2 (see table 4b p 11). The percentage of operations in which hired workers milked the majority of cows increased as herd size increased. Hired workers milked the majority of cows on 100.0 percent of large operations.



a. Percentage of operations by personnel who milked the majority of cows, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Personnel	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Owner/operator	74.8	(3.3)	33.7	(3.9)	0.0	(--)	59.8	(2.5)
Family member(s) of operator	17.4	(3.0)	14.3	(3.1)	0.0	(--)	15.6	(2.2)
Hired worker(s)	7.8	(1.8)	52.0	(3.9)	100.0	(0.0)	24.6	(1.7)
Total	100.0		100.0		100.0		100.0	

Hired workers milked the majority of cows on the highest percentage of operations in the West region (82.7 percent), while owners/operators milked the majority of cows on the highest percentage of operations in the East region (64.1 percent). A higher percentage of operations in the East region had family members milk the majority of cows compared with operations in the West region (16.9 and 1.2 percent, respectively).

b. Percentage of operations by personnel who milked the majority of cows, and by region:

Percent Operations				
Region				
Personnel	West		East	
	Percent	Std. Error	Percent	Std. Error
Owner/operator	16.1	(3.4)	64.1	(2.7)
Family member(s) of operator	1.2	(0.8)	16.9	(2.4)
Hired worker(s)	82.7	(3.5)	19.0	(1.8)
Total	100.0		100.0	

Although owners/operators milked the majority of cows on the most operations (reflecting the practice of small operations), the highest percentage of cows were milked by hired workers (68.2 percent) [reflecting the practice of large operations]. Almost one-quarter of cows (24.4 percent) were milked by owners/operators, while 7.4 percent were milked by family members.

c. Percentage of cows on operations in which the majority of cows were milked by the specified personnel:

<b>Personnel</b>	<b>Percent Cows</b>	<b>Standard Error</b>
Owner/operator	24.4	(1.5)
Family member(s) of operator	7.4	(1.1)
Hired worker(s)	68.2	(1.6)
Total	100.0	

Training milking personnel in the proper procedures used to milk cows and providing reasons for the procedures are usually ongoing processes, as milking protocols are often modified or updated. Milker training increased as herd size increased, with 42.3 percent of small operations training milking personnel compared with 75.3 percent of medium operations and 97.8 percent of large operations. Approximately one of three operations (35.6 percent) trained new employees only, while almost half of operations (46.0 percent) provided no milker training. However, approximately one of three operations that reported no milker training also reported they had no employees. A lower percentage of small operations (2.9 percent) performed training one to two times/year for all milkers compared with medium and large operations (14.1 and 27.0 percent, respectively).

d. Percentage of operations by how frequently milking personnel were trained, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Frequency	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
As new employees only	31.2	(3.6)	46.4	(4.1)	41.5	(5.6)	35.6	(2.7)
1 to 2 times/year for all milkers	2.9	(1.0)	14.1	(2.8)	27.0	(5.5)	7.2	(1.0)
3 to 4 times/year for all milkers	2.3	(1.3)	4.1	(1.3)	13.7	(3.8)	3.5	(1.0)
5 times/year or more for all milkers	1.0	(0.9)	6.6	(2.4)	10.5	(3.4)	3.0	(0.9)
Other	4.9	(1.6)	4.1	(1.8)	5.1	(2.5)	4.7	(1.2)
No milker training	57.7	(3.8)	24.7	(3.7)	2.2	(2.1)	46.0	(2.8)
Total	100.0		100.0		100.0		100.0	



Photo courtesy of Keith Weller, Agricultural Research Service

A higher percentage of operations in the West region provided milker training to new employees only or provided training one to two times/year for all milkers, compared with operations in the East region.

e. Percentage of operations by how frequently milking personnel were trained, and by region:

Percent Operations				
Region				
	West		East	
Frequency	Percent	Std. Error	Percent	Std. Error
As new employees only	53.5	(5.6)	33.9	(2.9)
1 to 2 times/year for all milkers	20.7	(4.0)	5.9	(1.1)
3 to 4 times/year for all milkers	6.7	(2.8)	3.2	(1.0)
5 times/year or more for all milkers	1.5	(0.9)	3.1	(1.0)
Other	2.0	(1.4)	5.0	(1.3)
No milker training	15.6	(3.9)	48.9	(3.0)
Total	100.0		100.0	

Almost all operations that trained milkers (97.1 percent) used on-the-job training. Almost one-third (31.9 percent) used discussion and lecture, while less than 1 of 10 (6.9 percent) used video training.

f. For operations that trained milking personnel, percentage of operations by training method used:

Training Method	Percent Operations	Standard Error
Video training	6.9	(1.1)
Discussion/lecture	31.9	(3.2)
On-the-job training	97.1	(0.9)
Other	3.9	(1.0)

### 3. Milking frequency

Milk production can be negatively affected by intramammary pressure. Frequent milking during peak production can decrease periods of increased intramammary pressure. Although increased milking frequency opens the teat canal more times, the risk for intramammary infection does not appear to be increased. Evidence suggests that increasing the times per day that fresh cows (cows less than 30 days in milk) are milked increases milk production, which persists throughout lactation. More than 9 of 10 operations (91.8 percent) milked fresh cows twice daily, while less than 1 of 10 (6.2 percent) milked fresh cows 3 times daily. Few operations milked fresh cows one time per day or more than three times per day (0.6 and 1.4 percent, respectively). The percentage of operations that milked fresh cows three times per day increased as herd size increased.

a. Percentage of operations by number of times per day the majority of **fresh** cows were milked, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Times per Day	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
1	0.6	(0.6)	0.5	(0.5)	0.0	(--)	0.6	(0.4)
2	98.4	(0.9)	81.8	(2.8)	58.9	(4.7)	91.8	(1.0)
3	1.0	(0.6)	13.3	(2.4)	35.1	(4.4)	6.2	(0.8)
More than 3	0.0	(--)	4.4	(1.7)	6.0	(2.7)	1.4	(0.5)
Total	100.0		100.0		100.0		100.0	

A lower percentage of operations in the West region (82.2 percent) milked fresh cows twice daily compared with operations in the East region (92.7 percent). A higher percentage of operations in the West region (17.8 percent) milked fresh cows three or more times daily compared with operations in the East region (6.7 percent).

b. Percentage of operations by number of times per day the majority of *fresh* cows were milked, and by region:

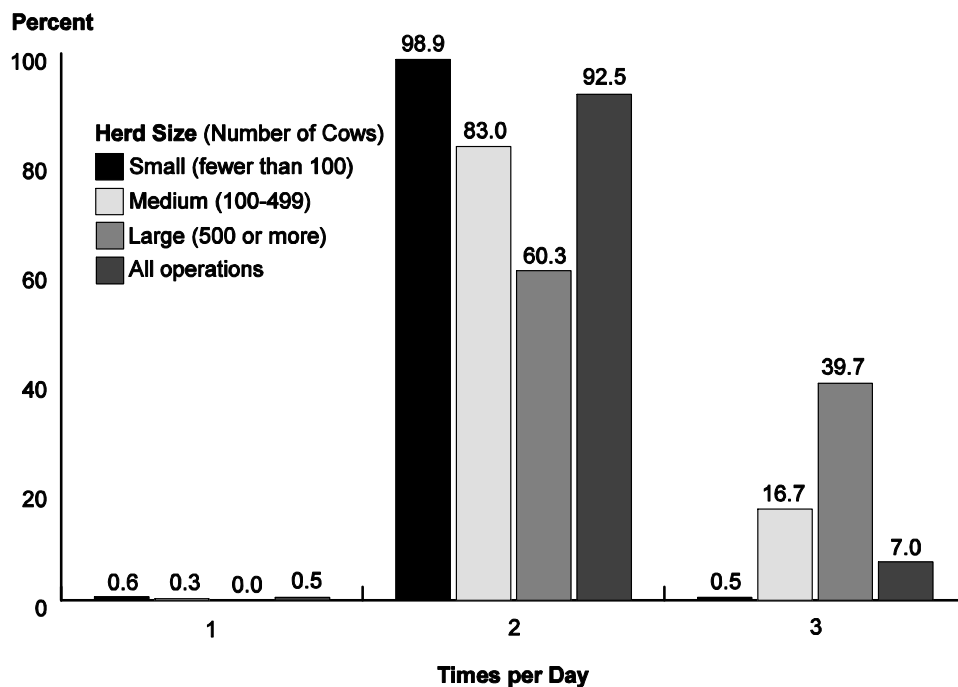
Percent Operations				
Region				
West			East	
Times per Day	Percent	Std. Error	Percent	Std. Error
1	0.0	(--)	0.6	(0.5)
2	82.2	(3.4)	92.7	(1.0)
3	13.7	(3.1)	5.5	(0.8)
More than 3	4.1	(2.0)	1.2	(0.5)
Total	100.0		100.0	

The majority of operations (92.5 percent) milked cows (other than fresh cows) twice daily. As was observed with the frequency of milking fresh cows, the percentage of operations that milked cows three times per day increased as herd size increased. No operations milked the majority of their cows more than three times per day.

c. Percentage of operations by number of times per day the majority of cows (other than fresh cows) were milked, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Times per Day	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
1	0.6	(0.6)	0.3	(0.3)	0.0	(--)	0.5	(0.4)
2	98.9	(0.7)	83.0	(2.8)	60.3	(5.2)	92.5	(0.9)
3	0.5	(0.4)	16.7	(2.8)	39.7	(5.2)	7.0	(0.8)
Total	100.0		100.0		100.0		100.0	

**Percentage of Operations by Number of Times per Day the Majority of Cows (Other than Fresh Cows) Were Milked, and by Herd Size**



A higher percentage of operations in the West region (14.9 percent) milked cows three times daily compared with operations in the East region (6.2 percent). No operations milked the majority of their cows more than three times per day.

d. Percentage of operations by the number of times per day the majority of cows, other than fresh cows, were milked, and by region:

Percent Operations				
Region				
West			East	
Times per Day	Percent	Std. Error	Percent	Std. Error
1	0.0	(--)	0.6	(0.5)
2	85.1	(3.0)	93.2	(1.0)
3	14.9	(3.0)	6.2	(0.8)
Total	100.0		100.0	

The percentage of operations that milked fresh cows more frequently than nonfresh cows increased as herd size increased. Only 0.5 percent of small operations milked fresh cows more often than nonfresh cows, compared with 5.7 percent of medium operations and 12.3 percent of large operations.

e. Percentage of operations that milked fresh cows more often than nonfresh cows:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
0.5	(0.5)	5.7	(1.8)	12.3	(4.4)	2.5	(0.6)

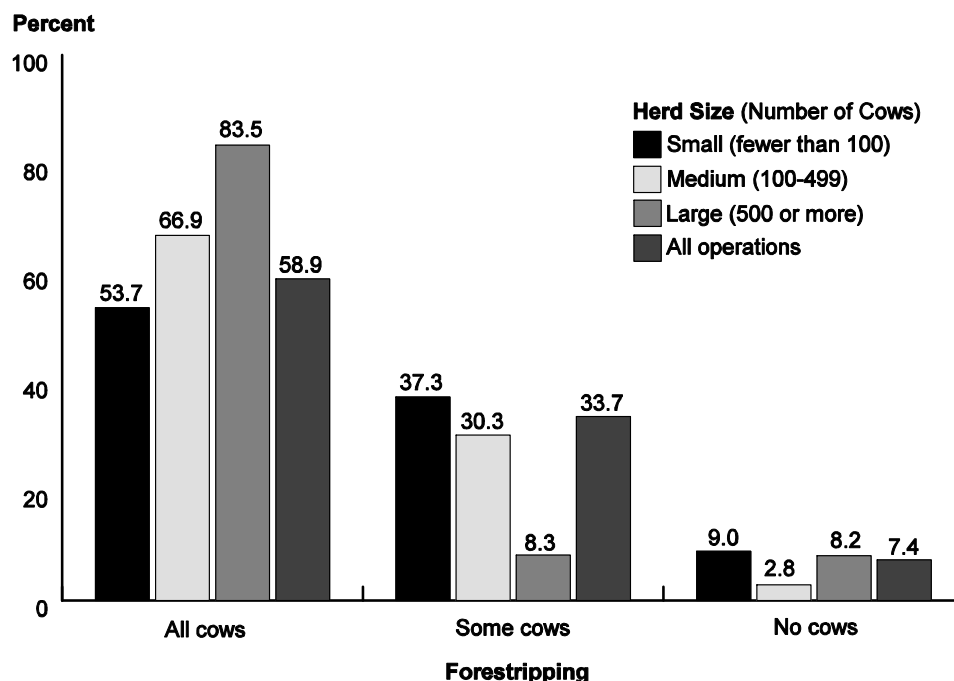


#### 4. Premilking procedures

Forestripping is the manual removal of a small amount of milk from each teat prior to the attachment of the milking machine. Forestripping cows stimulates milk secretion from mammary tissue, allows the milker to observe any abnormalities in the milk, and removes milk with concentrated somatic cells, thereby improving milk quality. A higher percentage of large operations (83.5 percent) forestripped all cows compared with medium and small operations (66.9 and 53.7 percent, respectively). A higher percentage of small and medium operations forestripped some cows (37.3 and 30.3 percent, respectively), compared with 8.3 percent of large operations. Less than 10 percent of operations across all herd sizes did not forestrip any cows.

a. Percentage of operations by use of forestripping and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
<b>Forestripping</b>								
All cows	53.7	(3.9)	66.9	(3.9)	83.5	(4.2)	58.9	(2.9)
Some cows	37.3	(3.8)	30.3	(3.9)	8.3	(2.4)	33.7	(2.8)
No cows	9.0	(2.3)	2.8	(1.1)	8.2	(3.6)	7.4	(1.6)
Total	100.0		100.0		100.0		100.0	

**Percentage of Operations by Use of Forestripping and by Herd Size**

If forestripping is performed before teat disinfection or while disinfectant is still on the teat, it may reduce the transfer of organisms from the milker to the teat. Teats may become recontaminated with bacteria if forestripping is performed after drying. Approximately one of four operations (27.4 percent) forestripped cows prior to teat disinfection. A lower percentage of small operations forestripped cows after disinfection but prior to drying compared to large operations (26.8 and 46.7 percent, respectively), while a higher percentage of small operations (47.0 percent) forestripped cows after disinfection and drying compared with large operations (22.4 percent).

b. For operations that forestripped any cows, percentage of operations by order of forestripping and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Order	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct. Std. Error
Prior to teat disinfection	26.2	(3.4)	29.7	(3.9)	30.9	(5.7)	27.4 (2.6)
After teat disinfection but prior to drying teats	26.8	(3.5)	31.6	(3.6)	46.7	(6.2)	29.3 (2.6)
After disinfection and/or drying	47.0	(4.0)	38.7	(4.1)	22.4	(5.0)	43.3 (2.9)
Total	100.0		100.0		100.0		100.0

A lower percentage of operations in the West region (22.8 percent) forestripped after disinfection and/or drying compared with operations in the East region (45.2 percent).

c. For operations that forestripped any cows, percentage of operations by order of forestripping and by region:

Percent Operations				
Region				
Order	West		East	
	Percent	Std. Error	Percent	Std. Error
Prior to teat disinfection	37.4	(5.6)	26.4	(2.7)
After teat disinfection but prior to drying teats	39.8	(5.6)	28.4	(2.7)
After disinfection and/or drying	22.8	(4.3)	45.2	(3.1)
Total	100.0		100.0	

Disinfecting teats before milking reduces environmental bacteria on the teat surface, bacterial counts in milk, and the incidence of new intramammary infections. Scientific studies evaluating the efficacy of premilking and postmilking teat disinfectants have been evaluated and are summarized each year in the proceedings from the NMC annual meeting. Using a new paper or cloth towel on each cow also reduces the risk of transmitting organisms from one cow to another. More than 4 of 10 large operations (41.5 percent) used a wash pen prior to milking, compared with less than 3 percent of small and medium operations. There were no differences by herd size in the percentage of operations that used water hoses; 2.8 percent of operations used water hoses with disinfectant and 4.2 percent used water hoses without disinfectant. A single-use paper towel dry wipe was used on 7.0 percent of operations. A single-use towel with labeled disinfectant was the predominant wet wipe used on 8.5 percent of operations. A higher percentage of small operations used this wet wipe method (10.3 percent) compared with large operations (1.5 percent). Almost half of all operations (49.0 percent) applied a labeled disinfectant in a predip via a predip cup. Predip (using a labeled disinfectant) applied via a sprayer was reported on 18.1 percent of operations, with a higher percentage of large operations using this method of teat disinfection than small operations.

## d. Percentage of operations by teat preparation and by herd size:

		Percent Operations Herd Size (Number of Cows)							
Teat Preparation		Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
General Method	Specific Procedure	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Wash pen	Wash animals in pen prior to entering parlor	1.2	(1.0)	2.4	(1.0)	41.5	(5.1)	4.1	(0.8)
Water hose	With disinfectant	2.6	(1.4)	2.3	(0.9)	6.7	(2.8)	2.8	(1.0)
	Without disinfectant	4.7	(1.3)	2.3	(0.9)	5.9	(2.8)	4.2	(1.0)
Dry wipe	Single-use cloth towel	2.7	(1.3)	4.7	(2.0)	3.8	(2.1)	3.3	(1.0)
	Multiple-use cloth towel	1.3	(0.7)	3.3	(1.2)	6.0	(2.9)	2.1	(0.6)
	Single-use paper towel	7.9	(1.9)	5.4	(2.1)	3.5	(2.4)	7.0	(1.4)
	Multiple-use paper towel	0.0	(--)	0.4	(0.3)	0.0	(--)	0.1	(0.1)
Wet wipe	Commercial teat wipes, single use	4.0	(1.4)	5.8	(2.3)	0.9	(0.8)	4.2	(1.1)
	Commercial teat wipes, multiple use	0.9	(0.9)	0.4	(0.4)	0.0	(--)	0.7	(0.6)
	Towel using labeled disinfectant, single use	10.3	(2.4)	5.1	(1.8)	1.5	(0.9)	8.5	(1.7)
	Towel using labeled disinfectant, multiple use	6.1	(1.9)	2.0	(0.9)	3.5	(2.4)	4.9	(1.4)
	Towel using nonlabeled/homemade disinfectant, single use	3.2	(1.7)	2.1	(1.3)	0.0	(--)	2.7	(1.2)
	Towel using nonlabeled/homemade disinfectant, multiple use	0.5	(0.5)	0.6	(0.5)	0.0	(--)	0.5	(0.3)
	Multiple use sponge with disinfectant	1.8	(0.9)	0.2	(0.2)	0.0	(--)	1.3	(0.6)
Predip applied via ...	Sprayer, labeled disinfectant	13.6	(2.5)	25.4	(3.5)	38.2	(5.6)	18.1	(2.0)
	Sprayer, nonlabeled/ homemade disinfectant	0.0	(--)	2.0	(1.4)	1.7	(1.6)	0.6	(0.4)
	Predip cup, labeled disinfectant	49.8	(3.9)	51.0	(4.2)	32.3	(5.3)	49.0	(2.9)
	Predip cup, nonlabeled/homemade disinfectant	2.8	(1.5)	0.7	(0.7)	1.9	(1.3)	2.2	(1.0)
	Foam, labeled disinfectant	1.4	(0.8)	8.2	(2.1)	6.1	(2.5)	3.4	(0.8)
	Foam, nonlabeled/ homemade disinfectant	0.0	(--)	0.7	(0.7)	0.0	(--)	0.2	(0.2)
Other		6.5	(1.9)	3.7	(1.4)	1.4	(0.7)	5.5	(1.3)

Few regional differences were observed in the implementation of premilking teat preparation practices. A higher percentage of operations in the West used a wash pen, a water hose without disinfectant, or applied a labeled disinfectant in a predip via a sprayer compared with operations in the East region. A higher percentage of operations in the East region used a predip cup to apply a labeled disinfectant to teats compared with operations in the West.

e. Percentage of operations by teat preparation and by region:

		Percent Operations Region			
Teat Preparation		West		East	
General Method	Specific Procedure	Percent	Std. Error	Percent	Std. Error
Wash pen	Wash animals in pen prior to entering parlor	36.8	(4.6)	0.9	(0.8)
Water hose	With disinfectant	9.3	(2.9)	2.2	(1.0)
	Without disinfectant	13.9	(3.7)	3.3	(1.0)
Dry wipe	Single-use cloth towel	4.2	(2.4)	3.2	(1.1)
	Multiple-use cloth towel	4.7	(2.4)	1.8	(0.6)
	Single-use paper towel	12.3	(4.6)	6.5	(1.5)
	Multiple-use paper towel	0.4	(0.4)	0.1	(0.1)
Wet wipe	Commercial teat wipes, single use	3.5	(2.2)	4.3	(1.2)
	Commercial teat wipes, multiple use	0.0	(--)	0.8	(0.7)
	Towel using labeled disinfectant, single use	2.2	(1.6)	9.1	(1.9)
	Towel using labeled disinfectant, multiple use	7.1	(3.6)	4.7	(1.5)
	Towel using nonlabeled/homemade disinfectant, single use	3.0	(3.0)	2.7	(1.3)
	Towel using nonlabeled/homemade disinfectant, multiple use	0.4	(0.4)	0.5	(0.4)
	Multiple use sponge with disinfectant	0.8	(0.8)	1.4	(0.7)
Predip applied via . . .	Sprayer, labeled disinfectant	36.5	(4.7)	16.3	(2.1)
	Sprayer, nonlabeled/homemade disinfectant	1.1	(1.1)	0.5	(0.4)
	Predip cup, labeled disinfectant	27.4	(4.6)	51.1	(3.1)
	Predip cup, nonlabeled/homemade disinfectant	0.9	(0.9)	2.4	(1.1)
	Foam, labeled disinfectant	0.0	(--)	3.7	(0.9)
	Foam, nonlabeled/homemade disinfectant	0.0	(--)	0.2	(0.2)
	Other	0.0	(--)	6.0	(1.5)

The majority of operations (about 60 percent) used iodophor compounds as predips in both summer and winter. Chlorhexidine was the next most common predip used by about 1 of 10 operations. There were no differences in summer or winter in the percentage of operations by compound used.

f. Percentage of operations by primary ***predip*** compounds used as disinfectants, and by season:

Percent Operations				
Season				
Compound	Summer		Winter	
	Percent	Std. Error	Percent	Std. Error
Iodophor (iodine containing)	59.6	(2.9)	59.7	(2.9)
Chlorhexidine	11.7	(2.1)	11.8	(2.1)
Fatty acid based	2.5	(0.7)	2.5	(0.7)
Quaternary ammonium	0.3	(0.2)	0.3	(0.2)
Phenols	0.1	(0.1)	0.1	(0.1)
Chlorine product	7.2	(1.5)	7.1	(1.5)
Other	7.9	(1.6)	8.0	(1.6)
None	10.7	(1.8)	10.5	(1.8)
Total	100.0		100.0	

Wet teats can cause liner slips and rapid air movement inside the milking claw, which may result in the injection of bacteria into teat canals, potentially resulting in mastitis. If teats become wet during premilking teat preparation, they should be dried using a single-use towel to decrease the risk of new infections. There were no seasonal differences in teat drying methods. Single-use paper or cloth towels were used on the majority of operations during summer and winter.

g. Percentage of operations by the method used to dry teats *prior* to milking, and by season:

Percent Operations				
Drying Method	Summer		Winter	
	Percent	Std. Error	Percent	Std. Error
Air dry	12.4	(2.1)	12.3	(2.1)
Single-use cloth towel	21.5	(2.1)	21.6	(2.1)
Single-use paper towel	54.8	(2.8)	54.6	(2.8)
Multiple-use cloth towel	7.1	(1.3)	7.1	(1.3)
Multiple-use paper towel	0.6	(0.4)	0.6	(0.4)
Other	0.4	(0.3)	0.6	(0.3)
Not applicable—teats not wet prior to milking	3.2	(1.1)	3.2	(1.1)
Total	100.0		100.0	





Photo courtesy of Judy Rodriguez

### 5. Postmilking procedures

The use of postmilking teat disinfectant reduces the incidence of contagious mastitis. Less than 2 percent of operations did not use a postmilking teat disinfectant during summer and/or winter (1.4 and 1.2 percent, respectively). More than three of four operations dipped teats with a labeled postdip product in each season. Approximately one of eight operations applied labeled disinfectant with a sprayer during the summer and winter (12.6 and 12.8 percent, respectively).

a. Percentage of operations by postmilking teat disinfection method and by season:

	Percent Operations			
	Summer		Winter	
Teat Disinfection Method	Percent	Std. Error	Percent	Std. Error
Teats dipped with labeled postdip product	79.7	(2.4)	77.0	(2.5)
Teats dipped with nonlabeled/homemade solution	0.5	(0.4)	0.5	(0.4)
Teats sprayed with commercial postdip product	12.6	(1.8)	12.8	(1.9)
Teats foamed with commercial postdip product	0.5	(0.3)	0.5	(0.3)
Teats covered in commercial powder product	0.1	(0.1)	2.7	(0.9)
Other	1.4	(0.9)	1.2	(0.6)
None	5.2	(1.6)	5.3	(1.6)
Total	100.0		100.0	

The percentages of operations by postdip compound were similar to the percentages of operations by predip compound. The majority of operations (approximately 70 percent) used an iodophor compound. Chlorhexidine was used by about 13 percent of operations.

b. Percentage of operations by primary *postdip* compounds used as disinfectants, and by season:

Percent Operations				
Season				
Compound	Summer		Winter	
	Percent	Std. Error	Percent	Std. Error
Iodophor (iodine containing)	69.8	(2.9)	67.8	(2.9)
Chlorhexidine	12.1	(2.1)	13.4	(2.2)
Fatty acid based	6.4	(1.4)	7.2	(1.5)
Quaternary ammonium	0.3	(0.2)	0.8	(0.5)
Phenols	0.0	(--)	0.0	(0.0)
Chlorine product	2.3	(1.1)	1.7	(0.8)
Other	3.9	(1.1)	3.8	(1.1)
None	5.2	(1.6)	5.3	(1.6)
Total	100.0		100.0	

Barrier teat dip applied after milking provides germicidal protection, improves teat condition, and reduces the number of new cases of mastitis. Approximately one of four operations (24.5 percent) used a barrier teat dip on all cows all the time, with no differences across herd sizes. A higher percentage of large and medium operations used a barrier teat dip on all cows during winter or adverse weather compared with small operations. Overall, two of three operations (66.7 percent) did not use a barrier dip, with a higher percentage of small operations (70.9 percent) not using a barrier dip compared with large operations (44.7 percent).

c. Percentage of operations by use of barrier teat dip\* and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Use of Barrier Teat Dip</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
All cows all the time	22.2	(2.9)	29.8	(3.8)	29.3	(5.7)	24.5	(2.2)
All cows during winter or adverse weather	0.0	(--)	5.6	(1.8)	14.4	(4.8)	2.3	(0.6)
Other	6.9	(2.1)	4.2	(1.8)	11.6	(3.9)	6.5	(1.6)
None	70.9	(3.3)	60.4	(4.1)	44.7	(5.7)	66.7	(2.5)
Total	100.0		100.0		100.0		100.0	

\*e.g., Blockade®, UDDERgold® 5-star.

A higher percentage of operations in the East region (68.4 percent) did not use a barrier teat dip compared with operations in the West region (49.0 percent). A higher percentage of operations in the West region (9.5 percent) used a barrier teat dip on all cows during winter or adverse weather compared with operations in the East region (1.6 percent).

d. Percentage of operations by use of barrier teat dip\* and by region:

Percent Operations				
Region				
West			East	
Use of Barrier Teat Dip	Percent	Std. Error	Percent	Std. Error
All cows all the time	37.8	(5.3)	23.2	(2.4)
All cows during winter or adverse weather	9.5	(3.4)	1.6	(0.5)
Other	3.7	(1.7)	6.8	(1.7)
None	49.0	(5.4)	68.4	(2.7)
Total	100.0		100.0	

\*e.g., Blockade® Uddergold® 5-star.

## 6. Milking equipment

A backflush system is used between cows to wash the milking claw or cluster, thereby helping to reduce the spread of contagious mastitis pathogens. There were no differences in the percentage of operations that used a backflush system across herd sizes.

a. Percentage of operations that used a backflush system in milking units, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
5.9	(1.8)	8.6	(2.1)	9.3	(2.6)	6.8	(1.3)

A higher percentage of operations in the West region (20.9 percent) used a backflush system compared with operations in the East region (5.4 percent).

b. Percentage of operations that used a backflush system in milking units, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
20.9	(4.0)	5.4	(1.4)

The majority of operations that used a backflush system (91.4 percent) used the system for every milking.

c. For operations that used a backflush system, percentage of operations that used the system for every milking:

Percent Operations	Standard Error
91.4	(4.1)

Automatic takeoffs may improve teat-end condition by promptly removing the milking claw at a predetermined flow rate. A higher percentage of medium and large operations (76.9 and 89.5 percent, respectively) used automatic takeoffs compared with small operations (30.2 percent).

d. Percentage of operations that used automatic takeoffs, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
30.2	(3.3)	76.9	(3.8)	89.5	(3.4)	45.4	(2.6)

About 7 of 10 operations in the West region (69.6 percent) used automatic takeoffs compared with approximately 4 of 10 operations in the East region (43.1 percent).

e. Percentage of operations that used automatic takeoffs, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
69.6	(4.1)	43.1	(2.8)

## 7. Milking practices

Approximately half of operations (55.2 percent) reported that milkers wore latex or nitrile gloves to milk all cows. However, more than three of four cows (76.8 percent) were on operations in which gloves were used, suggesting that the practice is more common on large operations.

a. Percentage of operations (and percentage of cows on these operations) in which milkers wore latex or nitrile gloves to milk all cows:

Percent Operations	Standard Error	Percent Cows	Standard Error
55.2	(2.8)	76.8	(2.5)

Milking cows with clinical mastitis at the end of milking, with a separate milking unit, or in a separate string can reduce the exposure of noninfected cows to mastitis organisms. Approximately one of three operations (34.9 percent) used a separate milking unit to milk mastitic cows; no differences were observed across herd sizes. A higher percentage of large operations (83.4 percent) milked mastitic cows in a separate string from healthy cows compared with medium and small operations (33.4 and 29.8 percent, respectively).

b. Percentage of operations by method used for milking cows with clinical mastitis, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Method	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Separate milking unit from healthy cows	38.5	(3.7)	25.7	(3.6)	31.5	(5.3)	34.9	(2.7)
Separate string from healthy cows	29.8	(3.5)	33.4	(3.8)	83.4	(4.7)	34.1	(2.6)

About 6 of 10 operations in the West region (59.9 percent) milked mastitis cows in a separate string from healthy cows compared with approximately 3 of 10 operations in the East region (31.6 percent).

c. Percentage of operations by method used to milk cows with clinical mastitis, and by region:

Percent Operations				
Region				
Method	West		East	
	Percent	Std. Error	Percent	Std. Error
Separate milking unit from healthy cows	27.5	(4.9)	35.6	(2.9)
Separate string from healthy cows	59.9	(5.0)	31.6	(2.8)



## 8. Vaccination

Although the efficacy of certain mastitis vaccines has been questioned, coliform vaccines have generally provided good protection. Coliform vaccines were used on at least some cows on 37.6 percent of operations, compared with vaccines for *Salmonella* (13.4 percent), siderophore receptors (4.1 percent), *Mycoplasma* (1.8 percent), and *Staphylococcus aureus* (7.3 percent).

a. Percentage of operations by type of vaccination used during the previous 12 months, and by proportion of cows vaccinated:

Percent Operations							
Proportion of Cows							
	All		Some		None		
Vaccination Type	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Total
Coliform mastitis	32.6	(2.4)	5.0	(1.1)	62.4	(2.6)	100.0
<i>Salmonella</i>	11.1	(1.5)	2.3	(0.7)	86.6	(1.6)	100.0
Siderophore receptors and porins (SRPs) vaccine	3.3	(0.7)	0.8	(0.4)	95.9	(0.8)	100.0
<i>Mycoplasma</i>	1.4	(0.5)	0.4	(0.2)	98.2	(0.6)	100.0
<i>Staphylococcus aureus</i>	5.7	(1.1)	1.6	(0.6)	92.7	(1.2)	100.0

Regional differences in vaccine use were observed for coliform mastitis and *Salmonella* vaccines. More operations in the West region vaccinated their cows than operations in the East region.

b. Percentage of operations that vaccinated at least some cows during the previous 12 months, by vaccination type and by region:

Vaccination Type	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Coliform mastitis	65.1	(4.7)	35.0	(2.8)
<i>Salmonella</i>	36.4	(4.8)	11.1	(1.7)
Siderophore receptors and porins (SRPs) vaccine	9.2	(2.9)	3.6	(0.8)
<i>Mycoplasma</i>	4.1	(2.5)	1.6	(0.6)
<i>Staphylococcus aureus</i>	13.2	(3.5)	6.7	(1.3)

Less than 4 percent of operations administered an autogenous vaccine.

c. Percentage of operations that administered autogenous vaccines for any disease, by proportion of cows receiving vaccine:

Proportion of Cows	Percent Operations	Standard Error
All	2.2	(0.6)
Some	1.4	(0.9)
None	96.4	(1.1)
Total	100.0	

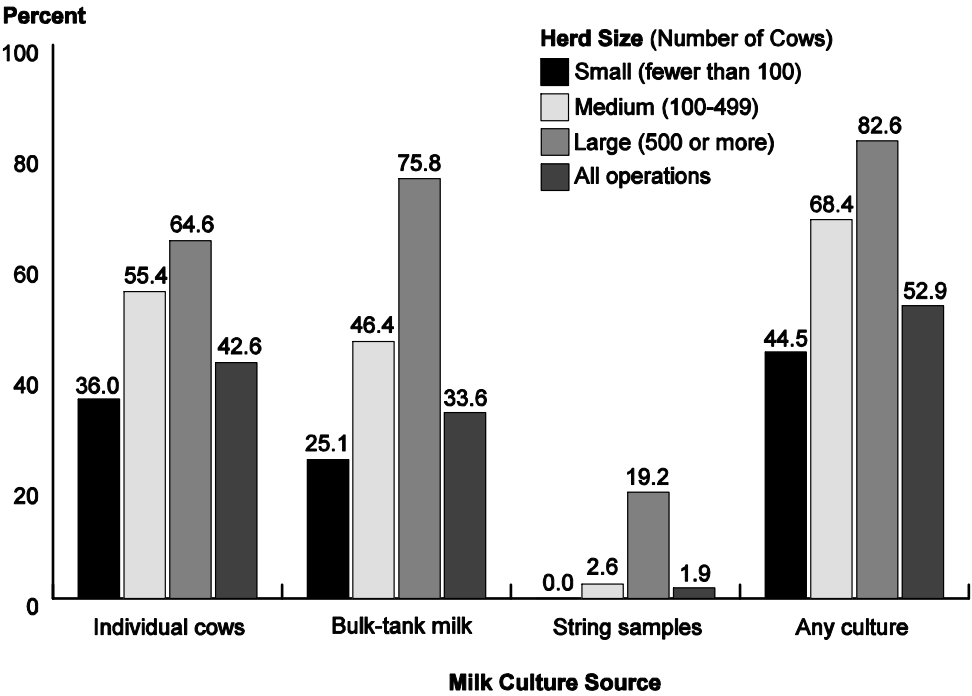
## 9. Milk cultures

Culturing milk has many benefits, including the identification of the most prevalent cause of clinical mastitis, helping direct mastitis therapy, and screening purchased herds or milking strings for contagious mastitis pathogens. A lower percentage of small operations performed individual cow, bulk-tank milk, string sample, or any cultures compared with medium and large operations. A higher percentage of large operations performed bulk-tank milk or string-sample cultures compared with medium and small operations. More than half of all operations (52.9 percent) performed milk cultures during the previous 12 months. More than 8 of 10 large operations (82.6 percent) performed any culture, compared with about 7 of 10 medium operations (68.4 percent) and 4 of 10 small operations (44.5 percent).

a. Percentage of operations by source of milk cultures performed during the previous 12 months, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Milk Culture Source	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Individual cows	36.0	(3.6)	55.4	(4.2)	64.6	(5.3)	42.6	(2.7)
Bulk-tank milk	25.1	(3.3)	46.4	(4.1)	75.8	(5.1)	33.6	(2.5)
String samples	0.0	(--)	2.6	(0.8)	19.2	(3.9)	1.9	(0.3)
Any culture	44.5	(3.8)	68.4	(3.9)	82.6	(4.6)	52.9	(2.8)

**Percentage of Operations by Source of Milk Cultures Performed During the Previous 12 Months, and by Herd Size**



A higher percentage of operations in the West region performed bulk-tank milk or string-sample cultures compared with operations in the East region.

b. Percentage of operations by source of milk cultures performed during the previous 12 months, and by region:

Percent Operations				
Milk Culture Source	West		East	
	Percent	Std. Error	Percent	Std. Error
Individual cows	43.4	(5.3)	42.6	(2.9)
Bulk-tank milk	60.6	(5.1)	31.0	(2.7)
String samples	11.0	(3.0)	1.0	(0.2)
Any culture	65.1	(5.0)	51.7	(3.1)

For operations that performed milk cultures during the previous 12 months, a higher percentage of large operations (20.8 percent) performed on-farm cultures compared with small operations (4.2 percent). A higher percentage of medium operations (45.5 percent) had cultures performed at a State or university diagnostic laboratory compared with small operations (24.1 percent). There were no differences across herd sizes in the percentage of operations that used a commercial laboratory, with approximately 4 of 10 operations (41.5 percent) using this facility type to culture milk. Almost 50 percent of operations performing milk cultures (49.2 percent) used a private veterinary laboratory or clinic, with no differences across herd sizes.

c. For operations that performed milk cultures during the previous 12 months, percentage of operations by facility used to perform cultures, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Facility</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
On-farm, by farm personnel	4.2	(2.0)	14.0	(3.8)	20.8	(4.8)	9.0	(1.8)
State or university diagnostic laboratory	24.1	(4.9)	45.5	(5.0)	31.2	(4.4)	31.8	(3.3)
Commercial laboratory	38.9	(5.6)	45.3	(5.0)	43.8	(6.0)	41.5	(3.6)
Private veterinary laboratory (veterinary clinic)	50.5	(5.7)	43.2	(5.1)	60.8	(6.3)	49.2	(3.7)

The only regional difference in the percentage of operations that used a specific facility to perform milk cultures was observed for State or university diagnostic laboratory, which was used by 13.0 percent of operations in the West region compared with 34.0 percent of operations in the East region.

d. For operations that performed milk cultures during the previous 12 months, percentage of operations by facility used to perform cultures, and by region:

Percent Operations				
Region				
Facility	West		East	
	Percent	Std. Error	Percent	Std. Error
On-farm, by farm personnel	13.0	(4.6)	8.5	(1.9)
State or university diagnostic laboratory	13.0	(4.2)	34.0	(3.7)
Commercial laboratory	59.2	(6.4)	39.4	(4.0)
Private veterinary laboratory (veterinary clinic)	52.5	(6.6)	48.8	(4.1)

Milk was cultured most commonly from cows with chronic clinical disease and from clinical cases that did not respond to treatment (59.1 and 54.0 percent of operations, respectively). A higher percentage of large operations performed cultures on milk from individual fresh cows and from all clinical cases compared with medium and small operations.

e. For operations that performed cultures on milk from individual cows during the previous 12 months, percentage of operations by cow type and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Cow Type</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Fresh cows	8.0	(3.5)	14.9	(3.8)	47.2	(6.6)	13.9	(2.5)
All clinical cases	22.2	(5.4)	35.4	(5.5)	65.4	(6.4)	30.5	(3.7)
Chronic clinical cases	54.8	(6.4)	64.5	(5.3)	67.0	(7.6)	59.1	(4.2)
Clinical cases that did not respond to treatment	50.1	(6.5)	61.1	(5.6)	53.5	(7.9)	54.0	(4.3)
High somatic cell count cows	37.9	(5.7)	49.6	(5.8)	31.5	(6.2)	41.1	(3.9)
Other	11.0	(4.8)	7.0	(2.5)	8.6	(4.4)	9.5	(3.0)

f. For operations that performed milk cultures on individual cows during the previous 12 months, percentage of operations by cow type and by region:

Cow Type	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Fresh cows	49.8	(7.9)	10.5	(2.6)
All clinical cases	60.7	(8.3)	27.7	(4.0)
Chronic clinical cases	55.4	(8.5)	59.4	(4.5)
Clinical cases that did not respond to treatment	43.9	(8.1)	54.9	(4.7)
High somatic cell count cows	46.6	(8.2)	40.6	(4.1)
Other	4.8	(2.6)	9.9	(3.2)



Similar percentages of operations that performed milk cultures during the previous 12 months detected *Staphylococcus aureus*, *E. coli/Klebsiella*/other gram negative, or environmental strep (*Strep. spp.*) (52.3, 53.3, and 60.1 percent of operations, respectively). A higher percentage of large operations (21.4 percent) identified *Mycoplasma* compared with medium and small operations (3.8 and 4.0 percent, respectively). A lower percentage of small operations identified *E. coli/Klebsiella*/other gram negative or coagulase negative staph (*Staph. spp. non-aureus*) organisms compared with large operations.

g. For operations that performed milk cultures on individual cows during the previous 12 months, percentage of operations by organism identified and by herd size:

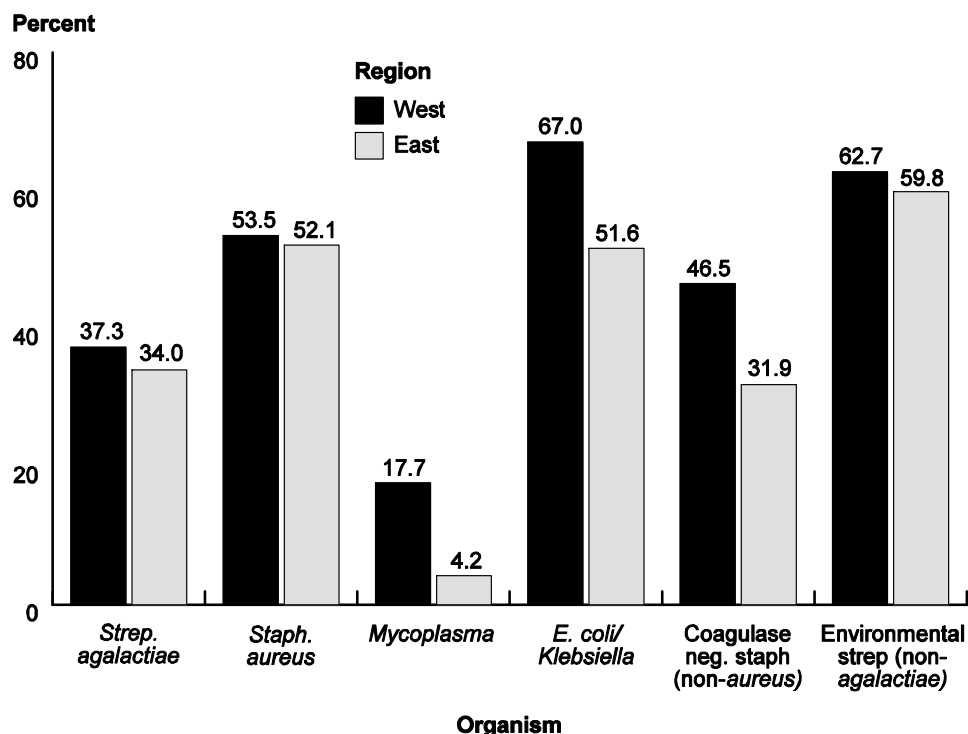
Percent Operations								
Herd Size (Number of Cows)								
Organism	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
<i>Strep. agalactiae</i>	29.4	(5.4)	42.2	(5.0)	35.6	(5.7)	34.4	(3.6)
<i>Staph. aureus</i>	50.5	(6.1)	51.4	(5.1)	64.4	(6.1)	52.3	(3.9)
<i>Mycoplasma</i>	4.0	(3.2)	3.8	(1.9)	21.4	(4.7)	5.7	(1.9)
<i>E. coli/ Klebsiella</i> /other gram negative	41.8	(5.9)	64.3	(4.8)	78.9	(5.4)	53.3	(3.8)
Coagulase negative staph ( <i>Staph. spp. non-aureus</i> )	25.3	(5.5)	37.6	(4.8)	63.4	(6.0)	33.5	(3.5)
Environmental strep ( <i>Strep. spp. non-agalactiae</i> )	52.4	(6.1)	67.0	(4.8)	78.3	(5.1)	60.1	(3.8)

*Mycoplasma* was isolated from a higher percentage of operations in the West region (17.7 percent) than operations in the East region (4.2 percent).

h. For operations that performed milk cultures on individual cows during the previous 12 months, percentage of operations by organism identified and by region:

Organism	Percent Operations			
	West		East	
	Percent	Std. Error	Percent	Std. Error
<i>Strep. agalactiae</i>	37.3	(6.2)	34.0	(3.9)
<i>Staph. aureus</i>	53.5	(6.4)	52.1	(4.3)
<i>Mycoplasma</i>	17.7	(4.5)	4.2	(2.1)
<i>E. coli/Klebsiella/</i> other gram negative	67.0	(6.3)	51.6	(4.2)
Coagulase negative staph ( <i>Staph. spp. non-aureus</i> )	46.5	(6.5)	31.9	(3.9)
Environmental strep ( <i>Strep. spp.</i> <i>non-agalactiae</i> )	62.7	(6.5)	59.8	(4.2)

**For Operations that Performed Milk Cultures on Individual Cows During the Previous 12 months, Percentage of Operations by Organism Identified and by Region**



## 10. Residue testing

Every tanker load of milk in the United States is tested at the milk plant prior to processing for the presence of specific antibiotics. Consequences of a positive test include discarding the entire truckload of milk and the possible suspension of the producer's permit to sell milk. Milk from cows treated with antibiotics should be discarded on the operation for a specified withdrawal period, as directed by the drug manufacturer via the product label. Manufacturers are required to go through an exhaustive drug approval process that determines the withdrawal period. If approved drugs are used in the manner prescribed by the label, producers can use the withdrawal period stated on the label to ensure that the milk does not contain violative drug residues. However, producers may use on-farm drug residue testing to be confident that the milk is free from violative drug residues. One caveat of on-farm drug testing is that the residue testing kits are approved for bulk milk and not for individual cows. Using residue tests on individual cows may result in milk being discarded even though it is below the violative level.

Almost half of operations (49.8 percent) performed residue testing of milk (either bulk-tank milk or individual cows), with a higher percentage of medium operations (64.5 percent) performing testing compared with small operations (44.2 percent).

a. Percentage of operations that performed on-farm antibiotic residue testing of milk, by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
44.2	(3.8)	64.5	(4.0)	53.2	(5.4)	49.8	(2.9)

Numerous tests can be used to screen milk for antibiotic residues. An excellent reference is the “Milk and Dairy Beef Residue Prevention Protocol,” produced by the Milk and Dairy Beef Quality Assurance Center. The most commonly reported residue screening test was the Delvotest<sup>®</sup>, which was used by 62.9 percent of operations that tested for residues.

b. For operations that performed on-farm antibiotic residue testing of milk, percentage of operations by test most commonly used:

Test	Percent Operations	Standard Error
Snap <sup>®</sup> test (beta-lactam or tetracycline)	22.8	(2.9)
Delvotest <sup>®</sup>	62.9	(3.6)
CITE Probe <sup>®</sup>	0.0	(--)
Charm Farm	10.8	(2.7)
Penzyme <sup>®</sup> Milk Test	1.7	(0.6)
Other	1.8	(0.8)
Total	100.0	

The majority of operations that screened for antibiotic residues tested individual cows recently treated for mastitis (90.0 percent of operations), followed by fresh cows (57.8 percent of operations).

c. For operations that performed on-farm antibiotic residue testing of milk, percentage of operations by source of sample tested:

Sample Source	Percent Operations	Standard Error
Fresh cows	57.8	(3.7)
Individual cows recently treated for mastitis	90.9	(1.6)
Bulk tank prior to processor pickup	29.1	(3.3)
Other	8.3	(1.9)

### 11. Dry-off procedures/antibiotic treatment

Research suggests that about half of new intramammary infections occur during the dry period. Reasons for the increased susceptibility during this period include increased gland pressure, leading to easier entrance of bacteria through the teat canal; decreased local immune response; and because milk and bacteria are not being removed, as would occur during lactation. Internal teat sealants were developed to reduce the potential of bacteria entering the teat canal and causing infection at dry-off. A higher percentage of large and medium operations used an internal teat sealant on all cows at dry-off (49.0 and 45.7 percent, respectively) compared with small operations (22.7 percent). Approximately 3 of 10 operations (30.1 percent) used an internal teat sealant on all cows at dry-off, with an additional 6.2 percent of operations using the sealant on cows with chronic mastitis, on all cows at dry-off during winter or adverse weather, or at other times. Approximately 7 of 10 small operations (71.0 percent) did not use an internal teat sealant, compared with about 5 of 10 medium and large operations (48.2 and 45.2 percent, respectively).

a. Percentage of operations by use of *internal* teat sealant\* at dry-off and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Use of Internal Teat Sealant	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
All cows at dry-off	22.7	(3.2)	45.7	(4.2)	49.0	(5.4)	30.1	(2.5)
Cows with chronic mastitis	2.3	(1.1)	2.4	(1.2)	1.2	(1.2)	2.2	(0.8)
All cows at dry-off but only during winter or adverse weather	2.2	(1.4)	0.8	(0.8)	4.3	(2.5)	2.0	(1.0)
Other	1.8	(1.0)	2.9	(1.6)	0.3	(0.2)	2.0	(0.8)
No internal teat sealant used on this operation	71.0	(3.5)	48.2	(4.2)	45.2	(5.4)	63.7	(2.7)
Total	100.0		100.0		100.0		100.0	

\*e.g., Orbeseal®.

The only regional difference in the use of internal teat sealant was that no operations in the West region used the sealant only on cows with chronic mastitis, while 2.5 percent of operations in the East region did use sealant only on chronic mastitis cows.

b. Percentage of operations by use of *internal* teat sealant\* at dry-off and by region:

	Percent Operations			
	Region			
	West		East	
Use of Internal Teat Sealant	Percent	Std. Error	Percent	Std. Error
All cows at dry-off	20.5	(4.2)	31.0	(2.8)
Cows with chronic mastitis	0.0	(--)	2.5	(0.9)
All cows at dry-off but only during winter or adverse weather	3.1	(1.8)	1.8	(1.0)
Other	0.2	(0.1)	2.2	(0.9)
No internal teat sealant used on this operation	76.2	(4.4)	62.5	(2.9)
Total	100.0		100.0	

\*e.g., Orbeseal®.

Coating the exterior of the teat with a sealant that remains in place for an extended period (4 to 5 days) is another method used to prevent bacterial entrance into the mammary gland at dry-off. The majority of all operations (82.8 percent) did not use an external teat sealant. Over 1 of 10 operations (14.0 percent) used a sealant on all cows at dry-off, with no differences across herd sizes.

c. Percentage of operations by use of **external** teat sealant\* at dry-off and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Use of External Teat Sealant	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
All cows at dry-off	12.5	(2.6)	15.1	(2.9)	26.1	(5.7)	14.0	(2.0)
Cows with chronic mastitis	1.1	(0.8)	1.7	(1.3)	0.0	(--)	1.2	(0.6)
All cows at dry-off but only during winter or adverse weather	1.1	(0.7)	0.1	(0.1)	0.0	(--)	0.8	(0.5)
Other	0.8	(0.8)	2.2	(1.4)	2.0	(1.5)	1.2	(0.7)
No external teat sealant used on the operation	84.5	(2.9)	80.9	(3.3)	71.9	(5.7)	82.8	(2.2)
Total	100.0		100.0		100.0		100.0	

\*e.g., Stronghold™.

There were no regional differences in the use of external teat sealants.

d. Percentage of operations by use of **external** teat sealant\* at dry-off and by region:

Percent Operations				
Region				
Use of External Teat Sealant	West		East	
	Percent	Std. Error	Percent	Std. Error
All cows at dry-off	19.6	(4.3)	13.5	(2.1)
Cows with chronic mastitis	0.0	(--)	1.3	(0.7)
All cows at dry-off but only during winter or adverse weather	0.0	(--)	0.8	(0.5)
Other	1.1	(1.1)	1.3	(0.7)
No external teat sealant used on the operation	79.3	(4.3)	83.1	(2.3)
Total	100.0		100.0	

\*e.g., Stronghold™.

Administering intramammary antibiotics at the time of dry-off cures many existing infections and reduces the incidence of new infections. Almost 1 of 10 operations (9.9 percent) did not use any dry-cow treatment, and a percentage of these were organic operations in which the use of antibiotics is not allowed. Some, but not all, cows were treated on 17.8 percent of operations, and all cows were treated on 72.3 percent of operations. More than four of five cows (81.7 percent) were treated at dry-off, while 5.9 percent were not treated.

e. Percentage of operations (and percentage of cows on these operations) by percentage of cows treated with dry-cow intramammary antibiotics at dry-off during the previous 12 months:

<b>Percent of Dry Cows Treated</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Cows</b>	<b>Standard Error</b>
0.0	9.9	(1.7)	5.9	(1.5)
1.0 to 33.0	5.6	(1.4)	2.7	(0.9)
33.1 to 66.0	3.0	(0.8)	2.4	(0.8)
66.1 to 99.9	9.2	(1.8)	7.3	(1.3)
100.0	72.3	(2.7)	81.7	(2.3)
Total	100.0		100.0	



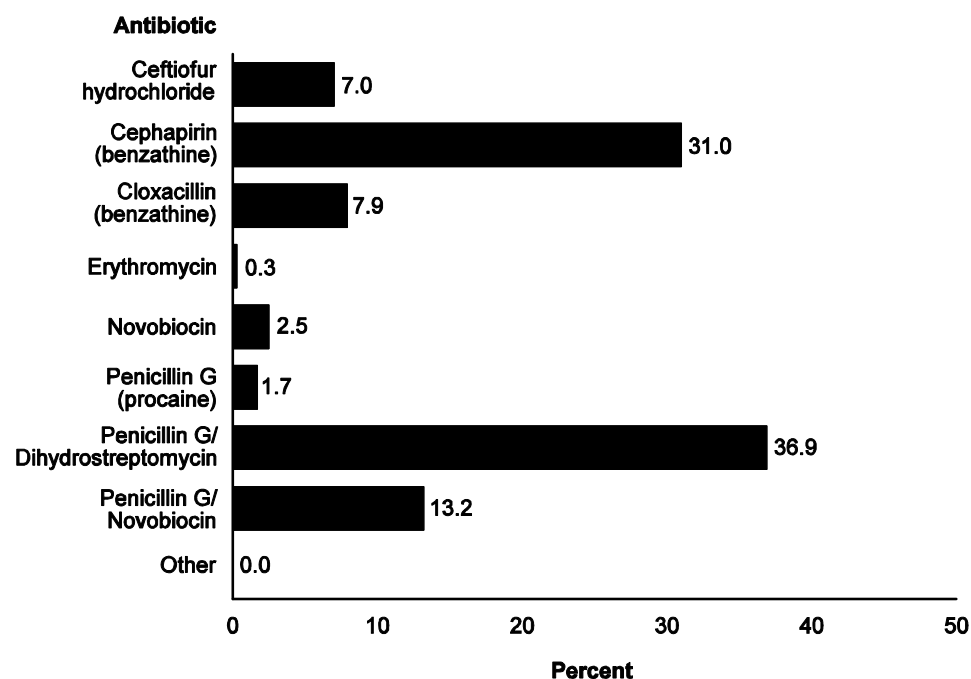
The most commonly used dry-cow antibiotics were cephapirin (31.0 percent of cows) and penicillin G (procaine)/dihydrostreptomycin (36.9 percent of cows).

f. For cows treated with dry-cow intramammary antibiotics during the previous 12 months, percentage of cows treated, by type of antibiotic:

Antibiotic	Percent Cows*	Standard Error
Ceftiofur hydrochloride	7.0	(2.0)
Cephapirin (benzathine)	31.0	(2.3)
Cloxacillin (benzathine)	7.9	(1.8)
Erythromycin	0.3	(0.1)
Novobiocin	2.5	(1.9)
Penicillin G (procaine)	1.7	(0.5)
Penicillin G (procaine)/ Dihydrostreptomycin	36.9	(3.2)
Penicillin G (procaine)/ Novobiocin	13.2	(2.4)
Other	0.0	(--)

\*As a percentage of cows dry treated during the previous 12 months. Some cows were treated with more than one antibiotic.

**For Cows Treated with Dry-Cow Intramammary Antibiotics During the Previous 12 Months, Percentage of Cows Treated, by Type of Antibiotic**



F. Antibiotic Use

**NOTE: In this section antibiotic and antimicrobial are used synonymously (see Terms Used in This Report, p 3).**

**1. Unweaned heifers**

Almost one of four unweaned heifers had diarrhea (23.9 percent) during the previous 12 months, and 17.9 percent of all unweaned heifers were treated for diarrhea. A lower percentage of unweaned heifers had respiratory disease (12.4 percent), and 11.4 percent of heifers were treated for respiratory disease.

a. Percentage of unweaned heifers affected and treated with antibiotics for a disease or disorder during the previous 12 months:

Percent Unweaned Heifers*				
Disease or Disorder	Affected		Treated	
	Percent	Std. Error	Percent	Std. Error
Respiratory	12.4	(1.3)	11.4	(1.3)
Diarrhea or other digestive problem	23.9	(1.9)	17.9	(1.7)
Navel infection	1.6	(0.2)	1.5	(0.2)
Other	0.6	(0.2)	0.6	(0.2)

\*As a percentage of dairy heifer calves born alive in 2006.

More than 9 of 10 of calves affected with respiratory disease or navel infection were treated with an antibiotic (93.4 and 92.3 percent, respectively). Almost three-fourths of unweaned calves affected with diarrhea (74.5 percent) were treated with an antibiotic.

b. For unweaned heifers affected with a disease or disorder during the previous 12 months, percentage of unweaned heifers treated with an antibiotic:

Disease or Disorder	Percent Affected Unweaned Heifers Treated	Standard Error
Respiratory	93.4	(2.3)
Diarrhea or other digestive problem	74.5	(4.8)
Navel infection	92.3	(2.4)
Other	97.2	(1.9)

Two-thirds of all operations (66.7 percent) used an antibiotic to treat respiratory disease in unweaned heifers. The primary antibiotics used to treat respiratory disease were florfenicol, macrolide, and beta-lactam (18.3, 15.2, and 11.6 percent of all operations, respectively). More than 6 of 10 operations (62.1 percent) treated unweaned heifers with diarrhea with antibiotics, while 17.4 percent of operations with unweaned heifers that had diarrhea did not treat these animals with antibiotics. The most commonly used primary antibiotics used for diarrhea were tetracycline, “other,” beta-lactam, and sulfonamide (16.2, 10.5, 9.4, and 9.2 percent, of all operations, respectively). The primary antibiotics from the “other” category included trimethoprim sulfamethoxazole, amprolium, and lincomycin/spectinomycin. Navel infection was treated on 28.7 percent of operations, and the primary antibiotics used were beta-lactam (21.2 percent of all operations). Less than 5 percent of all operations (4.5 percent) treated for other diseases.

c. Percentage of operations (including those not reporting diseases or disorders) by primary antibiotic used to treat unweaned heifers during the previous 12 months, and by disease or disorder treated:

Percent Operations								
Disease/Disorder								
Primary Antibiotic Used	Respiratory		Diarrhea*		Navel Infection		Other	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Aminocyclitol	0.0	(0.0)	1.7	(0.7)	0.0	(--)	0.0	(--)
Aminoglycoside	0.6	(0.4)	4.0	(1.1)	0.0	(0.0)	0.4	(0.4)
Beta-lactam	11.6	(2.0)	9.4	(1.8)	21.2	(2.5)	1.4	(0.7)
Cephalosporin	8.2	(1.5)	5.6	(1.1)	2.2	(0.6)	0.5	(0.4)
Florfenicol	18.3	(2.2)	4.0	(1.1)	1.1	(0.5)	0.0	(0.0)
Macrolide	15.2	(2.1)	1.5	(0.5)	0.8	(0.4)	0.3	(0.2)
Sulfonamide	1.9	(0.7)	9.2	(1.5)	0.9	(0.9)	0.2	(0.1)
Tetracycline	8.9	(1.7)	16.2	(2.3)	1.4	(0.4)	1.0	(0.6)
Other/unknown	2.0	(0.7)	10.5	(1.8)	1.1	(0.6)	0.7	(0.5)
Any antibiotic	66.7	(2.8)	62.1	(2.8)	28.7	(2.6)	4.5	(1.1)
No treatment but disease	1.4	(0.6)	17.4	(2.2)	2.5	(0.7)	0.2	(0.2)
No disease or disorder	31.9	(2.8)	20.5	(2.4)	68.8	(2.7)	95.3	(1.2)
Total	100.0		100.0		100.0		100.0	

\*Or other digestive problem.

The majority of unweaned heifers treated for respiratory disease were on operations that used florfenicol, cephalosporin, macrolide, or tetracycline (25.4, 24.6, 19.8, and 13.2 percent of unweaned heifers, respectively). To treat diarrhea, sulfonamide, tetracycline, and “other” were the antibiotics used on operations for the highest percentage of unweaned heifers.

d. Of unweaned heifers treated with antibiotics during the previous 12 months, percentage of unweaned heifers by primary antibiotic used on the operation for the following diseases/disorders:

Percent Treated Unweaned Heifers								
Primary Antibiotic Used	Disease/Disorder							
	Respiratory		Diarrhea*		Navel Infection		Other	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Aminocyclitol	0.1	(0.1)	5.1	(2.0)	0.0	(--)	0.0	(--)
Aminoglycoside	2.4	(1.7)	11.5	(3.9)	0.3	(0.2)	0.9	(0.9)
Beta-lactam	7.9	(2.1)	11.0	(2.8)	69.6	(7.9)	12.9	(6.4)
Cephalosporin	24.6	(8.5)	9.5	(2.3)	5.0	(1.7)	4.0	(3.4)
Florfenicol	25.4	(5.5)	5.2	(1.8)	3.7	(2.0)	0.2	(0.2)
Macrolide	19.8	(3.7)	2.8	(1.6)	11.6	(8.9)	15.2	(10.3)
Sulfonamide	3.3	(1.8)	23.3	(6.2)	1.8	(1.8)	10.2	(9.1)
Tetracycline	13.2	(3.3)	16.5	(2.9)	6.7	(3.2)	24.8	(16.5)
Other	3.3	(1.5)	15.1	(3.0)	1.3	(0.6)	31.8	(18.6)
Total	100.0		100.0		100.0		100.0	

\*Or other digestive problem.

## 2. Weaned heifers

More than half of operations (50.9 percent) used antibiotics in rations for weaned heifers, including 32.7 percent that used only ionophores.

a. Percentage of operations by use of antibiotics in weaned-heifer rations during the previous 12 months to prevent disease or promote growth:

Usage	Percent Operations	Standard Error
Antibiotics in heifer ration	18.2	(2.0)
Ionophores only in heifer rations	32.7	(2.6)
Did not know if antibiotics were in heifer ration	2.3	(0.9)
No antibiotics in heifer ration	44.2	(2.8)
No weaned heifers on operation	2.6	(0.8)
Total	100.0	

The majority of operations that used antibiotics in weaned heifer rations used ionophores (84.9 percent) followed by chlortetracycline (14.4 percent) and oxytetracycline compounds (10.9 percent).

b. For operations that used antibiotics in rations for weaned dairy heifers during the previous 12 months, percentage of operations by antibiotic used:

<b>Antibiotic Used</b>	<b>Percent Operations</b>	<b>Standard Error</b>
Bacitracin methylene disalicylate	0.0	(--)
Bambermycin	0.5	(0.5)
Chlortetracycline compounds	14.4	(2.3)
Neomycin sulfate	4.1	(1.8)
Ionophores	84.9	(2.8)
Neomycin-oxytetracycline	5.4	(1.9)
Oxytetracycline compounds	10.9	(2.2)
Sulfamethazine	5.7	(1.5)
Tylosin phosphate	0.0	(--)
Virginiamycin	0.2	(0.2)
Other antibiotics	2.0	(1.4)

Few weaned heifers were affected by or treated for disease. Only 5.9 percent of weaned heifers were affected with respiratory disease, and 5.5 percent of all weaned heifers were treated with antibiotics. Diarrhea was reported in 1.9 percent of weaned heifers, and 1.6 percent of all weaned heifers were treated. Less than 2 percent of weaned heifers had other diseases or disorders.

c. Percentage of weaned heifers affected and treated with antibiotics for a disease or disorder during the previous 12 months:

<b>Percent Weaned Heifers*</b>				
<b>Disease or Disorder</b>	<b>Affected</b>		<b>Treated</b>	
	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Respiratory	5.9	(0.5)	5.5	(0.5)
Diarrhea or other digestive problem	1.9	(0.7)	1.6	(0.7)
Other	1.7	(0.6)	1.4	(0.6)

\*As a percentage of weaned heifer inventory on January 1, 2007.

More than 9 of 10 weaned heifers affected with respiratory disease (93.3 percent) were treated with antibiotics. About 8 of 10 weaned heifers with diarrhea or other digestive problems (85.4 percent) were treated.

d. For weaned heifers affected with a disease or disorder during the previous 12 months, percentage of weaned heifers treated with an antibiotic:

<b>Disease or Disorder</b>	<b>Percent Affected Weaned Heifers Treated</b>	<b>Standard Error</b>
Respiratory	93.3	(1.8)
Diarrhea or other digestive problem	85.4	(7.8)
Other	81.3	(8.9)

Almost half of operations (49.2 percent) treated some weaned heifers for respiratory disease, while only 7.4 percent treated for diarrhea and 6.2 percent treated for other diseases. The primary antibiotics used on operations for respiratory disease in weaned heifers were florfenicol and tetracycline (12.4 and 11.0 percent of operations, respectively). Antibiotics used to treat diarrhea in weaned calves included “other” (primarily amprolium), beta-lactam, and tetracycline. Other diseases were treated with beta-lactam and tetracycline on 3.3 and 1.9 percent of operations, respectively.

e. Percentage of operations (including those not reporting diseases or disorders) by primary antibiotic used to treat weaned heifers during the previous 12 months, and by disease or disorder:

Primary Antibiotic Used	Percent Operations					
	Disease/Disorder					
	Respiratory		Diarrhea*		Other	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Aminocyclitol	0.4	(0.2)	0.0	(--)	0.0	(--)
Aminoglycoside	0.0	(--)	0.2	(0.1)	0.0	(--)
Beta-lactam	7.8	(1.6)	1.6	(0.8)	3.3	(1.1)
Cephalosporin	4.5	(1.3)	0.7	(0.2)	0.2	(0.2)
Florfenicol	12.4	(1.7)	0.4	(0.2)	0.0	(--)
Macrolide	8.0	(1.2)	0.2	(0.2)	0.2	(0.2)
Sulfonamide	1.5	(0.5)	0.4	(0.1)	0.2	(0.1)
Tetracycline	11.0	(1.7)	1.4	(0.5)	1.9	(0.6)
Other	3.6	(1.1)	2.5	(0.7)	0.4	(0.2)
Any antibiotic	49.2	(2.9)	7.4	(1.3)	6.2	(1.3)
No treatment but disease	5.1	(1.4)	4.2	(1.1)	4.7	(1.5)
No disease	45.7	(2.9)	88.4	(1.6)	89.1	(1.9)
Total	100.0		100.0		100.0	

\*Or other digestive problem.



The majority of weaned heifers treated for respiratory disease were on operations that primarily treated with florfenicol, tetracycline, and macrolide. Tetracycline was the primary antibiotic used on operations to treat more than 50 percent of weaned heifers with diarrhea or “other” diseases (55.1 and 67.0 percent, respectively).

f. Of weaned heifers treated with antibiotics during the previous 12 months, percentage of weaned heifers by primary antibiotic used on the operation for the following diseases/disorders:

Percent Treated Weaned Heifers						
Primary Antibiotic Used	Disease/Disorder					
	Respiratory		Diarrhea*		Other	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Aminocyclitol	2.8	(2.5)	0.0	(--)	0.0	(--)
Aminoglycoside	0.0	(--)	0.0	(--)	0.0	(--)
Beta-lactam	3.4	(0.8)	3.9	(2.8)	24.1	(14.2)
Cephalosporin	9.8	(2.8)	3.2	(2.3)	0.9	(0.9)
Florfenicol	30.3	(4.9)	10.0	(8.3)	0.0	(--)
Macrolide	15.6	(3.2)	0.2	(0.2)	0.5	(0.4)
Sulfonamide	4.1	(1.7)	2.0	(1.2)	1.7	(1.4)
Tetracycline	25.0	(4.7)	55.1	(22.2)	67.0	(16.2)
Other	9.0	(3.5)	25.6	(15.1)	5.8	(4.1)
Total	100.0		100.0		100.0	

\*Or other digestive problem.

### 3. Cows

Mastitis was the disease that affected the highest percentage of cows (18.2 percent), and, not surprisingly, the highest percentage of cows were treated for mastitis (16.4 percent). Lameness and reproductive diseases affected 12.5 and 10.0 percent of cows, respectively, and 7.1 and 7.4 percent of all cows were treated for lameness and reproductive diseases, respectively.

a. Percentage of cows affected and treated with antibiotics for a disease or disorder during the previous 12 months:

Disease or Disorder	Percent Cows*			
	Affected		Treated	
	Percent	Std. Error	Percent	Std. Error
Respiratory	2.9	(0.2)	2.8	(0.2)
Diarrhea or other digestive problem	6.0	(0.6)	1.9	(0.2)
Reproductive	10.0	(0.7)	7.4	(0.7)
Mastitis	18.2	(0.9)	16.4	(0.8)
Lameness	12.5	(0.9)	7.1	(0.7)
Other	0.7	(0.2)	0.5	(0.1)

\*As a percentage of cow inventory on January 1, 2007.

More than 95 percent of cows with respiratory disease (96.4 percent) were treated with antibiotics, while 89.9 percent of cows with mastitis were treated. Less than one-third of cows with diarrhea or digestive disease (32.3 percent) were treated with antibiotics.

b. For cows affected with a disease or disorder during the previous 12 months, percentage of cows treated with an antibiotic:

Disease or Disorder	Percent Affected Cows Treated	Standard Error
Respiratory	96.4	(1.2)
Diarrhea or other digestive problem	32.3	(4.0)
Reproductive	74.7	(3.1)
Mastitis	89.9	(1.3)
Lameness	56.5	(4.1)
Other	66.2	(12.7)

More than 8 of 10 operations (85.4 percent) treated cows for mastitis. About half of operations treated cows for respiratory disease, reproductive disease, or lameness. One-quarter of operations treated cows for diarrhea. Third-generation cephalosporin was the primary antibiotic used to treat all diseases listed, with the exception of reproductive diseases. Cephalosporin was most likely used because some products require no milk withdrawal, and slaughter withdrawal is relatively short compared to other antibiotics. Beta-lactam was the primary antibiotic used to treat respiratory diseases on 10.5 percent of operations, reproductive diseases on 13.5 percent, mastitis on 16.9 percent, and lameness on 13.6 percent of operations. Lincosamide was the primary antibiotic used to treat mastitis on 15.8 percent of operations. Tetracycline was the primary antibiotic used for reproductive and lameness on 17.7 and 18.6 percent of operations, respectively.

c. Percentage of operations (including those not reporting diseases or disorders) by primary antibiotic used to treat cows during the previous 12 months, and by disease or disorder:

Primary Antibiotic Used	Percent Operations											
	Disease or Disorder											
	Respiratory		Diarrhea*		Reproductive		Mastitis		Lameness		Other	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Aminocyclitol	1.0	(0.5)	0.0	(--)	0.6	(0.6)	1.1	(0.6)	0.0	(--)	0.0	(--)
Aminoglycoside	0.3	(0.3)	0.6	(0.3)	0.0	(--)	0.5	(0.4)	0.0	(--)	0.0	(--)
Beta-lactam	10.5	(1.8)	8.8	(1.6)	13.5	(2.0)	16.9	(2.0)	13.6	(2.1)	3.0	(1.1)
Cephalosporin	33.0	(2.7)	11.3	(1.8)	17.2	(2.0)	44.5	(2.9)	23.0	(2.2)	1.8	(0.7)
Florfenicol	2.4	(0.9)	0.3	(0.2)	0.2	(0.2)	0.0	(--)	0.3	(0.2)	0.0	(--)
Lincosamide							15.8	(2.1)				
Macrolide	1.2	(0.6)	0.6	(0.4)	0.0	(--)	0.3	(0.2)	0.2	(0.1)	0.0	(--)
Sulfonamide	1.7	(0.8)	1.3	(0.4)	0.1	(0.1)	1.8	(0.9)	1.4	(0.4)	0.0	(--)
Tetracycline	4.7	(1.0)	1.1	(0.4)	17.7	(2.1)	2.5	(0.7)	18.6	(2.2)	0.6	(0.4)
Other	1.0	(0.5)	1.1	(0.6)	3.6	(1.3)	2.0	(1.0)	1.5	(0.6)	1.5	(0.8)
Any antibiotic	55.8	(2.9)	25.0	(2.4)	52.9	(2.8)	85.4	(2.2)	58.6	(2.9)	6.9	(1.5)
No treatment but disease	3.5	(1.2)	31.6	(2.7)	21.8	(2.5)	7.7	(1.5)	17.2	(2.4)	3.5	(1.2)
No disease	40.7	(2.9)	43.4	(2.9)	25.3	(2.5)	6.9	(1.7)	24.2	(2.6)	89.6	(1.8)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

\*Or other digestive problem.

The primary antibiotics used to treat cows with specific diseases or disorders were similar to the primary antibiotics used at the operation level. Beta-lactam was the primary antibiotic used on operations for more than 19 percent of cows treated for diarrhea, reproductive disease, mastitis, and lameness.

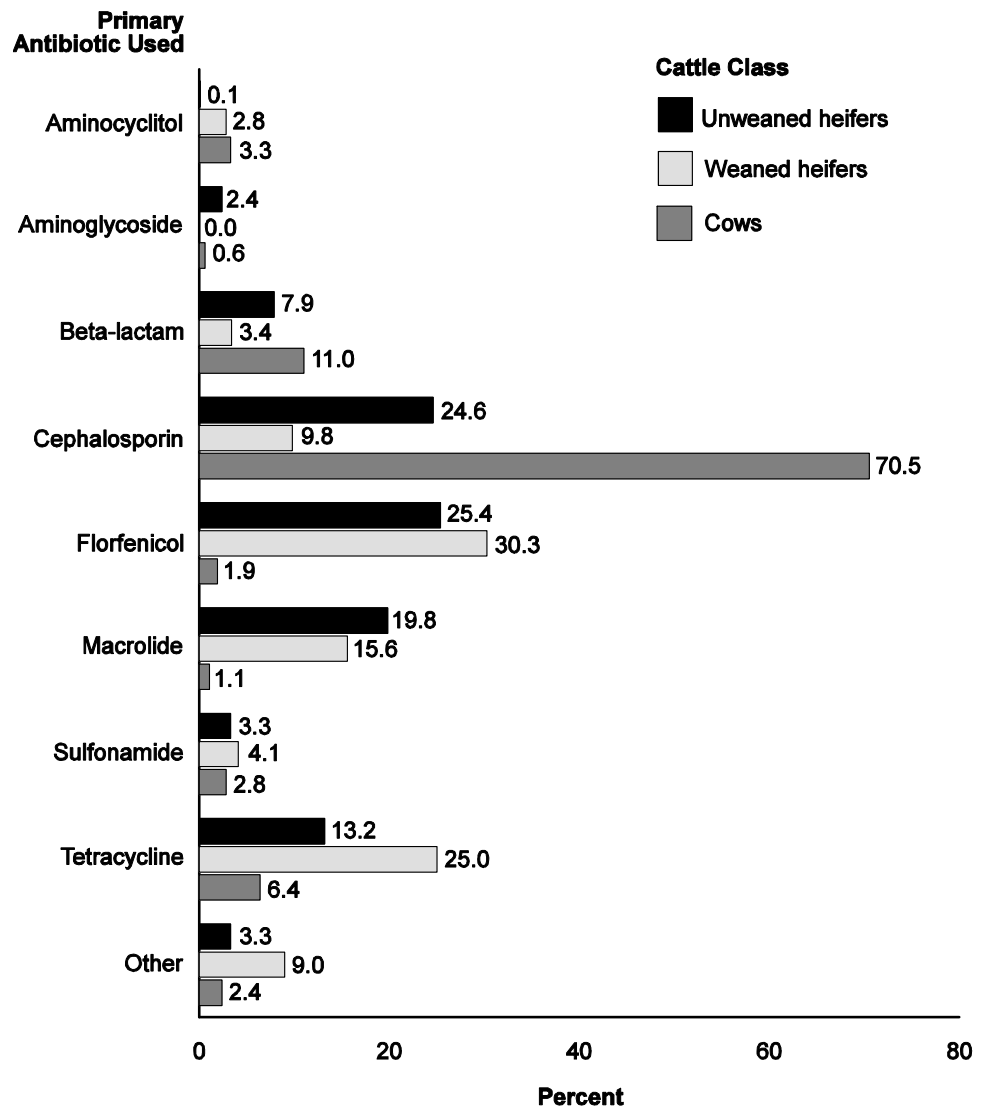
Cephalosporin was the primary antibiotic used on 70.5 percent of cows treated for respiratory disease, 53.2 percent treated for mastitis, 36.0 treated for diarrhea, and approximately 27 percent of cows treated for reproductive or lameness problems. Lincosamide was used on 19.4 percent of cows with mastitis. Sulfonamide was the primary antibiotic used on 15.6 percent of cows with diarrhea. Tetracycline was used to treat more than 4 of 10 cows with reproductive disease or lameness (44.4 and 42.1 percent, respectively).

d. Of cows treated with antibiotics during the previous 12 months, percentage of cows by primary antibiotic used on the operation for the following diseases/disorders:

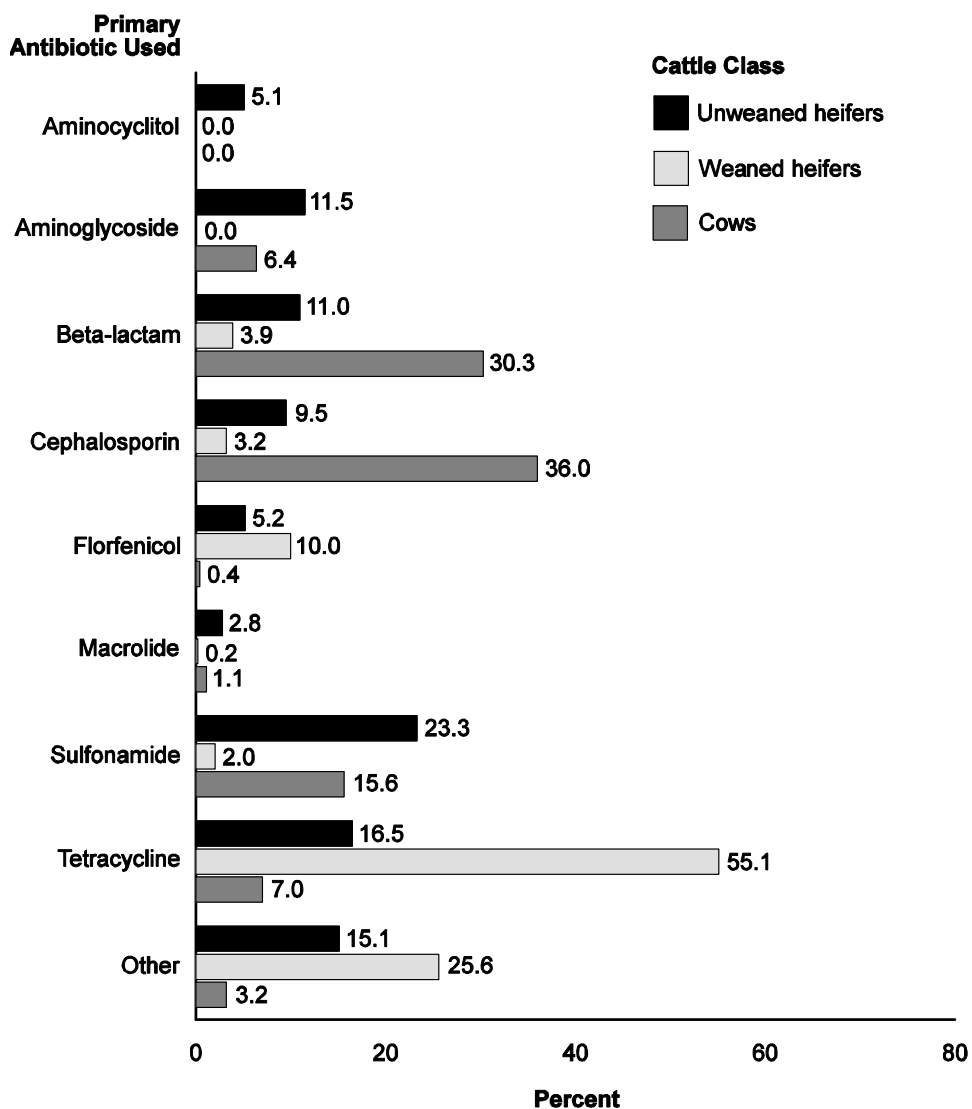
Percent Treated Cows												
Disease/Disorder												
	Respiratory		Diarrhea*		Repro- ductive		Mastitis		Lameness		Other	
Primary Antibiotic Used	Std. Pct.	Std. Error	Std. Pct.	Std. Error	Std. Pct.	Std. Error	Std. Pct.	Std. Error	Std. Pct.	Std. Error	Std. Pct.	Std. Error
Aminocyclitol	3.3	(1.6)	0.0	(--)	0.2	(0.2)	2.9	(2.0)	0.0	(--)	0.0	(--)
Aminoglycoside	0.6	(0.5)	6.4	(4.4)	0.0	(--)	0.2	(0.2)	0.0	(--)	0.0	(--)
Beta-lactam	11.0	(2.5)	30.3	(5.7)	19.7	(3.8)	19.1	(3.0)	19.5	(5.4)	29.9	(11.6)
Cephalosporin	70.5	(3.9)	36.0	(5.9)	27.9	(4.7)	53.2	(4.1)	27.2	(3.8)	23.6	(11.5)
Florfenicol	1.9	(0.7)	0.4	(0.4)	0.2	(0.2)	0.0	(--)	0.5	(0.3)	0.0	(--)
Lincosamide							19.4	(3.1)				
Macrolide	1.1	(0.5)	1.1	(0.8)	0.0	(--)	0.2	(0.2)	0.5	(0.3)	0.0	(--)
Sulfonamide	2.8	(1.4)	15.6	(6.6)	0.2	(0.2)	1.2	(0.5)	4.2	(1.4)	0.0	(--)
Tetracycline	6.4	(1.6)	7.0	(2.9)	44.4	(6.0)	2.0	(0.7)	42.1	(5.4)	2.6	(1.9)
Other	2.4	(1.3)	3.2	(2.2)	7.4	(4.5)	1.8	(0.9)	6.0	(3.0)	43.9	(16.6)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

\*Or other digestive problem.

**For Cattle Treated for Respiratory Disease During the Previous 12 Months,  
Percentage of Cattle by Class and by Primary Antibiotic Used for Treatment**



**For Cattle Treated for Diarrhea or Other Digestive Problems During the Previous 12 Months, Percentage of Cattle by Class and by Primary Antibiotic Used for Treatment**



Historical effectiveness was the predominant criterion for mastitis treatment (86.4 percent of operations). Veterinary recommendation was reported as a criterion on 46.3 percent of operations.

e. For operations that treated lactating cows for mastitis with an intramammary antibiotic during the previous 12 months, percentage of operations by criterion for treatment:

<b>Criterion</b>	<b>Percent Operations</b>	<b>Standard Error</b>
Veterinary recommendation	46.3	(3.0)
Historical effectiveness	86.4	(2.1)
Historical culture and antimicrobial sensitivity results	20.9	(2.2)
Individual cow culture results prior to therapy	20.2	(2.3)
Other	4.0	(1.1)

## Section II: Methodology

### A. Needs Assessment

NAHMS develops study objectives by exploring existing literature and contacting industry members about their informational needs and priorities during a needs-assessment phase. The objective of the needs assessment for the NAHMS Dairy 2007 study was to collect information from U.S. dairy producers and other dairy specialists about what they perceived to be the most important dairy health and productivity issues. A driving force of the needs assessment was the desire of NAHMS to receive as much input as possible from a variety of producers, industry experts and representatives, veterinarians, extension specialists, universities, and dairy organizations. Information was collected via focus groups and through a Needs Assessment Survey.

Focus group teleconferences and meetings were held to help determine the focus of the study.

Teleconference, March 30, 2006  
National Johne's Working Group

Louisville, KY, April 2, 2006  
National Johne's Working Group  
National Institute for Animal Agriculture

Louisville, KY, April 3, 2006  
National Milk Producers Federation  
Animal Health Committee

Teleconference, December 15, 2006  
Bovine Alliance on Management and Nutrition

The Needs Assessment Survey was designed to ascertain the top three management issues, diseases/disorders, and producer incentives from producers, veterinarians, extension personnel, university researchers, and allied industry groups. The survey, created in SurveyMonkey, was available online from early February through late April 2006. The survey was promoted via electronic newsletters, magazines, and Web sites. Organizations/magazines promoting the study included Vance Publishing's "Dairy Herd Management, Dairy Alert," "Dairy Today," "Hoard's Dairyman," NMC, "Journal of the American Veterinary Medical Association," and the American Association of Bovine Practitioners. E-mail messages asking for input were also sent to cooperative members of the National Milk Producers Federation as well as State and Federal personnel. A total of 313 people completed the questionnaire.



Universities/extension personnel accounted for 23 percent of respondents, while producers accounted for 22 percent, and veterinarians/consultants accounted for another 20 percent.

Fort Collins, CO, May 18, 2006  
CEAH Focus Group meeting

Draft objectives for the Dairy 2007 study, using input from teleconferences, face-to-face meetings, and the online survey, were drafted prior to the CEAH focus group meeting. Attendees included producers, university/extension personnel, veterinarians, and government personnel. The day-long meeting culminated in the formulation of eight objectives for the study:

- Describe trends in dairy cattle health and management practices,
- Evaluate management factors related to cow comfort and removal rates,
- Describe dairy-calf health and nutrition from birth to weaning and evaluate heifer disease prevention practices,
- Estimate the prevalence of herds infected with bovine viral diarrhea virus (BVD),
- Describe current milking procedures and estimate the prevalence of contagious mastitis pathogens,
- Estimate the herd-level prevalence and associated costs of *Mycobacterium avium* subspecies *paratuberculosis* (Johne's disease),
- Describe current biosecurity practices and determine producer motivation for implementing or not implementing biosecurity practices, and
- Determine the prevalence of specific food-safety pathogens and describe antimicrobial resistance patterns.

## **B. Sampling and Estimation**

### **1. State selection**

The preliminary selection of States to be included in the study was done in February 2006, using the National Agricultural Statistics Service (NASS) January 27, 2006, "Cattle Report." A goal for NAHMS national studies is to include States that account for at least 70 percent of the animals and producer population in the United States. The initial review of States identified 16 major States representing 82.0 percent of the milk cow inventory and 79.3 percent of the operations with milk cows (dairy herds). The States were: California, Idaho, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New Mexico, New York, Ohio, Pennsylvania, Texas, Vermont, Washington, and Wisconsin.

A memo identifying these 16 States was provided in March 2006 to the USDA-APHIS-VS CEAH Director and, in turn, the VS Regional Directors. Each Regional Director sought input from the respective States about being included or excluded from the study. Virginia expressed interest in participating and was included, bringing the total number of States to 17.

## **2. Operation selection**

The list sampling frame was provided by NASS. Within each State a stratified random sample was selected. The size indicator was the number of milk cows for each operation. NASS selected a sample of dairy producers in each State for making the January 1 cattle estimates. The list sample from the January 2006 survey was used as the screening sample. Among producers reporting one or more milk cows on January 1, 2006, a total of 3,554 operations were selected in the sample for contact in January 2007 during Phase I.

Operations with 30 or more dairy cows that participated in Phase I were invited to participate in data collection for Phase II. A total of 1,077 operations agreed via written consent to be contacted by veterinary medical officers to determine whether to complete Phase II.

## **3. Population inferences**

### **a. Phase I: General Dairy Management Report**

Inferences cover the population of dairy producers with at least 1 milk cow in the 17 participating States. As of January 1, 2007, these States accounted for 82.5 percent (7,536,000 head) of milk cows and 79.5 percent (59,640) of operations with milk cows in the United States. (See Appendix II for respective data on individual States.) All respondent data were statistically weighted to reflect the population from which it was selected. The inverse of the probability of selection for each operation was the initial selection weight. This selection weight was adjusted for nonresponse within each State and size group to allow for inferences back to the original population from which the sample was selected.

### **b. Phase II: VS Initial Visit**

Inferences cover the population of dairy producers with 30 or more milk cows in the 17 participating States. For operations eligible for Phase II data collection (those with 30 or more milk cows) weights were adjusted to account for operations that did not want to continue to Phase II. The 17-State target population of operations with 30 or more dairy cows represented 82.5 percent of dairy cows and 84.7 percent of U.S. dairy operations with 30 or more milk cows (see Appendix II).

## C. Data Collection

### 1. Phase I: General Dairy Management Report

From January 1-31, 2007, NASS enumerators administered the General Dairy Management Report. The interview took slightly over 1 hour.

### 2. Phase II: VS Initial Visit

From February 26 to April 30, 2007, Federal and State veterinary medical officers (VMOs) and/or animal health technicians (AHTs) collected the data from producers during an interview that lasted approximately 2 hours.

## D. Data Analysis

### 1. Validation

#### a. Phase I: Validation—General Dairy Management Report

Initial data entry and validation for the General Dairy Management Report were performed in individual NASS State offices. Data were entered into a SAS® data set. NAHMS national staff performed additional data validation on the entire data set after data from all States were combined.

#### b. Phase II: Validation—VS Initial Visit Questionnaires

After completing the VS Initial Visit Questionnaires, data collectors sent them to their respective State NAHMS Coordinators who reviewed the questionnaire responses for accuracy. Data entry and validation were completed by CEAH staff using SAS.

## E. Sample Evaluation

The purpose of this section is to provide various performance measurement parameters. Historically, the term “response rate” was used as a catch-all parameter, but there are many ways to define and calculate response rates. Therefore, the table below presents an evaluation based upon a number of measurement parameters, which are defined with an “x” in categories that contribute to the measurement.

### 1. Phase I: General Dairy Management Report

A total of 3,554 operations were selected for the survey. Of these operations, 3,304 (93.0 percent) were contacted. There were 2,519 operations that provided usable inventory information (70.9 percent of the total selected and 76.2 percent of those contacted). In addition, there were 2,194 operations (61.7 percent) that provided “complete” information for the questionnaire. Of operations that provided complete information and were eligible to participate in Phase II (VMO collection) of the study (2,067 operations), 1,077 (52.1 percent) consented to be contacted for consideration/discussion about further participation.

Response Category	Number Operations	Percent Operations	Measurement Parameter		
			Contacts	Usable <sup>1</sup>	Complete <sup>2</sup>
Survey complete and VMO consent	1,077	30.3	x	x	x
Survey complete, refused VMO consent	990	27.9	x	x	x
Survey complete, ineligible <sup>3</sup> for VMO	127	3.6	x	x	x
No dairy cows on January 1, 2007	214	6.0	x	x	
Out of business	111	3.1	x	x	
Out of scope	6	0.2			
Refusal of GDMR	785	22.1	x		
Office hold (NASS elected not to contact)	126	3.5			
Inaccessible	118	3.3			
Total	3,554	100.0	3,304	2,519	2,194
Percent of total operations			93.0	70.9	61.7
Percent of total operations weighted <sup>4</sup>			94.0	74.1	59.6

<sup>1</sup>Useable operation—respondent provided answers to inventory questions for the operation (either zero or positive number on hand).

<sup>2</sup>Survey complete operation—respondent provided answers to all or nearly all questions for at least one site.

<sup>3</sup>Ineligible—less than 30 head of milk cows on January 14, 2007.

<sup>4</sup>Weighted response—the rate was calculated using the initial selection weights.

## 2. Phase II: VS Initial Visit

There were 1,077 operations that provided consent during Phase I to be contacted by a veterinary medical officer for Phase II. Of these 1,077, 582 (54.0 percent) agreed to continue in Phase II of the study and completed the VMO Initial Visit Questionnaire; 380 (35.3 percent) refused to participate. Approximately 10 percent of the 1,077 operations were not contacted, and 0.4 percent were ineligible because they had no dairy cows at the time they were contacted by the VMO during Phase II.

Response Category	Number Operations	Percent Operations	Measurement Parameter		
			Contacts	Usable <sup>1</sup>	Complete <sup>2</sup>
Survey complete	582	54.0	x	x	x
Survey refused	380	35.3	x		
Not contacted	111	10.3			
Ineligible <sup>3</sup>	4	0.4	x	x	
Total	1,077	100.0	966	586	582
Percent of total operations			89.7	54.4	54.0
Percent of total operations weighted <sup>4</sup>			87.5	50.8	50.4

<sup>1</sup>Useable operation—respondent provided answers to inventory questions for the operation (either zero or positive number on hand).

<sup>2</sup>Survey complete operation—respondent provided answers to all or nearly all questions.

<sup>3</sup>Ineligible—no dairy cows at time of interview, which occurred from February 26 through April 30, 2007.

<sup>4</sup>Weighted response—the rate was calculated using the turnover weights.

## Appendix I: Sample Profile

### A. Responding Operations

#### 1. Number of responding operations, by herd size

	Phase I: General Dairy Management Report	Phase II: VS Initial Visit
Herd Size (Number of Cows)	Number of Responding Operations	
Fewer than 100	1,028	233
100 to 499	691	215
500 or more	475	134
Total	2,194	582

#### 2. Number of responding operations, by region

	Phase I: General Dairy Management Report	Phase II: VS Initial Visit
Region	Number of Responding Operations	
West	426	108
East	1,768	474
Total	2,194	582

## Appendix II: Antibiotic/Antimicrobial Class

Antibiotic/ Antimicrobial Class	Product Name	Active Ingredient
Aminocyclitol	Adspec®	Spectinomycin
Aminoglycoside	AmTech Neomycin Oral Solution	Neomycin
	Biosol® Liquid	Neomycin sulfate
	Gentamicin	Gentamicin
	Neomix Ag® 325 Soluble Powder	Neomycin sulfate
	Neomix® 325 Soluble Powder	Neomycin sulfate
	Neomycin 325 Soluble Powder	Neomycin sulfate
	Neomycin Oral Solution	Neomycin sulfate
	Neo-Sol 50	Neomycin sulfate
	Strep Sol 25%	Streptomycin sulfate
	Streptomycin Oral Solution	Streptomycin
Beta-lactam	Agri-Cillin™	Penicillin G procaine
	Amoxi-Bol®	Amoxicillin
	Amoxi-Inject ®	Amoxicillin
	Amoxi-Mast® Intramammary Infusion	Amoxicillin
	Aquacillin™	Penicillin G procaine
	Aqua-Mast Intramammary Infusion	Penicillin G (procaine)
	Combi-Pen™-48	Penicillin G (benzathine)
	Crysticillin 300 AS Vet.	Penicillin G procaine
	Dariclox® Intramammary Infusion	Cloxacillin (sodium)
	Duo-Pen®	Penicillin G benzathine; procaine
	Durapen™	Penicillin G benzathine; procaine
	Hanford's/US Vet Masti-Clear Intramammary Infusion	Penicillin G (procaine)
	Hanford's/US Vet/Han-Pen G/Ultrapen	Penicillin G Procaine
	Hanford's/US Vet/Han-Pen-B/Ultrapen B	Penicillin G (benzathine)
	Hetacin®K Intramammary Infusion	Hetacillin (potassium)
	Microcillin	Penicillin G procaine
	Pen-G Max™	Penicillin G (procaine)
	Penicillin G Procaine	Penicillin G procaine
	PFI-Pen G®	Penicillin G procaine
	Polyflex®	Ampicillin
	Princillin Bolus	Ampicillin trihydrate
	Pro-Pen-G™ Injection	Penicillin G procaine

Antibiotic/ Antimicrobial Class	Product Name	Active Ingredient
Cephalosporin	Cefa-Lak®/Today Intramammary Infusion	Cephapirin (sodium)
	Excede™ Sterile Suspension	Ceftiofur crystalline free acid
	Excenel® RTU	Ceftiofur hydrochloride
	Naxcel®	Ceftiofur sodium
	Spectramast™ LC Intramammary Infusion	Ceftiofur
	ToDAY® Intramammary Infusion	Cephapirin (sodium)
Florfenicol	Nuflor Injectable Solution	Florfenicol
Lincosamide	Pirsue® Intramammary Infusion	Pirlimycin
Macrolide	Draxxin™	Tulathromycin
	Gallimycin®-100 Injection	Erythromycin
	Gallimycin®-36 Intramammary Infusion	Erythromycin
	Micotil® 300 Injection	Tilmicosin phosphate
	Tylan Injection 50/200 Tylosin Injection	Tylosin
Other	AS700	Chlortetracycline/sulfamethazine
	CORID 20% Soluble Powder	Amprolium
	CORID 9.6% Oral Solution	Amprolium
	Deccox-M	Decoquinat
	Linco-Spectin® Sterile Solution	Lincomycin/Spectinomycin
	TMZ	Trimethoprim sulfamethoxazole
Sulfonamide	20% SQX Solution	Sulfaquinoxaline
	Albon® Bolus	Sulfadimethoxine
	Albon® Concentrated Sol. 12.5%	Sulfadimethoxine
	Albon® Injection 40%	Sulfadimethoxine
	Albon® SR Bolus	Sulfadimethoxine
	Di-Methox & 12.5% Oral Solution	Sulfadimethoxine
	Di-Methox Injection 40%	Sulfadimethoxine
	Di-Methox Soluble Powder	Sulfadimethoxine
	Liquid Sul-Q-Nox	Sulfaquinoxaline (sodium)
	SDM Injection	Sulfadimethoxine
	SDM Injection 40%	Sulfadimethoxine
	SDM Solution	Sulfadimethoxine
	Sulfadimethoxine 12.5% Oral Solution	Sulfadimethoxine
	Sulfadimethoxine Inj. 40%	Sulfadimethoxine
	Sulfadimethoxine Soluble Powder	Sulfadimethoxine
	Sulfa-Nox Concentrate	Sulfaquinoxaline
	Sulfa-Nox Liquid	Sulfaquinoxaline (sodium)
	Sulfaquinoxaline Sodium Solution 20%	Sulfaquinoxaline (sodium)
	SulfaSure™ SR Cattle/Calf Bolus	Sulfamethazine
	Sulmet® Drinking Water Solution 12.5%	Sulfamethazine (sodium)
	Sulmet® Oblets®	Sulfamethazine
	Sulmet® Soluble Powder	Sulfamethazine (sodium)
	Sustain III® Cattle Bolus	Sulfamethazine
	Vetisulid Injection	Sulfachlorpyridazine (sodium)
	Vetisulid Powder	Sulfachlorpyridazine (sodium)



Antibiotic/ Antimicrobial Class	Product Name	Active Ingredient
Tetracycline	Agrimycin™ 100	Oxytetracycline hydrochloride
	Agrimycin™ 200	Oxytetracycline hydrochloride
	AmTech Oxytetracycline HCL Solution Powder - 343	Oxytetracycline
	Aureomycin® Soluble Powder	Chlortetracycline hydrochloride
	Aureomycin® Soluble Powder Concentrate	Chlortetracycline hydrochloride
	Bio-Mycin® 200	Oxytetracycline
	Bio-Mycin® C	Oxytetracycline hydrochloride
	CLTC 100 MR	Chlortetracycline calcium
	Duramycin-100	Oxytetracycline hydrochloride
	Duramycin-200	Oxytetracycline hydrochloride
	Liquamycin® LA-200®	Oxytetracycline
	Maxim-200®	Oxytetracycline
	Maxim™-100	Oxytetracycline hydrochloride
	Oxy 500 and 1000 Calf Bolus	Oxytetracycline hydrochloride
	Oxybiotic™ 200	Oxytetracycline
	Oxycure™ 100	Oxytetracycline hydrochloride
	Oxy-Mycin™ 100	Oxytetracycline hydrochloride
	Oxy-Mycin™ 200	Oxytetracycline hydrochloride
	Oxytetracycline HCL Soluble Powder	Oxytetracycline hydrochloride
	Oxytetracycline HCL Soluble Powder 343	Oxytetracycline hydrochloride
	Panmycin® 500 Bolus	Tetracycline hydrochloride
	Pennchlor™ 64 Soluble Powder	Chlortetracycline hydrochloride
	Pennox™ 200 Injectable	Oxytetracycline
	Pennox™ 343 Soluble Powder	Oxytetracycline hydrochloride
	Polyotic® Soluble Powder	Tetracycline hydrochloride
	Promycin™ 100	Oxytetracycline hydrochloride
	Solu/Tet Soluble Powder	Tetracycline hydrochloride
	Terramycin® 343 Soluble Powder	Oxytetracycline hydrochloride
	Terramycin® Scours Tablets	Oxytetracycline hydrochloride
	Terramycin® Soluble Powder	Oxytetracycline hydrochloride
	Terra-Vet 100	Oxytetracycline hydrochloride
	Tet-324	Tetracycline hydrochloride
	Tetra-Bac 324	Tetracycline hydrochloride
	Tetracycline HCL Soluble Powder- 324	Tetracycline hydrochloride
	Tetradure™ 300	Oxytetracycline
	Tetrasol Soluble Powder	Tetracycline hydrochloride
	Tet-Sol™ 324	Tetracycline hydrochloride

## Appendix III: U.S. Milk Cow Population and Operations

Region	State	Number of Milk Cows, January 1, 2007* (Thousand Head)		Number of Operations 2006*		Average Herd Size	
		Milk cows on operations with 1 or more head	Milk cows on operations with 30 or more head	Operations with 1 or more head	Operations with 30 or more head	Operations with 1 or more head	Operations with 30 or more head
<b>West</b>	California	1,790	1,788.2	2,200	1,920	813.6	931.4
	Idaho	502	501.0	800	620	627.5	808.1
	New Mexico	360	358.9	450	180	800.0	1,993.9
	Texas	347	344.2	1,300	660	266.9	521.5
	Washington	235	234.3	790	540	297.5	433.9
	Total	3,234	3,226.6	5,540	3,920	583.8	823.1
<b>East</b>	Indiana	166	154.4	2,100	1,150	79.0	134.3
	Iowa	210	203.7	2,400	1,870	87.5	108.9
	Kentucky	93	86.5	2,000	1,180	46.5	73.3
	Michigan	327	320.5	2,700	1,910	121.1	167.8
	Minnesota	455	441.3	5,400	4,800	84.3	91.9
	Missouri	114	108.3	2,600	1,400	43.8	77.4
	New York	628	612.3	6,400	5,100	98.1	120.1
	Ohio	274	252.1	4,300	2,400	63.7	105.0
	Pennsylvania	550	536.3	8,700	7,000	63.2	76.6
	Vermont	140	137.2	1,300	1,100	107.7	124.7
	Virginia	100	97.0	1,300	820	76.9	118.3
	Wisconsin	1,245	1,213.9	14,900	12,800	83.6	94.8
	Total	4,302	4,163.5	54,100	41,530	79.5	100.3
<b>Total (17 States)</b>		7,536	7,390.1	59,640	45,450	126.4	162.6
<b>Percentage of U.S.</b>		82.5	82.5	79.5	84.7		
<b>Total U.S. (50 States)</b>		9,132.0	8,958.5	74,980	53,680	121.8	166.9

\*Source: NASS Cattle report, February 2, 2007, and NASS Farms, Land in Farms, and Livestock Operations 2006 Summary report, February 2007. An operation is any place having one or more head of milk cows, excluding cows used to nurse calves, on hand at any time during the year.

Updates: NASS Cattle report, February 1, 2008, and NASS Farms, Land in Farms, and Livestock Operations 2007 Summary report, February 1, 2008.

## Appendix IV: Study Objectives and Related Outputs

1. Describe trends in dairy cattle health and management practices

- Part II: Changes in the U.S. Dairy Cattle Industry 1991-2007, March 2008
- Part V: Changes in Dairy Cattle Health and Management in the United States, 1991-2007, 2007, expected fall 2008

2. Evaluate management factors related to cow comfort and removal rates

- Dairy Facilities and Cow Comfort on U.S Dairy Operations, 2007, interpretive Report, expected fall 2008

3. Describe dairy calf health and nutrition from birth to weaning and evaluate heifer disease prevention practices

- Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, October 2007
- Off-Site Heifer Raising on U.S. Dairy Operations, 2007, info sheet, November 2007
- Colostrum Feeding and Management on U.S. dairy Operations, 1991-2007, info sheet, March 2008
- Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, expected fall 2008
- Calf Health and Management Practices on U.S. Dairy Operations, 2007, interpretive report, expected fall 2008
- Calving Management on U.S. Dairy Operations, 2007, info sheet, expected fall 2008

4. Estimate the prevalence of herds infected with bovine viral diarrhea virus (BVD)

- Bovine Viral Diarrhea (BVD) Detection in Bulk Tank Milk and BVD Management Practices in the United States, 1996-2007, info sheet, expected September 2008

5. Describe current milking procedures and estimate the prevalence of contagious mastitis pathogens

- **Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, September 2008**
- Milking Procedures on U.S. Dairy Operations, 2007, info sheet, expected September 2008

6. Estimate the herd-level prevalence and associated costs of *Mycobacterium avium* subspecies *paratuberculosis*

- Johne's Disease on U.S. Dairies, 1991-2007, info sheet, April 2008

7. Describe current biosecurity practices and determine producer motivation for implementing or not implementing biosecurity practices

- Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, October 2007
- **Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, September 2008**
- Biosecurity Practices on U.S. Dairy operations, 2002-2007, interpretive report, expected fall 2008

8. Determine the prevalence of specific food-safety pathogens and describe antimicrobial resistance patterns

- Antibiotic Use on U.S. Dairy Operations, 2002-2007, info sheet, expected September 2008
- Prevalence of *Salmonella* and *Listeria* in Bulk Tank Milk on U.S. Dairy Operations, 2007, info sheet, expected September 2008
- *Salmonella* and *Campylobacter* on U.S. Dairy Operations, 2002-2007, info sheet, expected fall 2008
- Food Safety Pathogens Isolated from U.S. Dairy Operations, 2007, interpretive report, expected winter 2008

Additional informational sheets

- Dairy Cattle Identification Practices in the United States, 2007, info sheet, November 2007
- Reproduction Practices on U.S. Dairy Operations, 2007, info sheet, expected fall 2008
- Bovine Leukosis Virus (BLV) on U.S. Dairy Operations, 2007, info sheet, expected September 2008
- Dairy Cattle Injection Practices in the United States, 2007, info sheet, expected fall 2008
- Methicillin-Resistant *Staphylococcus aureus* (MRSA) Isolation from Bulk Tank Milk in the United States, 2007, info sheet, expected fall 2008



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February 2009



# Dairy 2007

## Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007



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## Introduction

The National Animal Health Monitoring System (NAHMS) is a nonregulatory program of the Animal and Plant Health Inspection Service (APHIS), a branch of the United States Department of Agriculture (USDA). Designed to help meet the animal health information needs of a variety of stakeholders, NAHMS has collected data on dairy health and management practices through three previous studies.

The NAHMS 1991–92 National Dairy Heifer Evaluation Project (NDHEP) provided the dairy industry's first national information on the health and management of dairy cattle in the United States. Just months after the study's first results were released in 1993, cases of acute bovine viral diarrhea (BVD) surfaced in the United States following a 1993 outbreak in Canada. NDHEP information on producer vaccination and biosecurity practices helped officials address the risk of disease spread and target educational efforts on vaccination protocols. When an outbreak of human illness related to *Escherichia coli* O157:H7 was reported in 1993 in the Pacific Northwest, NDHEP data on the bacteria's prevalence in dairy cattle helped officials define public risks as well as research needs. This baseline picture of the industry also helped identify additional research and educational needs in various production areas, such as feed management and weaning age.

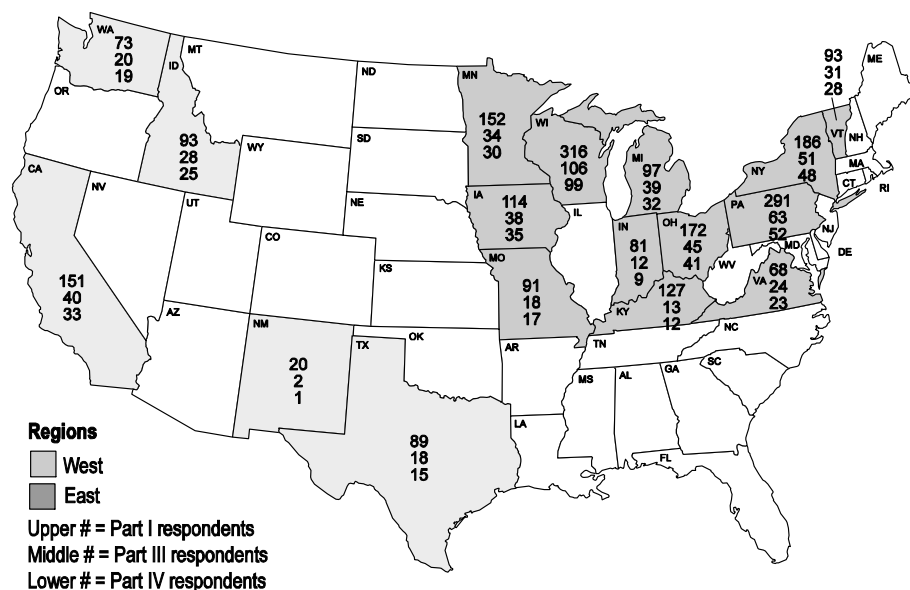
Information from the NAHMS Dairy 1996 Study helped the U.S. dairy industry identify educational needs and prioritize research efforts on such timely topics as antibiotic use; Johne's disease; digital dermatitis; bovine leukosis virus (BLV); and potential foodborne pathogens, including *E. coli*, *Salmonella*, and *Campylobacter*.

Two major goals of the Dairy 2002 Study were to describe management strategies that prevent and reduce Johne's disease and to determine management factors associated with *Mycoplasma* and *Listeria* in bulk-tank milk. The study was designed also to describe levels of participation in quality assurance programs, the incidence of digital dermatitis, animal-waste handling systems used on U.S. dairy operations, and industry changes since the NDHEP in 1991 and Dairy 1996.

The Dairy 2007 Study was conducted in 17 of the Nation's major dairy States (see map on next page) and provides valuable information to participants, stakeholders, and the industry as a whole. Dairy operations and cows in these States represent 79.5 percent of U.S. dairy operations and 82.5 percent of U.S. dairy cows. Results are presented in a variety of publications, including the following reports.

- **Part 1: Reference of Dairy Cattle Health and Management Practices in the United States, 2007 (October 2007)**—The first in a series of reports containing national information from the NAHMS Dairy 2007 Study, this report contains information collected from 2,194 dairy operations.
- **Part II: Changes in the United States Dairy Industry, 1991–2007 (March 2008)**—This report presents trends by providing national estimates of animal-health management practices for comparable populations from the NAHMS 1991–92 NDHEP, Dairy 1996, Dairy 2002, and Dairy 2007 studies.
- **Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007 (September 2008)**—This report presents national information from 582 operations with 30 or more dairy cows, a subset of the 2,194 operations described in Part I. State and Federal veterinary medical officers (VMOs) and animal health technicians (AHTs) conducted questionnaire interviews with producers and collected biological samples for analysis between February 26 and April 30, 2007.
- **Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007**—This report presents national information from 519 operations with 30 or more dairy cows, a subset of the 582 operations described in Part III. State and Federal VMOs and AHTs conducted questionnaire interviews with producers and collected biological samples for analysis between May 1 and August 31, 2007.

**Dairy 2007 Participating States and Number of Respondents by State**



Information on the methods used and number of respondents in the study can be found at the end of this report.

All Dairy 2007 Study reports, as well as reports from previous NAHMS dairy studies, are available online at <http://nahms.aphis.usda.gov>.

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## Terms Used In This Report

**Cow:** Female dairy bovine that has calved at least once.

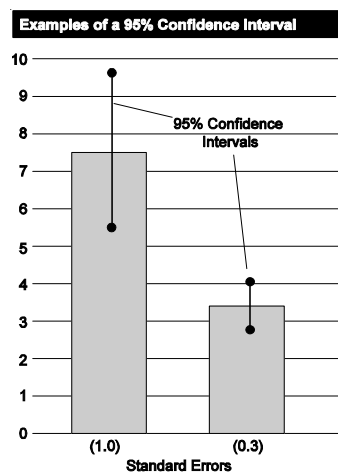
**Estrous:** Pertaining to estrus or in reference to the entire reproductive cycle (i.e., estrous cycle).

**Estrus:** Also referred to as “heat,” the period of time during the reproductive cycle when the female displays interest in mating and will stand to be mounted. Behavioral signs of estrus, in addition to standing to be mounted, include passage of clear mucus from the vulva and swelling of the vulva.

**Heifer:** Female dairy bovine that has not yet calved.

**Herd size:** Herd size is based on January 1, 2007, inventory. Small herds are those with fewer than 100 cows, medium herds are those with 100 to 499 cows, and large herds are those with 500 or more cows.

**Operation average:** The average value for all operations. A single value for each operation is summed over all operations reporting divided by the number of operations reporting. For example, operation average voluntary waiting period (see table a. on p 5) is calculated by summing voluntary waiting period (in days) over all operations divided by the number of operations.



**Population estimates:** Estimates in this report are provided with a measure of precision called the **standard error**. A 95-percent confidence interval can be created with bounds equal to the estimate plus or minus two standard errors. If the only error is sampling error, the confidence intervals created in this manner will contain the true population mean 95 out of 100 times. In the example to the left, an estimate of 7.5 with a standard error of 1.0 results in limits of 5.5 to 9.5 (two times the standard error above and below the estimate). The second estimate of 3.4 shows a standard error of 0.3, which results in limits of 2.8 and 4.0. Alternatively, the 90-percent confidence interval would be created by multiplying the standard error by 1.65 instead of 2. Most estimates in this report are rounded to the nearest tenth. If rounded to 0, the standard error was reported (0.0). If there were no reports of the event, no standard error was reported (--).

**Regions:**

- **West:** California, Idaho, New Mexico, Texas, and Washington
- **East:** Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Vermont, Virginia, and Wisconsin

**Sample profile:** Information that describes characteristics of the operations from which Dairy 2007 data were collected.

## Section I: Population Estimates

### A. Reproduction

#### 1. Voluntary waiting period

The time between calving and subsequent rebreeding is referred to as the voluntary waiting period. This period of time allows uterine involution, including the clearing of material and bacteria associated with parturition and return of the uterus to its pre-pregnancy size. Normally, uterine involution occurs within 20 to 30 days of parturition. In addition, it has been reported that 20 to 30 percent of cows are not cycling at 60 days in milk. Increasing the voluntary waiting period may increase fertility but can also result in increased days open.

The operation average voluntary waiting period was 54.8 days. The length of the voluntary waiting period did not differ by herd size.

a. Operation average number of days after calving cows were declared eligible to be bred (elective or voluntary waiting period) during the previous 12 months, and by herd size:

Operation Average Number Days							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error
55.2	(1.2)	53.4	(1.3)	56.1	(1.9)	54.8	(0.9)

More than one-half of dairy operations (53.5 percent) waited an average of 51 to 60 days after calving to start breeding cows during the previous 12 months. The low percentage of operations (2.3 percent) with a voluntary waiting period of 0 to 20 days likely housed bulls with all lactating cows. More than 9 of 10 operations (92.3 percent) declared cows eligible to be bred by 70 days after calving.

b. Percentage of operations by number of days after calving cows were declared eligible to be bred (elective or voluntary waiting period) during the previous 12 months:

Number of Days	Percent Operations	Standard Error
0 to 20	2.3	(0.9)
21 to 30	6.0	(1.4)
31 to 40	4.9	(1.2)
41 to 50	21.5	(2.3)
51 to 60	53.5	(2.8)
61 to 70	4.1	(1.0)
71 or more	7.7	(1.6)
Total	100.0	

## 2. Estrus (heat) detection

Detecting estrus is important in artificial insemination programs that do not rely exclusively on timed insemination. Research has shown that the duration and intensity of estrus in dairy cows have declined over time. Additionally, cows that spend a majority of time on concrete flooring have less-intense estrus. Recently developed methods to monitor estrus include electronic pedometers that measure increased activity, which is typical of cows in estrus, and electronic systems such as HeatWatch®, a device glued to the tailhead that detects the pressure of a mounting animal and transmits information about mounting activity.



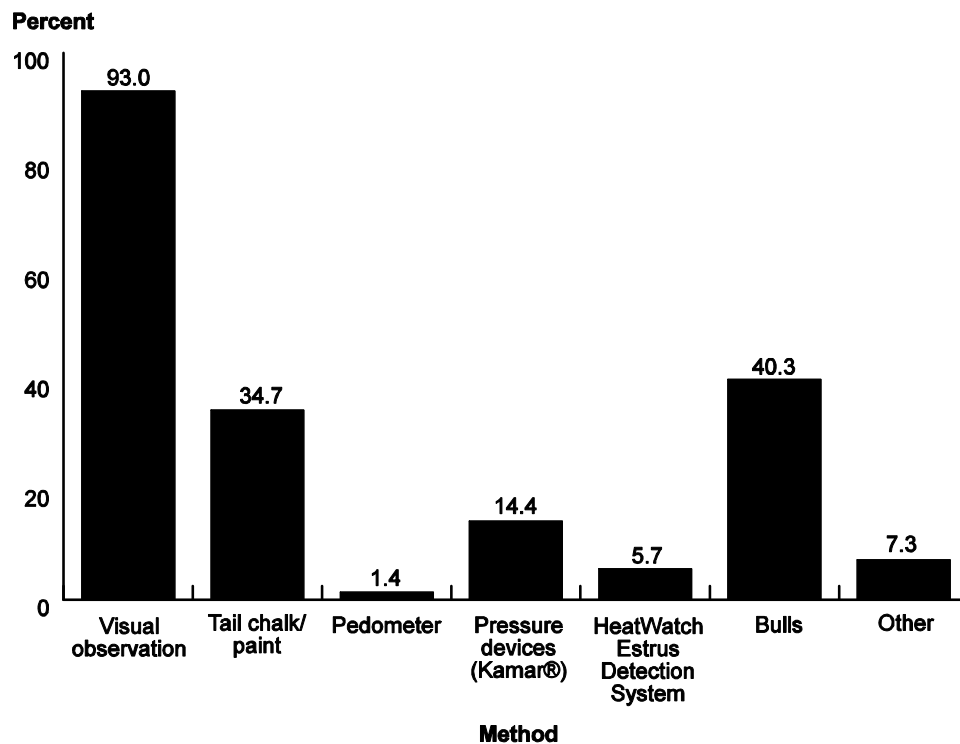
The most common method used to detect estrus on operations during the previous 12 months was visual observation, with 93.0 percent of all operations using this practice. Bulls or tail chalk/paint were used to detect estrus by 40.3 and 34.7 percent of operations, respectively. Electronic methods of detection—pedometers and HeatWatch—were used by a low percentage of operations (1.4 and 5.7 percent, respectively). Visual observation to detect estrus was used by a higher percentage of small and medium operations (93.5 and 95.5 percent, respectively) than large operations (77.7 percent) during the previous 12 months. A higher percentage of large operations used tail chalk/paint or pedometers (66.0 and 9.2 percent, respectively) than did small and medium operations. Although 51.7 percent of operations had bulls for breeding purposes (reported on p 72 of Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007), only 40.3 percent of operations used bulls to detect estrus. These operations may have housed bulls separately from cows and used other methods to detect estrus.

a. Percentage of operations by method used to detect estrus (heat) during the previous 12 months, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Method</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Visual observation	93.5	(1.8)	95.5	(1.3)	77.7	(6.0)	93.0	(1.3)
Tail chalk/paint	31.2	(3.6)	36.4	(4.1)	66.0	(6.0)	34.7	(2.7)
Pedometer	0.6	(0.4)	1.5	(0.7)	9.2	(3.0)	1.4	(0.4)
Pressure devices (Kamar®)	15.6	(2.8)	12.2	(2.8)	10.3	(4.0)	14.4	(2.1)
HeatWatch Estrus Detection System	5.2	(1.7)	7.4	(2.3)	4.8	(2.4)	5.7	(1.3)
Bulls	38.4	(4.0)	44.1	(4.5)	46.2	(6.1)	40.3	(3.0)
Other	5.9	(1.9)	10.1	(2.9)	10.9	(3.7)	7.3	(1.5)

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**Percentage of Operations by Method Used to Detect Estrus (Heat) During the Previous 12 Months**



The only regional differences in estrus-detection methods were for visual observation and tail chalk/paint. Visual observation was used by a lower percentage of operations in the West region (73.0 percent) than in the East region (94.9 percent). The percentage of operations that used tail chalk/paint in the West region was almost twice that of the East region (61.6 and 32.1 percent, respectively).

b. Percentage of operations by method used to detect estrus (heat) during the previous 12 months, by region:

Percent Operations				
Region				
West			East	
Method	Percent	Std. Error	Percent	Std. Error
Visual observation	73.0	(5.6)	94.9	(1.4)
Tail chalk/paint	61.6	(5.1)	32.1	(2.9)
Pedometer	0.9	(0.6)	1.4	(0.4)
Pressure devices (Kamar)	12.2	(4.2)	14.7	(2.2)
HeatWatch Estrus Detection System	4.4	(2.1)	5.8	(1.4)
Bulls	45.5	(6.1)	39.8	(3.2)
Other	7.3	(2.7)	7.3	(1.6)

Visual observation for estrus is generally accomplished by one of two methods. Either the owner/employees casually watch females for signs of estrus while performing other tasks around the dairy, or one or more people are designated to watch females for a specified length of time during a set number of times per day. The recommended minimum amount of time for visual observation of estrus is 30 minutes three times daily.

About 6 of 10 operations (59.7 percent) that used visual observation for estrus detection had a specific person observe cows for estrus, and the percentage did not differ by herd size or region.

c. For the 93.0 percent of operations that used visual observation for estrus (heat) detection, percentage of operations that had a designated person(s) specifically responsible for visually observing estrus, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
61.2	(4.1)	53.6	(4.7)	69.1	(6.6)	59.7	(3.1)

d. For the 93.0 percent of operations that used visual observation for estrus (heat) detection, percentage of operations that had a designated person(s) specifically responsible for visually observing estrus, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
71.2	(6.2)	58.8	(3.3)

For operations that used visual observation for estrus detection, 37.9 percent had a set number of times per day and duration each time for observing estrus. No herd size or regional differences were observed.

e. For the 93.0 percent of operations that used visual observation for estrus (heat) detection, percentage of operations that had a set number of times per day and duration each time for observing estrus, and by herd size:

<b>Percent Operations</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
35.5	(4.0)	42.9	(4.6)	45.4	(6.8)	37.9	(3.0)

f. For the 93.0 percent of operations that used visual observation for estrus (heat) detection, percentage of operations that had a set number of times per day and duration each time for observing estrus, by region:

<b>Percent Operations</b>			
<b>Region</b>			
<b>West</b>		<b>East</b>	
<b>Percent</b>	<b>Standard Error</b>	<b>Percent</b>	<b>Standard Error</b>
48.2	(6.8)	37.1	(3.2)

For operations with a set number of times per day and duration each time for visually detecting estrus, one-half (50.3 percent) observed cows twice daily, while 31.1 percent observed cows three or more times daily.

g. For the 37.9 percent of operations with a set number of times per day and duration each time for observing estrus (heat), percentage of operations by number of times cows were visually observed for estrus:

<b>Times Per Day</b>	<b>Percent Operations</b>	<b>Standard Error</b>
1	18.6	(3.5)
2	50.3	(4.6)
3	15.3	(3.0)
4 or more	15.8	(3.2)
Total	100.0	

For operations with a set number of times per day and duration each time for visually observing cows for estrus, about one-third of operations (35.6 percent) observed cows for 11 to 20 minutes each time cows were observed. Overall, more than one-half of operations reported visually observing cows for estrus 20 minutes or less at each visual observation period.

h. For the 37.9 percent of operations with a set number of times per day and duration each time for observing estrus (heat), percentage of operations by duration each time cows were visually observed for estrus:

<b>Duration Each Time (Minutes)</b>	<b>Percent Operations</b>	<b>Standard Error</b>
10 or less	27.1	(4.1)
11 to 20	35.6	(4.4)
21 to 30	16.1	(3.5)
31 to 40	0.4	(0.2)
41 or more	20.8	(3.8)
Total	100.0	

For operations with a set number of times per day to observe cows for estrus, the operation average number of minutes per day that cows were observed was 62.5 minutes. Although the time spent visually observing estrus appears different by herd size, the differences were not significant.

i. For the 37.9 percent of operations with a set number of times per day and duration each time for observing for estrus (heat), operation average total duration per day in minutes that cows were visually observed for estrus, and by herd size:

<b>Operation Average Number Minutes</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>
61.1	(7.4)	60.7	(6.1)	85.9	(11.4)	62.5	(5.2)

Of operations visually observing cows for estrus a set number of times per day, approximately one-third of operations (30.3 percent) observed estrus for 21 to 40 minutes per day. Approximately 20 percent of operations observed for estrus 20 minutes or less, 41 to 60 minutes, or 81 or more minutes per day.

j. For the 37.9 percent of operations with a set number of times per day and duration each time for observing for estrus (heat), percentage of operations by total duration per day in minutes that cows were visually observed for estrus:

<b>Duration Per Day</b> (Minutes)	<b>Percent Operations</b>	<b>Standard Error</b>
20 or less	22.9	(3.9)
21 to 40	30.3	(4.3)
41 to 60	23.6	(4.0)
61 to 80	2.2	(1.5)
81 or more	21.0	(3.6)
Total	100.0	

### 3. Breeding practices

Advances in technology and increases in knowledge of cattle reproductive biology have enabled development of new methods of breeding cattle. Better understanding of dairy cattle reproduction has led to the induction of estrus and, more recently, the induction of ovulation. These two advances have allowed operations to breed cows and heifers at specific times rather than waiting for the cows to show natural estrus. One protocol, popularly known as Ovsynch, uses prostaglandins and gonadotropin-releasing hormone (GnRH) in combination to manipulate ovulation for timed artificial insemination (timed AI). The Presynch protocol involves the administration of prostaglandins to regress the corpus luteum, synchronize the timing of estrus, and/or prepare for a timed breeding program such as Ovsynch. The implementation of an additional Ovsynch protocol for the second or greater service is termed Resynch.

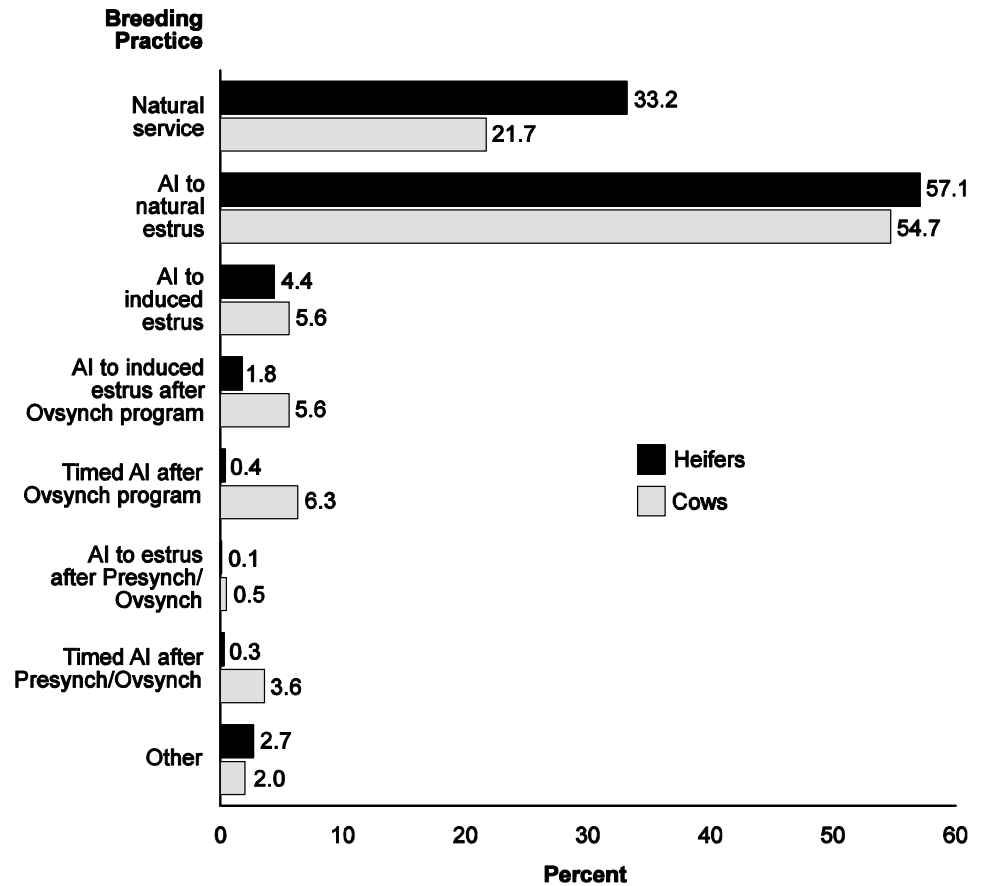
More than one-half of operations surveyed used artificial insemination (AI) to natural estrus for first service for the majority of heifers and cows (57.1 and 54.7 percent, respectively) during the previous 12 months. Natural service was used for the first service by one-third of operations (33.2 percent) for heifers and one-fifth of operations (21.7 percent) for cows. Timed-AI programs (timed AI after the Ovsynch protocol or after Presynch/Ovsynch) were used more frequently for first service of cows than heifers.

a. Percentage of operations by **first-service** breeding practice used for the majority of heifers and cows during the previous 12 months:

Breeding Practice	Percent Operations			
	Heifers		Cows	
	Percent	Std. Error	Percent	Std. Error
Natural service (bull-bred)	33.2	(3.0)	21.7	(2.7)
AI to natural estrus (no injections given to induce estrus)	57.1	(3.0)	54.7	(3.0)
AI to induced estrus (prostaglandin injections only)	4.4	(1.0)	5.6	(1.3)
AI to induced estrus after Ovsynch program (prostaglandin and GnRH injections)	1.8	(0.8)	5.6	(1.3)
Timed AI after Ovsynch program (prostaglandin and GnRH injections)	0.4	(0.2)	6.3	(1.4)
AI to estrus after Presynch/Ovsynch	0.1	(0.1)	0.5	(0.2)
Timed AI after Presynch/Ovsynch	0.3	(0.2)	3.6	(0.8)
Other	2.7	(0.8)	2.0	(0.6)
Total	100.0		100.0	



**Percentage of Operations by First-service Breeding Practice Used for the Majority of Heifers and Cows During the Previous 12 Months**

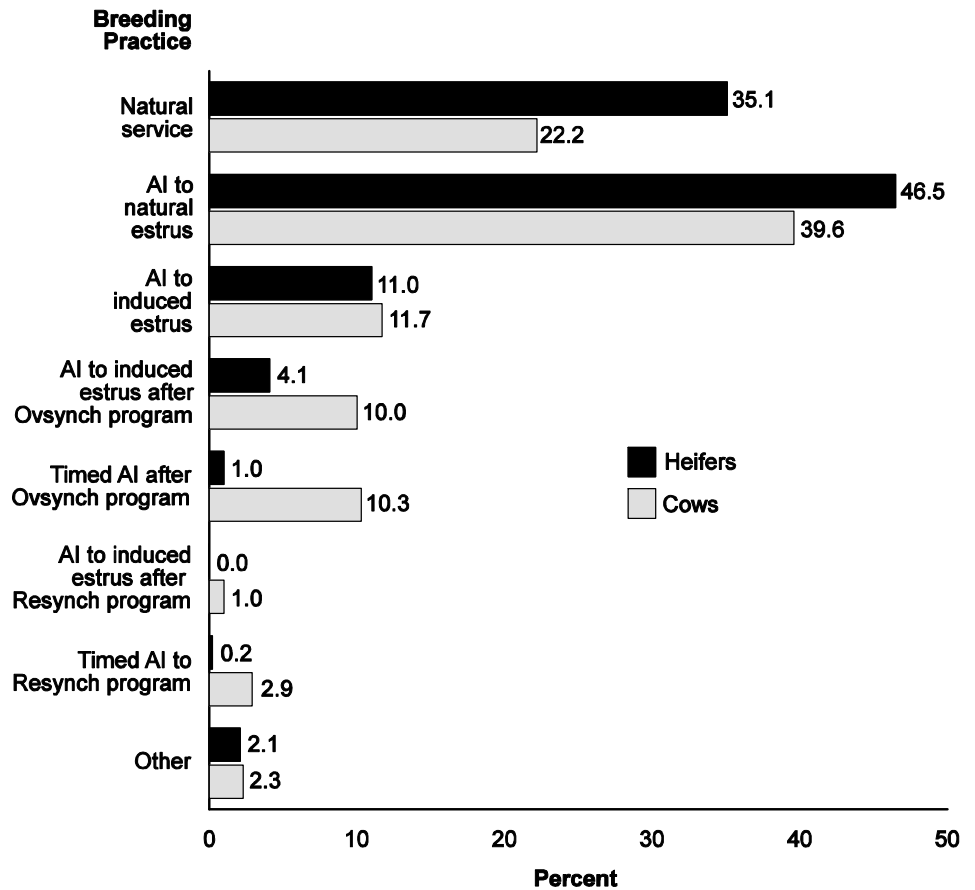


For the second or greater service, AI to natural estrus was used to breed the majority of heifers on 46.5 percent of operations and the majority of cows on 39.6 percent of operations during the previous 12 months. Bulls were used for the second or greater service for heifers on 35.1 percent of operations and for cows on 22.2 percent of operations. A higher percentage of operations used timed AI after Ovsynch or Resynch or AI to induced estrus after Resynch for the second or greater service in cows than in heifers. (The Resynch program is Ovsynch's first GnRH started 1 week prior to, or at, pregnancy diagnosis followed by prostaglandin and second GnRH injection.)

b. Percentage of operations by breeding practice used for the **second or greater service** for the majority of heifers and cows during the previous 12 months:

Breeding Practice	Percent Operations			
	Heifers		Cows	
	Percent	Std. Error	Percent	Std. Error
Natural service (bull-bred)	35.1	(2.9)	22.2	(2.6)
AI to natural estrus (no injections given to induce estrus)	46.5	(3.0)	39.6	(3.0)
AI to induced estrus (prostaglandin injections only)	11.0	(2.0)	11.7	(2.0)
AI to induced estrus after Ovsynch program (prostaglandin and GnRH injections)	4.1	(1.2)	10.0	(1.8)
Timed AI after Ovsynch program (prostaglandin and GnRH injections)	1.0	(0.4)	10.3	(1.8)
AI to induced estrus after Resynch program (Ovsynch's 1 <sup>st</sup> GnRH started 1 week prior to, or at, pregnancy diagnosis)	0.0	(--)	1.0	(0.4)
Timed AI to Resynch program (Ovsynch's 1 <sup>st</sup> GnRH started 1 week prior to, or at, pregnancy diagnosis)	0.2	(0.1)	2.9	(0.9)
Other	2.1	(0.7)	2.3	(0.8)
Total	100.0		100.0	

**Percentage of Operations by Breeding Practice Used for Second or Greater Service for the Majority of Heifers and Cows During the Previous 12 Months**



More than one-half of operations (57.6 percent) used timed-AI programs for at least some cows during the previous 12 months and about one-fourth (25.4 percent) used timed-AI programs for at least some heifers. Timed-AI programs were used for either heifers or cows on 58.2 percent of operations. A higher percentage of medium operations used timed AI for cows (69.7 percent) and either heifers or cows (70.8 percent) compared with small operations (52.8 and 53.2 percent, respectively).

c. Percentage of operations that used timed-AI programs to manage reproduction in heifers, cows, or either heifers or cows during the previous 12 months, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Cattle Class	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Heifers	22.7	(3.3)	33.3	(4.2)	24.7	(5.2)	25.4	(2.5)
Cows	52.8	(4.0)	69.7	(3.8)	62.9	(6.2)	57.6	(2.9)
Either heifers or cows	53.2	(4.0)	70.8	(3.8)	62.9	(6.2)	58.2	(2.9)

Timed-AI programs for cows and either heifers or cows were used on a higher percentage of operations in the East region (59.9 and 60.3 percent) compared with 34.3 and 35.6 percent, respectively, in the West region.

d. Percentage of operations that used timed-AI programs to manage reproduction in heifers, cows, or either heifers or cows during the previous 12 months, by region:

Percent Operations				
Region				
Cattle Class	West		East	
	Percent	Std. Error	Percent	Std. Error
Heifers	14.2	(3.7)	26.5	(2.7)
Cows	34.3	(4.8)	59.9	(3.2)
Either heifers or cows	35.6	(4.9)	60.3	(3.2)

About 4 of 10 operations (43.9 percent) that used timed-AI programs for either heifers or cows during the previous 12 months had been using timed AI for 7 years or more. More than one-third of operations (33.9 percent) had been using timed AI for 9 years or more.

e. For the 58.2 percent of operations that used timed-AI programs during the previous 12 months, percentage of operations by number of years timed-AI programs have been used:

Number of Years	Percent Operations	Standard Error
Fewer than 2.0	8.0	(2.2)
2.0 to 2.9	9.3	(2.3)
3.0 to 4.9	21.7	(3.2)
5.0 to 6.9	17.1	(2.8)
7.0 to 8.9	10.0	(2.3)
9.0 or more	33.9	(3.7)
Total	100.0	

Almost one-half of operations (48.8 percent) using timed-AI programs during the previous 12 months reported that timed AI was used only occasionally to catch up on nonpregnant cows. “Other” reasons best described use of timed AI on 5.6 percent of operations, and these included controlling only first-service, anestrus cows in addition to all reasons provided.

f. For the 58.2 percent of operations that used timed-AI programs during the previous 12 months, percentage of operations by reason that best describes why timed AI was used:

Reason	Percent Operations	Standard Error
To control all first and subsequent services	27.7	(3.2)
To control only second and greater services	17.9	(3.0)
Only occasionally to catch up on nonpregnant cows	48.8	(3.9)
Other	5.6	(1.4)
Total	100.0	

A controlled internal drug release (CIDR) insert has been approved for dairy cows and heifers since 2003. The product contains progesterone and is inserted vaginally to synchronize estrus in cattle. The CIDR insert is removed after 7 days, and estrus in nonpregnant cows is usually observed 3 to 4 days later.

Approximately one-third of operations (32.4 percent) used a CIDR insert during the previous 12 months. No significant differences were observed in the use of inserts by herd size or region.

g. Percentage of operations that used a CIDR insert during the previous 12 months, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
28.6	(3.5)	41.1	(4.5)	39.7	(5.5)	32.4	(2.7)

h. Percentage of operations that used a CIDR insert during the previous 12 months, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
19.5	(4.2)	33.7	(2.9)

For operations that reported using a CIDR insert during the previous 12 months, nearly two-thirds of operations (65.7 percent) used inserts for anestrous females. A majority of the operations that noted “Other” as the reason for using a CIDR insert used them for problem breeders.

i. For the 32.4 percent of operations that used a CIDR insert during the previous 12 months, percentage of operations by reason(s) used:

Reason	Percent Operations	Standard Error
As part of a herd synchronization program	34.3	(4.4)
Specifically for animals identified as anestrous	65.7	(4.4)
Specifically for animals identified as cystic	43.5	(4.7)
Postbreeding	15.0	(3.8)
Other	10.9	(3.1)

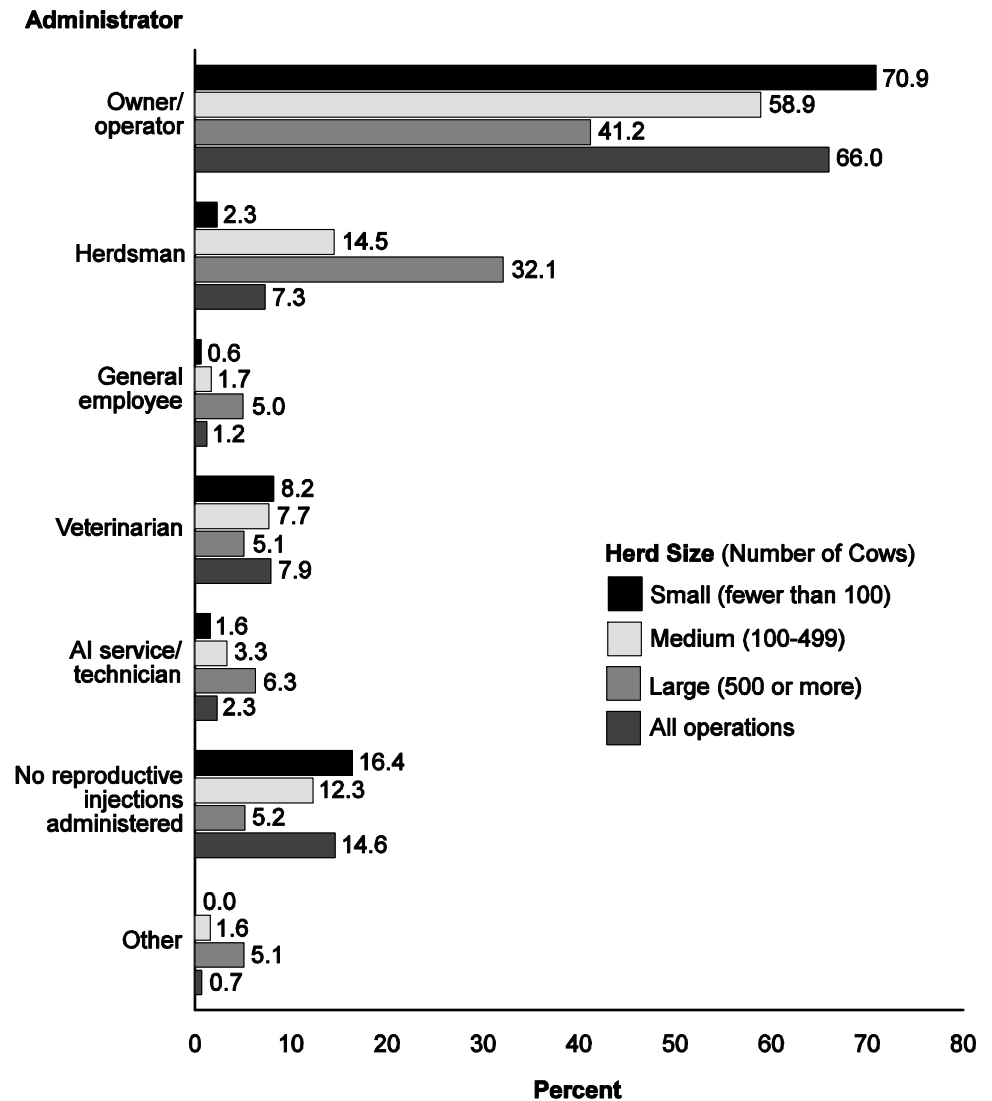
The owner/operator administered the majority of reproductive injections to cattle on two-thirds (66.0 percent) of all operations during the previous 12 months. For 70.9 percent of small operations and 58.9 percent of medium operations, the owner/operator gave the majority of reproductive injections. For large herds, the owner/operator gave the majority of reproductive injections on 41.2 percent of operations, with the herdsman giving the majority of reproductive injections on 32.1 percent of operations. The herdsman gave the majority of reproductive injections for fewer small operations (2.3 percent) than medium or large operations (14.5 and 32.1 percent, respectively). Reproductive injections were not administered on 16.4 percent of small operations, 12.3 percent of medium operations, and 5.2 percent of large operations.

j. Percentage of operations by person who administered the majority of reproductive injections during the previous 12 months, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
	<b>Small</b>		<b>Medium</b>		<b>Large</b>		<b>All</b>	
	<b>(Fewer than 100)</b>		<b>(100-499)</b>		<b>(500 or More)</b>		<b>Operations</b>	
<b>Administrator</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Owner/operator	70.9	(3.7)	58.9	(4.4)	41.2	(6.2)	66.0	(2.8)
Herdsman	2.3	(1.1)	14.5	(3.0)	32.1	(5.2)	7.3	(1.1)
General employee	0.6	(0.5)	1.7	(0.8)	5.0	(2.6)	1.2	(0.4)
Veterinarian	8.2	(2.5)	7.7	(2.4)	5.1	(2.9)	7.9	(1.8)
AI service/technician	1.6	(1.2)	3.3	(1.6)	6.3	(3.1)	2.3	(0.9)
No reproductive injections administered	16.4	(2.8)	12.3	(3.0)	5.2	(3.2)	14.6	(2.1)
Other	0.0	(--)	1.6	(1.1)	5.1	(2.8)	0.7	(0.3)
Total	100.0		100.0		100.0		100.0	



**Percentage of Operations by Person Who Administered the Majority of Reproductive Injections During the Previous 12 Months, and by Herd Size**



The only regional difference in the administration of reproductive injections during the previous 12 months was observed for the owner/operator. The owner/operator gave the majority of reproductive injections on a lower percentage of operations in the West region (37.3 percent) than in the East region (68.7 percent).

k. Percentage of operations by person who administered the majority of reproductive injections during the previous 12 months, by region:

<b>Percent Operations</b>				
<b>Region</b>				
<b>West</b>			<b>East</b>	
<b>Administrator</b>	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Owner/operator	37.3	(5.2)	68.7	(3.0)
Herdsman	12.4	(2.8)	6.8	(1.2)
General employee	3.1	(1.9)	1.0	(0.4)
Veterinarian	10.0	(3.6)	7.7	(1.9)
AI service/technician	8.3	(3.2)	1.7	(1.0)
No reproductive injections administered	25.6	(4.4)	13.6	(2.3)
Other	3.3	(2.1)	0.5	(0.3)
Total	100.0		100.0	

Embryo transfer (ET) can be used to obtain more offspring from cattle with superior genetics. In addition, for cattle with heat stress, ET has been shown to achieve higher pregnancy rates than routine AI. Embryos can be collected from donor cattle and then either transplanted immediately into recipient cattle or frozen for transplantation at a later date. Superovulated embryos result from eggs that are fertilized in the uterus of the dam. When the fertilization step occurs in the laboratory, the embryos are referred to as *in vitro* produced.

About 1 of 10 operations (11.5 percent) transplanted embryos into any heifers or cows during the previous 12 months. A similar percentage of each embryo type (fresh or frozen) was transplanted in heifers and cows. Fresh embryos were transplanted into heifers and/or cows on 8.2 percent of operations, while frozen embryos were transplanted into heifers and/or cows on 7.7 percent of operations.

I. Percentage of operations that transplanted fresh or frozen embryos, or either type, into heifers or cows, or either heifers or cows, during the previous 12 months:

	Percent Operations					
	Embryo Type					
	Fresh		Frozen		Either	
Cattle Class	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Heifers	7.1	(1.7)	5.2	(1.2)	8.9	(1.8)
Cows	6.1	(1.6)	4.3	(1.2)	8.6	(1.9)
Either heifers or cows	8.2	(1.8)	7.7	(1.5)	11.5	(2.0)

More than one-half of operations (54.9 percent) had cattle pregnancies conceived through natural service (bull breeding). Almost 9 of 10 operations (88.4 percent) had pregnancies conceived via AI, and about 1 of 10 operations (9.9 percent) had pregnancies via ET. A higher percentage of large operations (71.8 percent) used natural service compared with small operations (51.2 percent).

m. Percentage of operations with cattle pregnancies conceived during the previous 12 months by breeding method, and by herd size:

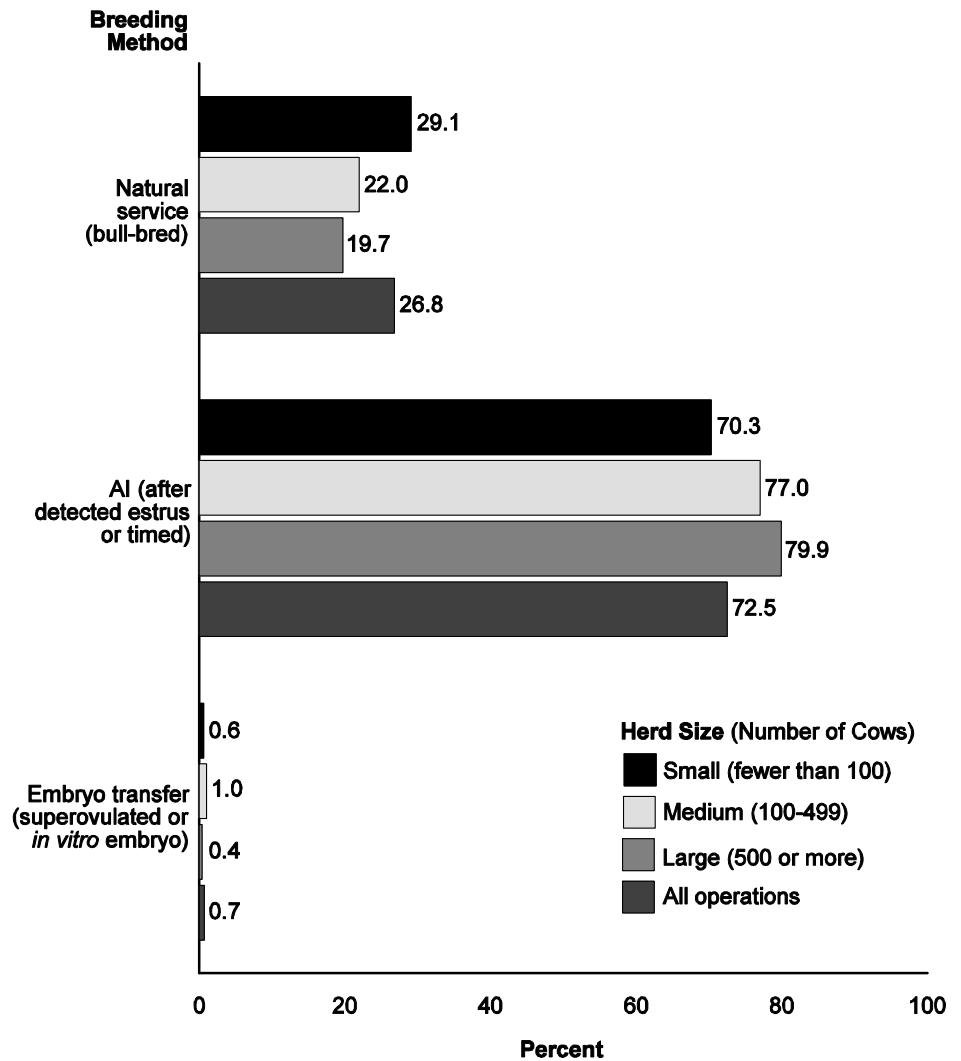
Percent Operations								
Herd Size (Number of Cows)								
Breeding Method	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Natural service (bull-bred)	51.2	(4.0)	60.9	(4.3)	71.8	(4.6)	54.9	(3.0)
AI (after detected estrus or timed)	86.4	(2.8)	93.7	(1.7)	89.6	(4.1)	88.4	(2.0)
Embryo transfer (superovulated or <i>in vitro</i> embryo)	8.5	(2.6)	13.0	(3.2)	12.7	(4.0)	9.9	(2.0)

On average, 72.5 percent of pregnancies were conceived by AI—either after detected estrus or timed—during the previous 12 months. About one-fourth of pregnancies (26.8 percent) were conceived through natural service. Less than 1 percent of pregnancies resulted from embryo transfer. No herd size differences were noted.

n. Operation average percentage of cattle pregnancies conceived during the previous 12 months by breeding method, and by herd size:

Operation Average Percent Pregnancies								
Herd Size (Number of Cows)								
Breeding Method	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Natural service (bull-bred)	29.1	(3.3)	22.0	(2.8)	19.7	(4.0)	26.8	(2.4)
AI (after detected estrus or timed)	70.3	(3.2)	77.0	(2.8)	79.9	(3.9)	72.5	(2.4)
Embryo transfer (superovulated or <i>in vitro</i> embryo)	0.6	(0.2)	1.0	(0.4)	0.4	(0.2)	0.7	(0.2)
Total	100.0		100.0		100.0		100.0	

**Operation Average Percentage of Cattle Pregnancies Conceived During the Previous 12 Months by Breeding Method, and by Herd Size**



There were no differences in operation average percent pregnancies by breeding method between the West and East regions.

o. Operation average percentage of cattle pregnancies conceived during the previous 12 months by breeding method, by region:

Operation Average Percent Pregnancies				
Region				
West			East	
Breeding Method	Percent	Std. Error	Percent	Std. Error
Natural service (bull-bred)	28.6	(4.5)	26.6	(2.6)
AI (after detected estrus or timed)	71.2	(4.5)	72.7	(2.6)
Embryo transfer (superovulated or <i>in vitro</i> embryo)	0.2	(0.1)	0.7	(0.2)
Total	100.0		100.0	

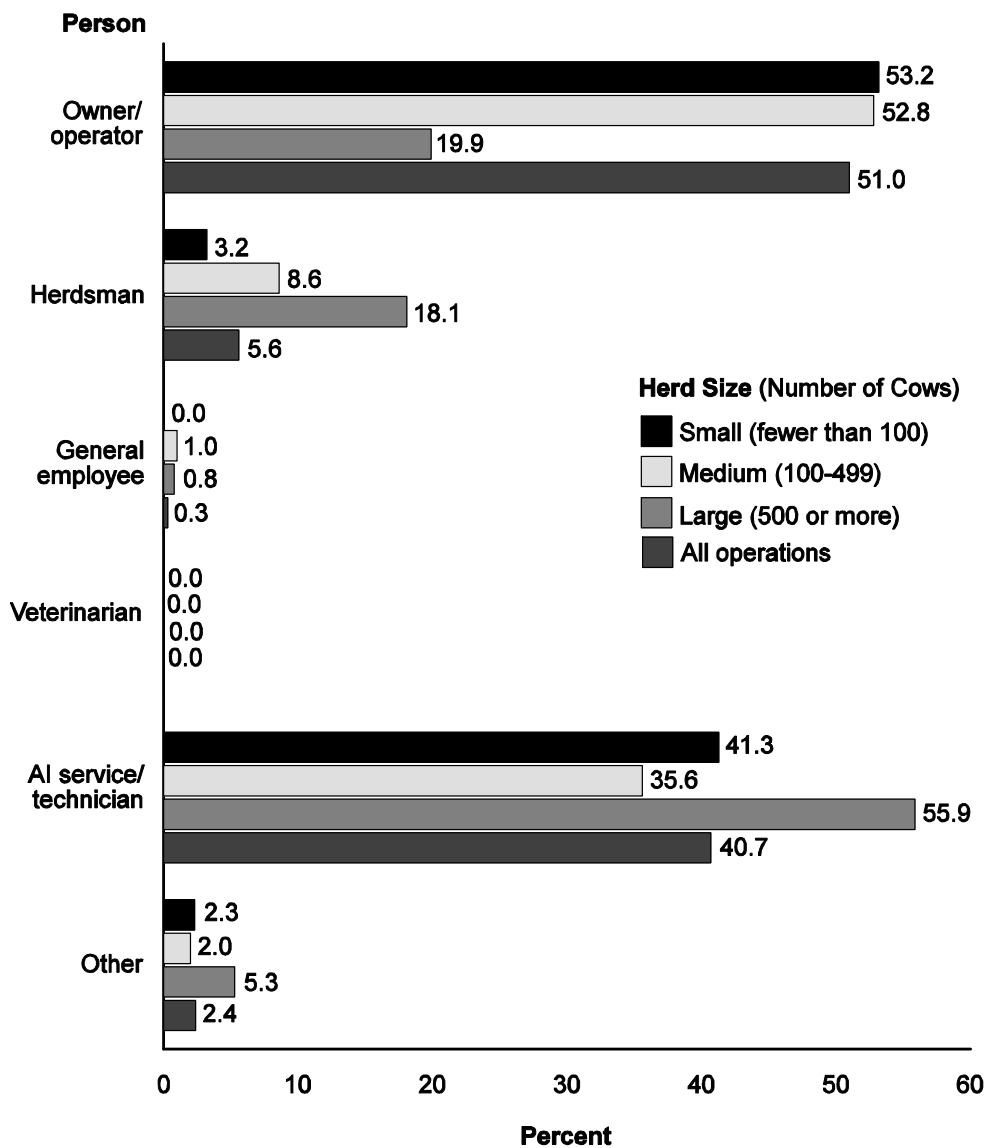
#### 4. AI personnel and services

On operations with any pregnancies conceived through AI during the previous 12 months, the owner/operator performed the majority of AI services on 51.0 percent of operations, while an AI service/technician performed the majority of these services on 40.7 percent of operations. An AI service/technician performed the majority of AI services on more than one-half of large operations (55.9 percent). The owner/operator performed the majority of AI services on a lower percentage of large operations (19.9 percent) than small or medium operations (53.2 and 52.8 percent, respectively). A herdsman performed the majority of AI services on a higher percentage of large operations (18.1 percent) than small operations (3.2 percent).

a. For the 88.4 percent of operations with cattle pregnancies conceived through AI during the previous 12 months, percentage of operations by person who performed the majority of AI services, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Person	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Owner/ operator	53.2	(4.4)	52.8	(4.7)	19.9	(5.2)	51.0	(3.2)
Herdsman	3.2	(1.3)	8.6	(1.9)	18.1	(3.8)	5.6	(1.0)
General employee	0.0	(--)	1.0	(0.7)	0.8	(0.3)	0.3	(0.2)
Veterinarian	0.0	(--)	0.0	(--)	0.0	(--)	0.0	(--)
AI service/ technician	41.3	(4.4)	35.6	(4.6)	55.9	(6.5)	40.7	(3.2)
Other	2.3	(1.5)	2.0	(1.2)	5.3	(3.1)	2.4	(1.0)
Total	100.0		100.0		100.0		100.0	

**For the 88.4 Percent of Operations with Cattle Pregnancies Conceived Through AI During the Previous 12 Months, Percentage of Operations by Person Who Performed the Majority of AI Services, and by Herd Size**





A herdsman performed the majority of AI services on a higher percentage of operations in the West region (15.8 percent) than in the East region (4.7 percent).

b. For the 88.4 percent of operations with cattle pregnancies conceived through AI during the previous 12 months, percentage of operations by person who performed the majority of AI services, by region:

Person	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Owner/operator	39.1	(6.2)	52.0	(3.4)
Herdsman	15.8	(3.6)	4.7	(1.1)
General employee	0.0	(--)	0.3	(0.2)
Veterinarian	0.0	(--)	0.0	(--)
AI service/technician	39.2	(6.1)	40.9	(3.4)
Other	5.9	(3.2)	2.1	(1.1)
Total	100.0		100.0	

On almost all operations (95.9 percent) that had pregnancies conceived through AI during the previous 12 months, the person responsible for the majority of AI services had been formally trained via lecture and/or laboratory exercises in performing AI.

c. For the 88.4 percent of operations with cattle pregnancies conceived through AI during the previous 12 months, percentage of operations on which the person responsible for the majority of AI services was formally trained:

Percent Operations	Standard Error
95.9	(1.2)

Although it has been possible to sex and sort semen since the 1980s, the use of sexed semen is still not a common practice. The sorting process is extremely slow, can damage the semen, and greatly reduces the overall semen counts. Consequently, compared with unsexed semen, sexed semen costs more and contains fewer viable sperm per straw, leading to a lower conception rate. Because heifers are generally more fertile, it is recommended that sexed semen be used only in virgin heifers.

About 1 of 10 heifers (11.4 percent) that eventually entered the milking herd were inseminated with sexed semen, compared with 3.5 percent of cows.

d. For the 88.4 percent of operations with cattle pregnancies conceived through AI during the previous 12 months, percentage of heifers and of cows that were inseminated with sexed semen during that time:

<b>Percent Heifers<sup>1</sup></b>	<b>Std. Error</b>	<b>Percent Cows<sup>2</sup></b>	<b>Std. Error</b>
11.4	(2.4)	3.5	(2.3)

<sup>1</sup>As a percentage of dairy heifers that entered the milking herd in 2006.

<sup>2</sup>As a percentage of cows on the operation at the time of VS Initial Visit interview.

For operations with pregnancies conceived through AI during the previous 12 months, approximately two-thirds of operations (70.9 percent) attempted AI breeding three to six times before designating nonpregnant cows for a different strategy.

e. For the 88.4 percent of operations with cattle pregnancies conceived through AI during the previous 12 months, and for cows in which AI was unsuccessful, percentage of operations by typical maximum number of times AI was attempted before these cows were designated for a different strategy (e.g., moved to a bull pen, sold, etc.):

<b>Number AI Attempts</b>	<b>Percent Operations</b>	<b>Standard Error</b>
1 or 2	10.8	(2.2)
3 or 4	33.2	(3.0)
5 or 6	37.7	(3.2)
7 or more	18.3	(2.1)
Total	100.0	

## 5. Pregnancy diagnosis

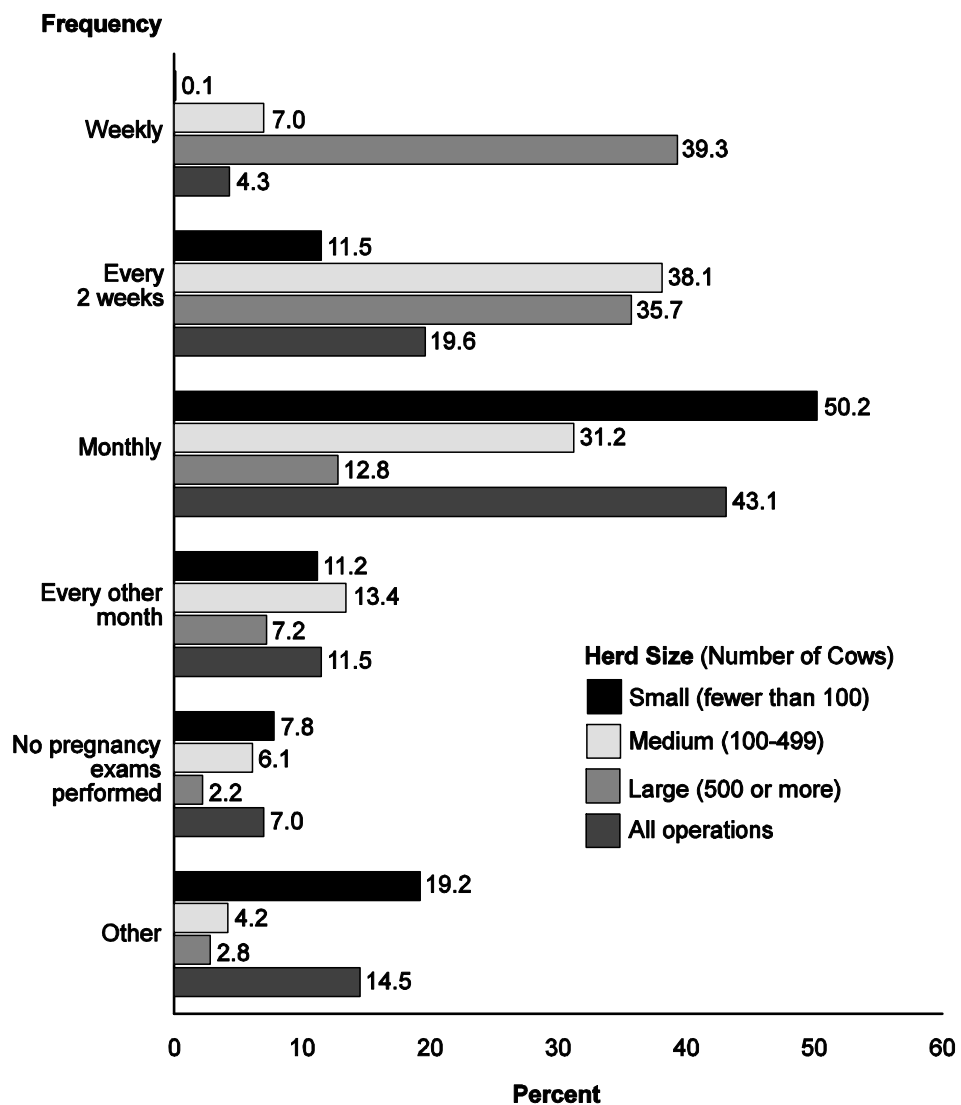
Pregnancy exams are important in evaluating the reproductive status of heifers and cows. The biggest advantage of performing pregnancy exams is identifying animals that are not pregnant so that they can be managed for rebreeding in a short period of time. Additional benefits of pregnancy exams include identification of uterine or ovarian disease, diagnosis of twins, and estimation of conception dates for animals in herds with unobserved natural service.

More than 9 of 10 operations (93.0 percent) had some pregnancy exams performed during the previous 12 months. Two-thirds of all operations (67.0 percent) performed pregnancy exams at least monthly during the previous 12 months. Most small operations (50.2 percent) performed exams on a monthly basis, while most medium operations performed exams every 2 weeks (38.1 percent) or monthly (31.2 percent). Most large operations performed exams weekly (39.3 percent) or every 2 weeks (35.7 percent). The increased frequency of exams with larger herd size might be related to the number of cows that need to be examined. On 7.0 percent of operations, no pregnancy exams were performed. Operations listing “Other” frequencies reported examining cows from 3 months of gestation to once annually.

a. Percentage of operations by frequency with which pregnancy exams were performed during the previous 12 months, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Frequency	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Weekly	0.1	(0.1)	7.0	(1.9)	39.3	(5.1)	4.3	(0.6)
Every 2 weeks	11.5	(2.5)	38.1	(4.2)	35.7	(5.9)	19.6	(2.1)
Monthly	50.2	(4.0)	31.2	(4.2)	12.8	(4.1)	43.1	(3.0)
Every other month	11.2	(2.7)	13.4	(3.4)	7.2	(3.3)	11.5	(2.0)
No pregnancy exams performed	7.8	(2.1)	6.1	(2.3)	2.2	(2.1)	7.0	(1.5)
Other	19.2	(3.2)	4.2	(1.3)	2.8	(2.2)	14.5	(2.2)
Total	100.0		100.0		100.0		100.0	

### Percentage of Operations by Frequency with Which Pregnancy Exams Were Performed During the Previous 12 Months, and by Herd Size



A higher percentage of operations in the East region (44.9 percent) performed monthly pregnancy exams than in the West region (25.0 percent).

b. Percentage of operations by frequency with which pregnancy exams were performed during the previous 12 months, by region:

<b>Percent Operations</b>				
<b>Region</b>				
	<b>West</b>		<b>East</b>	
<b>Frequency</b>	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Weekly	10.8	(3.1)	3.7	(0.6)
Every 2 weeks	32.6	(5.1)	18.4	(2.2)
Monthly	25.0	(4.9)	44.9	(3.3)
Every other month	11.7	(3.4)	11.4	(2.2)
No pregnancy exams performed	10.2	(4.1)	6.7	(1.6)
Other	9.7	(3.7)	14.9	(2.4)
Total	100.0		100.0	

Almost 9 of 10 operations (89.5 percent) used a private veterinarian to perform the majority of pregnancy exams during the previous 12 months. A higher percentage of small operations (91.3 percent) used a private veterinarian than large operations (76.0 percent). Pregnancy exams were performed by nonveterinarian employees on a higher percentage of large operations (10.3 percent) than small or medium operations (0.4 and 0.0 percent, respectively).

c. For the 93.0 percent of operations that had pregnancy exams performed during the previous 12 months, percentage of operations by person who performed the majority of exams, and by herd size:

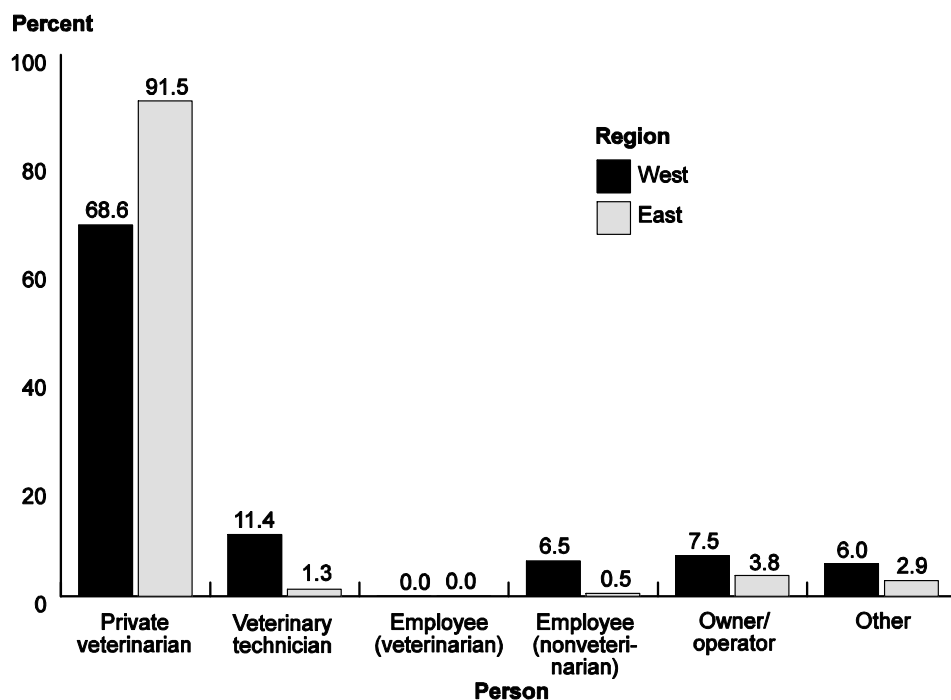
Percent Operations								
Herd Size (Number of Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Person	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Private veterinarian	91.3	(2.2)	88.2	(2.6)	76.0	(5.3)	89.5	(1.7)
Veterinary technician	1.6	(0.8)	2.4	(1.0)	7.5	(2.8)	2.2	(0.6)
Employee (veterinarian)	0.0	(--)	0.0	(--)	0.1	(0.1)	0.0	(0.0)
Employee (nonveterinarian)	0.4	(0.4)	0.0	(--)	10.3	(4.2)	1.0	(0.4)
Owner/operator	3.8	(1.2)	5.2	(1.6)	3.3	(1.9)	4.1	(0.9)
Other	2.9	(1.7)	4.2	(1.8)	2.8	(1.9)	3.2	(1.2)
Total	100.0		100.0		100.0		100.0	

A higher percentage of operations in the East region (91.5 percent) used a private veterinarian for pregnancy exams compared with operations in the West region (68.6 percent). In the West region, a higher percentage of operations (11.4 percent) used a veterinary technician to perform pregnancy exams than in the East region (1.3 percent).

d. For the 93.0 percent of operations that had pregnancy exams performed during the previous 12 months, percentage of operations by person who performed the majority of exams, by region:

Percent Operations				
Region				
West			East	
Person	Percent	Std. Error	Percent	Std. Error
Private veterinarian	68.6	(5.3)	91.5	(1.7)
Veterinary technician	11.4	(3.5)	1.3	(0.6)
Employee (veterinarian)	0.0	(--)	0.0	(0.0)
Employee (nonveterinarian)	6.5	(3.1)	0.5	(0.3)
Owner/operator	7.5	(2.7)	3.8	(0.9)
Other	6.0	(3.0)	2.9	(1.3)
Total	100.0		100.0	

**For the 93.0 Percent of Operations that had Pregnancy Exams Performed During the Previous 12 Months, Percentage of Operations by Person Who Performed the Majority of Exams, by Region**





The primary method used to restrain cows for pregnancy diagnosis on most small operations was tie stall/stanchion (80.7 percent of operations). The majority of large operations used headlocks (83.0 percent) for cow restraint.

e. For the 93.0 percent of operations that had pregnancy exams performed during the previous 12 months, percentage of operations by primary method used to restrain cows for pregnancy diagnosis, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Method</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Headlocks at the feed bunk	6.5	(1.9)	30.0	(3.7)	83.0	(4.4)	17.5	(1.7)
Palpation rail	0.6	(0.6)	10.3	(2.8)	6.0	(1.8)	3.4	(0.8)
Tie stall/stanchion	80.7	(2.7)	18.2	(4.1)	1.8	(1.8)	59.7	(2.5)
Chute	3.0	(1.0)	10.0	(2.8)	1.2	(0.7)	4.7	(1.0)
Parlor	5.4	(1.2)	11.1	(2.4)	5.6	(3.2)	6.8	(1.0)
Loose in freestalls	0.4	(0.3)	14.3	(3.5)	0.5	(0.2)	3.9	(0.9)
Other	3.4	(1.4)	6.1	(2.3)	1.9	(1.9)	4.0	(1.1)
Total	100.0		100.0		100.0		100.0	

Similar to the differences observed by herd size, a higher percentage of operations in the West region restrained cows for pregnancy diagnosis using headlocks at the feed bunk (71.7 percent) than operations in the East region (12.5 percent). Tie stalls/stanchions were used to restrain cows by 65.0 percent of operations in the East region compared with 2.5 percent in the West region.

f. For the 93.0 percent of operations that had pregnancy exams performed during the previous 12 months, percentage of operations by primary method used to restrain cows for pregnancy diagnosis, by region:

Percent Operations				
Region				
West			East	
Method	Percent	Std. Error	Percent	Std. Error
Headlocks at the feed bunk	71.7	(5.5)	12.5	(1.8)
Palpation rail	2.4	(1.3)	3.5	(0.9)
Tie stall/stanchion	2.5	(1.8)	65.0	(2.6)
Chute	7.0	(2.4)	4.4	(1.0)
Parlor	13.6	(4.9)	6.2	(1.0)
Loose in freestalls	1.3	(1.3)	4.2	(1.0)
Other	1.5	(1.5)	4.2	(1.2)
Total	100.0		100.0	



Photo courtesy of "Dairy Herd Management"/"Bovine Veterinarian"

The majority of operations (85.7 percent) routinely used rectal palpation to perform pregnancy exams. More than one-fourth of operations (27.4 percent) routinely used ultrasound to determine pregnancy status. Blood tests were not frequently used. There were no differences by herd size.

g. For the 93.0 percent of operations that had pregnancy exams performed during the previous 12 months, percentage of operations by method used routinely to determine pregnancy status, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Method	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Rectal palpation	84.6	(3.2)	88.5	(3.2)	86.5	(3.9)	85.7	(2.4)
Ultrasound	26.3	(3.7)	30.0	(4.3)	28.3	(5.4)	27.4	(2.8)
Blood test	4.5	(1.7)	2.3	(1.5)	7.4	(3.2)	4.1	(1.2)
Milk progesterone	0.0	(--)	0.0	(--)	0.0	(--)	0.0	(--)
Other	0.7	(0.5)	0.6	(0.6)	0.0	(0.0)	0.6	(0.3)

Rectal palpation was used to detect pregnancy on 96.3 percent of operations in the West region, compared with 84.7 percent in the East region. A higher percentage of operations in the East region (28.6 percent) used ultrasound for pregnancy exams than in the West region (14.0 percent).

h. For the 93.0 percent of operations that had pregnancy exams performed during the previous 12 months, percentage of operations by method used routinely to determine pregnancy status, by region:

Percent Operations				
Region				
West			East	
Method	Percent	Std. Error	Percent	Std. Error
Rectal palpation	96.3	(2.3)	84.7	(2.6)
Ultrasound	14.0	(4.0)	28.6	(3.0)
Blood test	2.6	(1.9)	4.3	(1.3)
Milk progesterone	0.0	(--)	0.0	(--)
Other	0.0	(--)	0.7	(0.4)

## 6. Ultrasound

Of operations that routinely used ultrasound to determine pregnancy status during the previous 12 months, more than three-fourths (77.4 percent) began using ultrasound for routine pregnancy diagnosis prior to 2006. Almost one-third of operations (29.6) reported using ultrasound for routine pregnancy exams in 2003 or earlier.

a. For the 27.4 percent of operations that routinely used ultrasound to determine pregnancy status during the previous 12 months, percentage of operations by year in which routine ultrasound diagnosis of pregnancy was first performed:

<b>Year</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Cumulative Percent</b>
2002 and before	16.4	(4.2)	16.4
2003	13.2	(4.5)	29.6
2004	14.9	(4.3)	44.5
2005	32.9	(6.0)	77.4
2006	14.9	(3.6)	92.3
2007	7.7	(2.6)	100.0
Total	100.0		

For operations that routinely used ultrasound to evaluate pregnancy status during the previous 12 months, almost all operations (99.6 percent) reported that the ultrasound equipment was owned by the veterinarian. No herd size or regional differences were observed for ownership of the ultrasound machine used for pregnancy diagnosis.

b. For the 27.4 percent of operations that routinely used ultrasound to determine pregnancy status during the previous 12 months, percentage of operations by owner of the ultrasound equipment used for the majority of pregnancy diagnoses:

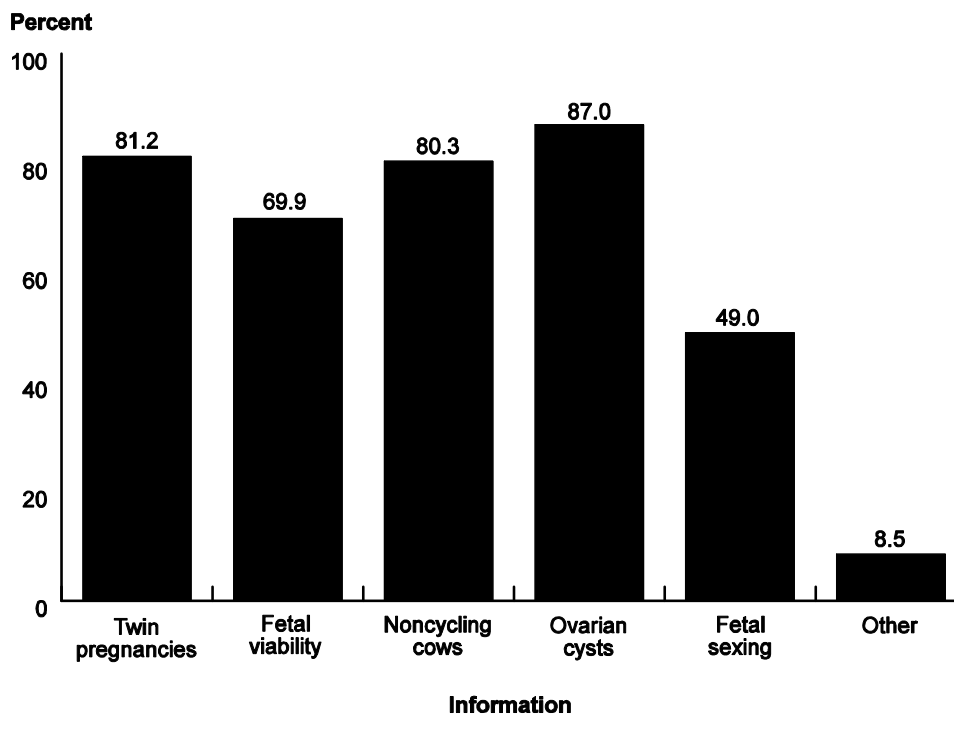
<b>Owner</b>	<b>Percent Operations</b>	<b>Standard Error</b>
Veterinarian	99.6	(0.2)
Dairy operation	0.2	(0.1)
Other	0.2	(0.1)
Total	100.0	

Ultrasound was often used to provide additional information during pregnancy exams. More than two-thirds of operations that routinely used ultrasound for pregnancy diagnosis during the previous 12 months collected and evaluated information on ovarian cysts (87.0 percent), twin pregnancies (81.2 percent), noncycling cows (80.3 percent), and fetal viability (69.9 percent). One-half the operations (49.0 percent) used ultrasound to determine the sex of the fetus.

c. For the 27.4 percent of operations that routinely used ultrasound to determine pregnancy status during the previous 12 months, percentage of operations by additional information collected/evaluated during ultrasound exams:

Information	Percent Operations	Standard Error
Twin pregnancies	81.2	(4.8)
Fetal viability	69.9	(5.6)
Noncycling (no heat) cows	80.3	(4.6)
Ovarian cysts	87.0	(4.2)
Fetal sexing	49.0	(5.9)
Other	8.5	(3.5)

**For the 27.4 Percent of Operations that Routinely Used Ultrasound to Determine Pregnancy Status During the Previous 12 Months, Percentage of Operations by Additional Information Collected/Evaluated During Ultrasound Exams**



## 7. Producer use of reproductive parameters

The parameters used to evaluate reproductive performance are interrelated and evolving. Pregnancy rate is calculated as the product of the conception rate times the heat detection rate. Conception rate is calculated by dividing the percentage of cows determined to be pregnant by those that were either naturally or artificially bred. Heat detection rate is the number of cows detected in estrus divided by the number of cows eligible to be bred within a 21-day period. Mean days open is typically the average number of days between calving and conception, but may also include the interval from calving to most recent service or current days in milk for cows that have gone beyond the voluntary waiting period and not been bred. The percentage of herd pregnant is typically reported for a given point in time. Calving interval is calculated by taking the mean number of months from one calving to the next calving for each cow in the herd.

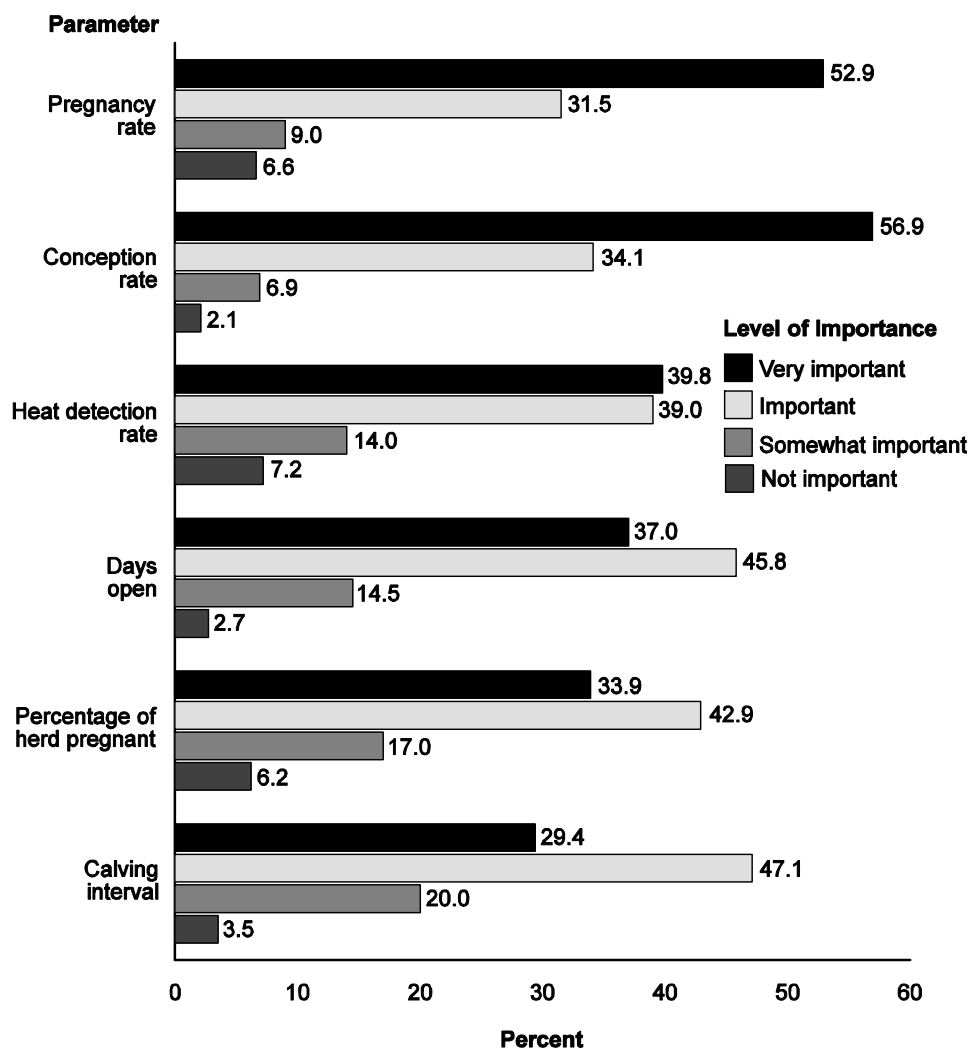
For each reproductive performance parameter, less than 8 percent of operations reported that the parameter was not important. The majority of operations reported that conception rate and pregnancy rate were very important in evaluating the reproductive performance of the herd (56.9 and 52.9 percent of operations, respectively).

a. Percentage of operations by level of importance of reproductive parameters used in evaluating reproductive performance of the herd:

Percent Operations									
Level of Importance									
Parameter	Very Important		Important		Somewhat Important		Not Important		Total
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	
Pregnancy rate	52.9	(3.0)	31.5	(2.9)	9.0	(1.7)	6.6	(1.4)	100.0
Conception rate	56.9	(3.0)	34.1	(2.9)	6.9	(1.6)	2.1	(0.8)	100.0
Heat detection rate	39.8	(2.9)	39.0	(3.0)	14.0	(2.0)	7.2	(1.5)	100.0
Days open	37.0	(2.8)	45.8	(3.0)	14.5	(2.1)	2.7	(0.9)	100.0
Percentage of herd pregnant	33.9	(2.8)	42.9	(3.0)	17.0	(2.1)	6.2	(1.4)	100.0
Calving interval	29.4	(2.6)	47.1	(3.0)	20.0	(2.5)	3.5	(1.0)	100.0

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**Percentage of Operations by Level of Importance of Reproductive Parameters Used in Evaluating Reproductive Performance of the Herd**





The highest percentage of operations (91.0 percent) considered conception rate to be important or very important in evaluating reproductive performance of the herd. For large operations, a higher percentage considered pregnancy rate, heat detection rate, and percentage of herd pregnant to be important or very important compared with small operations. There were no regional differences in the percentage of operations that considered reproductive parameters important or very important.

b. Percentage of operations that considered the following reproductive parameters to be important or very important in evaluating reproductive performance of the herd, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Parameter</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Pregnancy rate	81.0	(3.0)	90.4	(2.3)	96.7	(1.9)	84.4	(2.1)
Conception rate	90.3	(2.4)	92.0	(2.2)	94.2	(3.3)	91.0	(1.7)
Heat detection rate	76.3	(3.3)	82.5	(3.3)	90.4	(3.2)	78.8	(2.4)
Days open	80.3	(3.1)	88.1	(2.7)	88.4	(3.8)	82.8	(2.2)
Percentage of herd pregnant	74.4	(3.3)	79.7	(3.2)	91.0	(3.1)	76.8	(2.4)
Calving interval	75.7	(3.4)	77.8	(3.9)	80.3	(4.9)	76.5	(2.6)

## B. Calving Practices

### 1. Guidelines

Many factors contribute to calving difficulty and the need to intervene and assist with the calving process. For heifers, an important factor is the relationship of the calf size to the heifer size. In cows, dystocias are often related to multiple fetuses or malposition of the fetus. Guidelines for when and how to assist with calving are available and are slightly different for heifers and cows. Intervening too early or too late in the calving process can cause injury or death to the dam, the calf, or both.

Approximately 6 of 10 operations had guidelines on when to intervene during calving for heifers (60.7 percent), cows (60.5 percent), or both (60.5 percent). There were no differences in the percentage of operations with calving guidelines by herd size or region.

a. Percentage of operations with general guidelines (e.g., standard operating procedures or established protocols) on when to intervene during calving for heifers, cows, or both, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Cattle Class	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Heifers	62.3	(3.8)	56.9	(4.6)	57.4	(6.5)	60.7	(2.9)
Cows	62.3	(3.8)	56.3	(4.6)	57.5	(6.5)	60.5	(2.9)
Both	62.3	(3.8)	56.3	(4.6)	57.4	(6.5)	60.5	(2.9)

b. Percentage of operations with general guidelines (e.g., standard operating procedures or established protocols) on when to intervene during calving for heifers, cows, or both, by region:

Percent Operations				
Region				
West			East	
Cattle Class	Percent	Std. Error	Percent	Std. Error
Heifers	54.9	(6.2)	61.2	(3.1)
Cows	54.9	(6.2)	61.1	(3.1)
Both	54.9	(6.2)	61.1	(3.1)

For operations with guidelines for both heifers and cows, about one-half of operations (51.7 percent) used different guidelines for heifers and cows.

c. For the 60.5 percent of operations with guidelines for intervening during calving for both heifers and cows, percentage of operations that used different guidelines for heifers and cows:

Percent Operations	Standard Error
51.7	(3.9)

## 2. Calving personnel and training

For all operations, the average number of calving personnel (people with any work duties in the calving area, including employees and family members) was 2.4. The average number of calving personnel increased as herd size increased.

a. Average number of calving personnel, and by herd size:

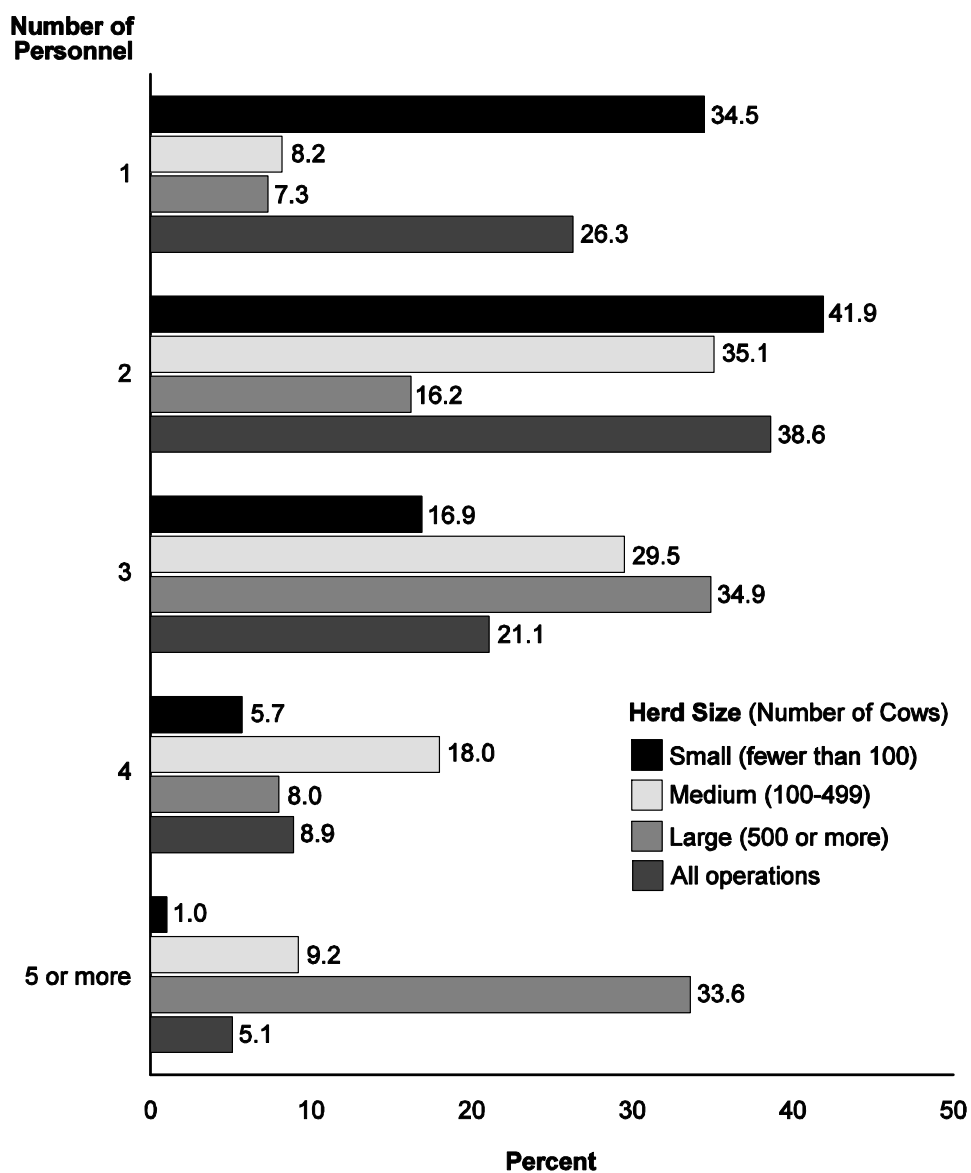
Average Number of Calving Personnel							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error	Avg.	Std. Error
2.0	(0.1)	3.0	(0.1)	4.1	(0.3)	2.4	(0.1)

The majority of small operations (76.4 percent) had one or two calving personnel, compared with two or three people for medium operations (64.6 percent) and three or more people for large operations (76.5 percent).

b. Percentage of operations by number of calving personnel, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Number of Calving Personnel</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
1	34.5	(3.9)	8.2	(2.3)	7.3	(3.7)	26.3	(2.8)
2	41.9	(4.0)	35.1	(4.3)	16.2	(4.7)	38.6	(3.0)
3	16.9	(3.1)	29.5	(4.2)	34.9	(6.4)	21.1	(2.4)
4	5.7	(1.6)	18.0	(3.5)	8.0	(3.3)	8.9	(1.5)
5 or more	1.0	(0.7)	9.2	(2.4)	33.6	(5.5)	5.1	(0.9)
Total	100.0		100.0		100.0		100.0	

### Percentage of Operations by Number of Calving Personnel, and by Herd Size



The West region had a higher percentage of operations with five or more people in the calving area (16.6 percent) than the East region (4.0 percent).

c. Percentage of operations by number of calving personnel, by region:

Percent Operations				
Region				
Number of Calving Personnel	West		East	
	Percent	Std. Error	Percent	Std. Error
1	15.7	(4.8)	27.3	(3.1)
2	35.1	(5.9)	38.9	(3.2)
3	27.4	(5.1)	20.6	(2.6)
4	5.2	(2.5)	9.2	(1.6)
5 or more	16.6	(3.9)	4.0	(0.9)
Total	100.0		100.0	

More than 90 percent of operations (91.9 percent) provided training in calving intervention for owners/employees of the operation. Most operations (90.4 percent) used on-the-job training in calving intervention. Approximately one of four operations (27.0 percent) provided training through discussion/lecture. Some operations used more than one method to train owners/employees in calving intervention.

d. Percentage of operations by training methods in calving intervention used for owners/employees of the operation:

Training Method	Percent Operations	Standard Error
Video	2.4	(0.7)
Discussion/lecture	27.0	(2.7)
On-the-job	90.4	(1.8)
Other	6.1	(1.5)
Any	91.9	(1.7)

### 3. Calving difficulty scoring

Recording and monitoring calving difficulty scores can help producers select sires and make decisions about retaining replacement heifers. The most common scoring system for the degree of calving difficulty is based on 5 points: 1 point = no problem, 2 = slight problem, 3 = needed assistance, 4 = needed considerable force, and 5 = extreme difficulty/surgical procedure. Studies have shown that a higher percentage of heifers require assistance than cows.

More than one-third of operations (38.5 percent) reported having a system for scoring calving difficulty. A higher percentage of large operations (57.9 percent) than small operations (35.2 percent) had a scoring system.

a. Percentage of operations with a system for scoring calving difficulty, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
35.2	(3.8)	42.6	(4.3)	57.9	(6.1)	38.5	(2.9)

There was no difference by region in the percentage of operations with a system for scoring calving difficulty.

b. Percentage of operations with a system for scoring calving difficulty, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
35.4	(5.1)	38.8	(3.1)

Of the operations with a system for scoring calving difficulty, almost all (91.6 percent) record the score for assisted births.

c. For the 38.5 percent of operations with a system for scoring calving difficulty, percentage of operations that record the calving difficulty score for assisted births:

Percent Operations	Standard Error
91.6	(3.0)

#### 4. Observation close to calving

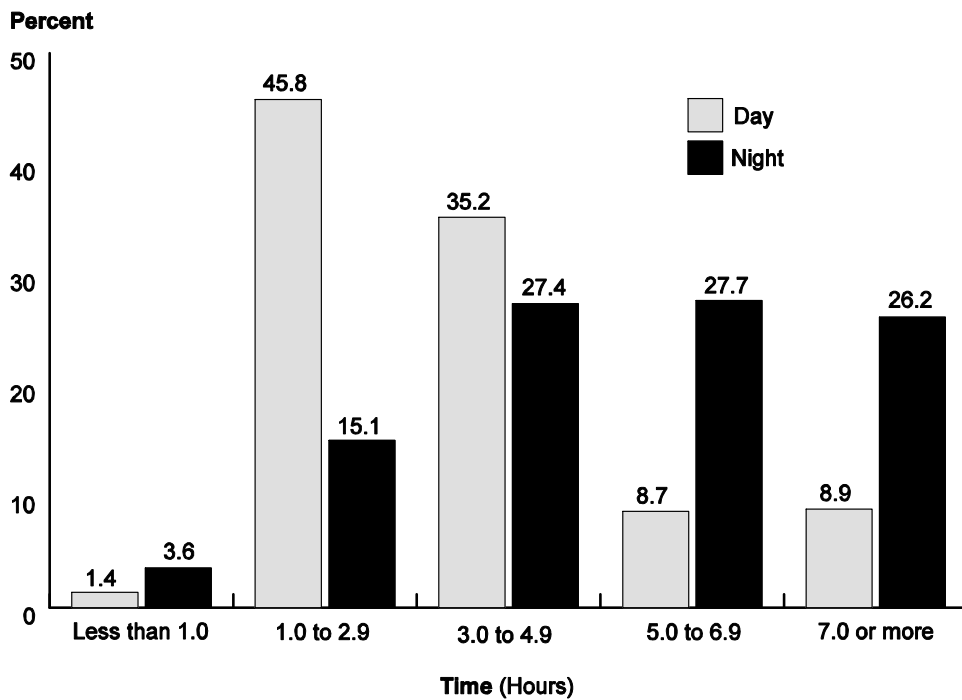
Ideally, heifers and cows close to calving would be observed at all times in case they need assistance, but this is not practical or even possible for many operations. The literature suggests, however, that no more than 3 hours should pass between observation periods.

As one would expect, females close to calving were observed more frequently during the day than at night. About one-half of operations (47.2 percent) allowed less than 3 hours, on average, to pass between observations during the day, with 17.6 percent of operations allowing 5 hours or more between observation periods. During the night, 18.7 percent of operations allowed less than 3 hours to pass between observations, and 53.9 percent of operations let 5 hours or more pass between observation periods.

a. Percentage of operations by average time between observation periods of cattle close to calving, by time of day:

	Percent Operations			
	Day		Night	
Time (Hours)	Percent	Std. Error	Percent	Std. Error
Less than 1.0	1.4	(0.6)	3.6	(1.3)
1.0 to 2.9	45.8	(3.0)	15.1	(2.1)
3.0 to 4.9	35.2	(2.9)	27.4	(2.8)
5.0 to 6.9	8.7	(1.8)	27.7	(2.7)
7.0 or more	8.9	(1.8)	26.2	(2.6)
Total	100.0		100.0	



**Percentage of Operations by Average Time Between Observation Periods of Cattle Close to Calving, by Time of Day**

Although the normal calving process is classified into three stages, the process is continuous and proceeds gradually from one stage to the next. Stage 1 is characterized by cervical dilation and uterine contractions that usually are not evident as abdominal contractions. Cattle during this stage may be restless/off feed because of the discomfort of the uterine contractions. Stage 1 usually lasts 2 to 6 hours but may be longer in heifers. During stage 2 of labor, uterine contractions continue and abdominal contractions become evident. Stage 2 ends in the delivery of the fetus(es) and usually takes less than 2 hours for mature cows but up to 4 hours for heifers. In stage 3, the fetal membranes (placenta) are expelled as a result of continued uterine contractions. The duration of stage 3 can be minutes to multiple days, if the placenta is retained.

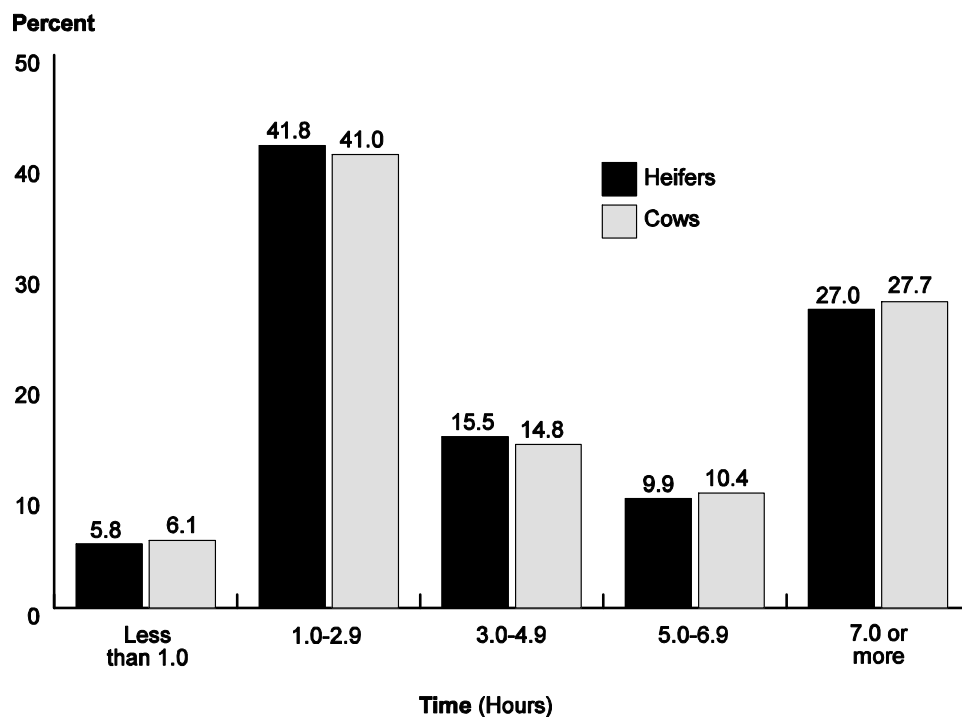
The majority of operations (63.1 percent for heifers and 61.9 percent for cows) reported that they would examine or assist an animal before 5 hours elapsed if she shows signs of stage 1 labor without subsequent straining. More than one-fourth of operations (27.0 percent for heifers and 27.7 percent for cows) would wait 7 hours or more to examine or assist an animal that exhibits signs of stage 1 labor without subsequent straining.

b. Percentage of operations by length of time producers would wait to examine or assist an animal when calving is imminent and the heifer or cow is restless/off feed but not observed to be straining:

Time (Hours)	Percent Operations			
	Heifers		Cows	
	Percent	Std. Error	Percent	Std. Error
Less than 1.0	5.8	(1.2)	6.1	(1.3)
1.0 to 2.9	41.8	(2.9)	41.0	(2.8)
3.0 to 4.9	15.5	(2.0)	14.8	(1.9)
5.0 to 6.9	9.9	(1.9)	10.4	(2.1)
7.0 or more	27.0	(2.8)	27.7	(2.8)
Total	100.0		100.0	

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**Percentage of Operations by Length of Time Producers Would Wait to Examine or Assist an Animal When Calving is Imminent and the Heifer or Cow is Restless/Off Feed but not Observed to be Straining**



Abdominal contractions and straining typically mark the beginning of stage 2 labor. Once straining is observed, the animal should be assessed if she is not making good progress in delivery within 2 to 3 hours for heifers and 1 hour for cows.

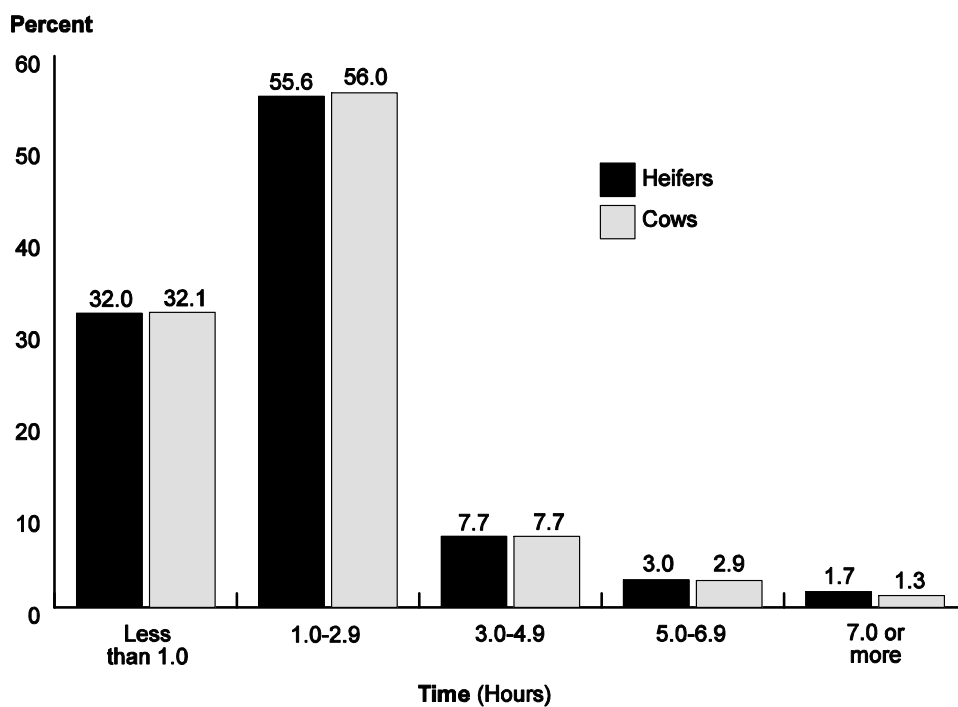
Almost 9 of 10 operations reported that they wait less than 3 hours to assist heifers or cows that are observed to be straining but are not progressing in delivery of the calf (87.6 and 88.1 percent, respectively). Less than 2 percent of operations reported that they wait 7 or more hours before attending to heifers or cows that are straining but not progressing in delivery.

c. Percentage of operations by length of time producers would wait to examine or assist a heifer or cow that has begun to strain but is not progressing in delivery of the calf:

Time (Hours)	Percent Operations			
	Heifers		Cows	
	Percent	Std. Error	Percent	Std. Error
Less than 1.0	32.0	(2.9)	32.1	(2.9)
1.0 to 2.9	55.6	(3.0)	56.0	(3.0)
3.0 to 4.9	7.7	(1.5)	7.7	(1.5)
5.0 to 6.9	3.0	(1.2)	2.9	(1.3)
7.0 or more	1.7	(0.9)	1.3	(0.8)
Total	100.0		100.0	

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**Percentage of Operations by Length of Time Producers Would Wait to Examine or Assist a Heifer or Cow that has Begun to Strain but is not Progressing in Delivery of the Calf**



About 95 percent of operations reported that they examine or assist heifers and cows within 3 hours of the water bag appearing at the vulva. Almost one-half of operations would assist heifers and cows within 1 hour of the water bag appearing at the vulva.

d. Percentage of operations by length of time producers would wait before examining or assisting a heifer or cow once the water bag appears at the vulva:

Percent Operations				
Time (Hours)	Heifers		Cows	
	Percent	Std. Error	Percent	Std. Error
Less than 1.0	48.4	(2.8)	49.2	(2.8)
1.0 to 2.9	46.2	(2.8)	46.4	(2.8)
3.0 to 4.9	4.1	(1.1)	3.5	(1.0)
5.0 to 6.9	0.6	(0.5)	0.0	(--)
7.0 or more	0.7	(0.5)	0.9	(0.5)
Total	100.0		100.0	

## 5. Intervention

Implementation of the practices listed below is generally recommended when a dystocia or difficult calving necessitates intervention. More than 50 percent of all operations reported that they generally implemented recommended practices, except for calling a veterinarian to assist (12.9 percent) and tying or holding the tail out of the way (32.4 percent). A higher percentage of small operations (14.6 percent) than large operations (3.6 percent) would generally call a veterinarian to assist. A higher percentage of large operations would restrain the cow in a head catch or similar equipment; this might reflect the loose housing systems (such as freestall or drylot) more common on large operations, compared with the tie stall and stanchion facilities more common on small operations. A higher percentage of large operations than small operations would typically wash the perineum area with soap and water (74.8 and 48.8 percent, respectively); wear obstetrical gloves (87.1 and 62.5 percent, respectively); or use a lubricant (82.2 and 50.4 percent, respectively) while assisting with delivery.

a. Percentage of operations by practice generally implemented once a decision is made to intervene in calving, and by herd size:

Practice	Percent Operations							
	Herd Size (Number of Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Call veterinarian to assist	14.6	(3.1)	10.6	(2.9)	3.6	(2.1)	12.9	(2.3)
Move cow to an individual maternity pen	54.4	(4.0)	64.4	(4.1)	69.0	(5.5)	57.8	(2.9)
Restrain cow in a head catch or similar equipment	55.1	(4.0)	58.4	(4.3)	91.7	(2.4)	58.3	(2.9)
Tie back or hold cow's tail out of the way	30.3	(3.7)	36.0	(4.3)	41.2	(6.3)	32.4	(2.8)
Wash perineum area with soap and water	48.8	(4.1)	55.9	(4.5)	74.8	(5.4)	52.2	(3.0)
Wear obstetrical gloves	62.5	(4.0)	76.2	(3.5)	87.1	(4.3)	67.5	(2.9)
Clean and disinfect chains or other equipment prior to use in the vagina or uterus	70.4	(3.7)	75.2	(4.0)	85.7	(4.5)	72.6	(2.7)
Use a lubricant	50.4	(4.1)	69.5	(4.1)	82.2	(5.1)	57.2	(3.0)
Other	3.0	(1.4)	0.3	(0.3)	0.3	(0.3)	2.2	(0.9)

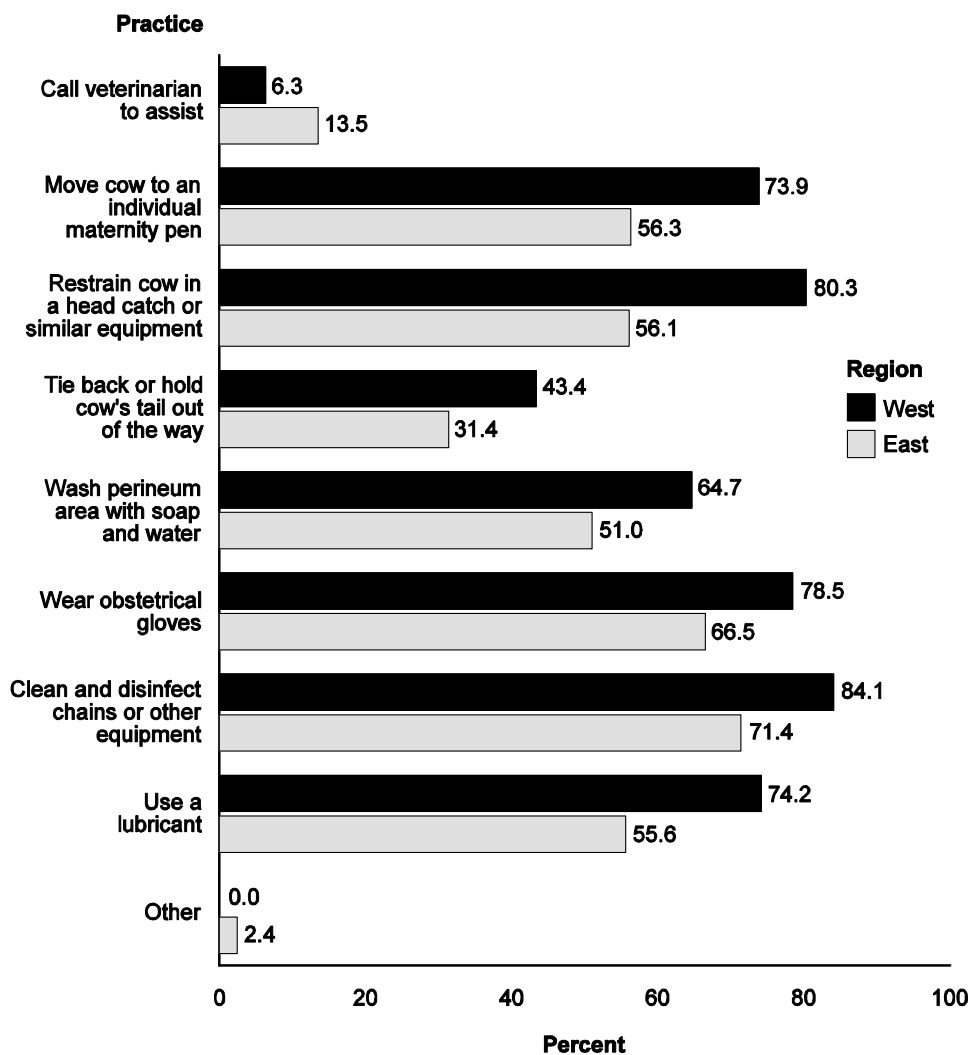
The use of three recommended practices for calving interventions differed by region. A higher percentage of operations in the West region than in the East region would generally move the cow to an individual maternity pen (73.9 and 56.3 percent, respectively), restrain the cow in a head catch or similar equipment (80.3 and 56.1 percent, respectively), or use a lubricant (74.2 and 55.6 percent, respectively).

b. Percentage of operations by practice generally implemented once a decision is made to intervene in calving, by region:

Percent Operations				
Region				
Practice	West		East	
	Percent	Std. Error	Percent	Std. Error
Call veterinarian to assist	6.3	(2.4)	13.5	(2.5)
Move cow to an individual maternity pen	73.9	(5.1)	56.3	(3.2)
Restrain cow in a head catch or similar equipment	80.3	(3.7)	56.1	(3.2)
Tie back or hold cow's tail out of the way	43.4	(5.6)	31.4	(3.0)
Wash perineum area with soap and water	64.7	(5.8)	51.0	(3.3)
Wear obstetrical gloves	78.5	(5.0)	66.5	(3.1)
Clean and disinfect chains or other equipment prior to use in the vagina or uterus	84.1	(4.3)	71.4	(2.9)
Use a lubricant	74.2	(5.2)	55.6	(3.2)
Other	0.0	(--)	2.4	(1.0)



**Percentage of Operations by Practice Generally Implemented Once a Decision is Made to Intervene in Calving, by Region**



Although the dam provides the best lubricant, during difficult deliveries additional lubricant can be helpful in delivering a healthy calf, as well as in protecting the dam from trauma. With the exception of water used alone, all the lubricants listed below may be helpful. The best choice is a commercial obstetrical lubricant mixed with water and used generously.

More than 50 percent of operations that reported generally using a lubricant during calving intervention used a commercial lubricant (57.5 percent), soap (56.2 percent), or water with other lubricant (51.8 percent). Less than 10 percent of operations used mineral oil, shortening, or water only as a lubricant.

c. For the 57.2 percent of operations that generally use a lubricant during calving intervention, percentage of operations by type of lubricant used:

Lubricant	Percent Operations	Standard Error
Mineral oil	8.4	(1.8)
Soap	56.2	(3.6)
Water with other lubricant	51.8	(3.8)
Water only	2.0	(1.1)
Commercial obstetrical lubricant (e.g., J-Lube)	57.5	(3.8)
Shortening (e.g., Crisco)	2.4	(1.1)
Other	1.0	(0.5)

Any instrument that is used to assist with a difficult delivery should be easy to sanitize, especially instruments that are used inside the vagina and uterus to deliver calves. Most operations (71.1 percent) used stainless-steel OB chains for pulling calves; these chains are easy to sanitize and are recommended for use. Almost 50 percent of operations (49.6 percent) used twine, while 22.1 percent used rope to pull calves. Stainless-steel OB chains were used on a higher percentage of medium and large operations compared with small operations. Alternatively, twine was used on a higher percentage of small operations than medium or large operations.

d. Percentage of operations by type of equipment used for pulling calves (direct contact with calf), and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Equipment Type</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Stainless-steel OB chains	65.5	(3.8)	81.5	(3.7)	90.6	(3.5)	71.1	(2.8)
Twine	56.5	(4.0)	37.7	(4.4)	21.5	(5.4)	49.6	(3.0)
Rope	23.2	(3.5)	19.4	(3.5)	21.4	(5.3)	22.1	(2.6)
Other	3.1	(1.3)	1.7	(0.7)	8.1	(3.5)	3.1	(0.9)
Any	99.4	(0.6)	100.0	(0.0)	100.0	(0.0)	99.6	(0.4)

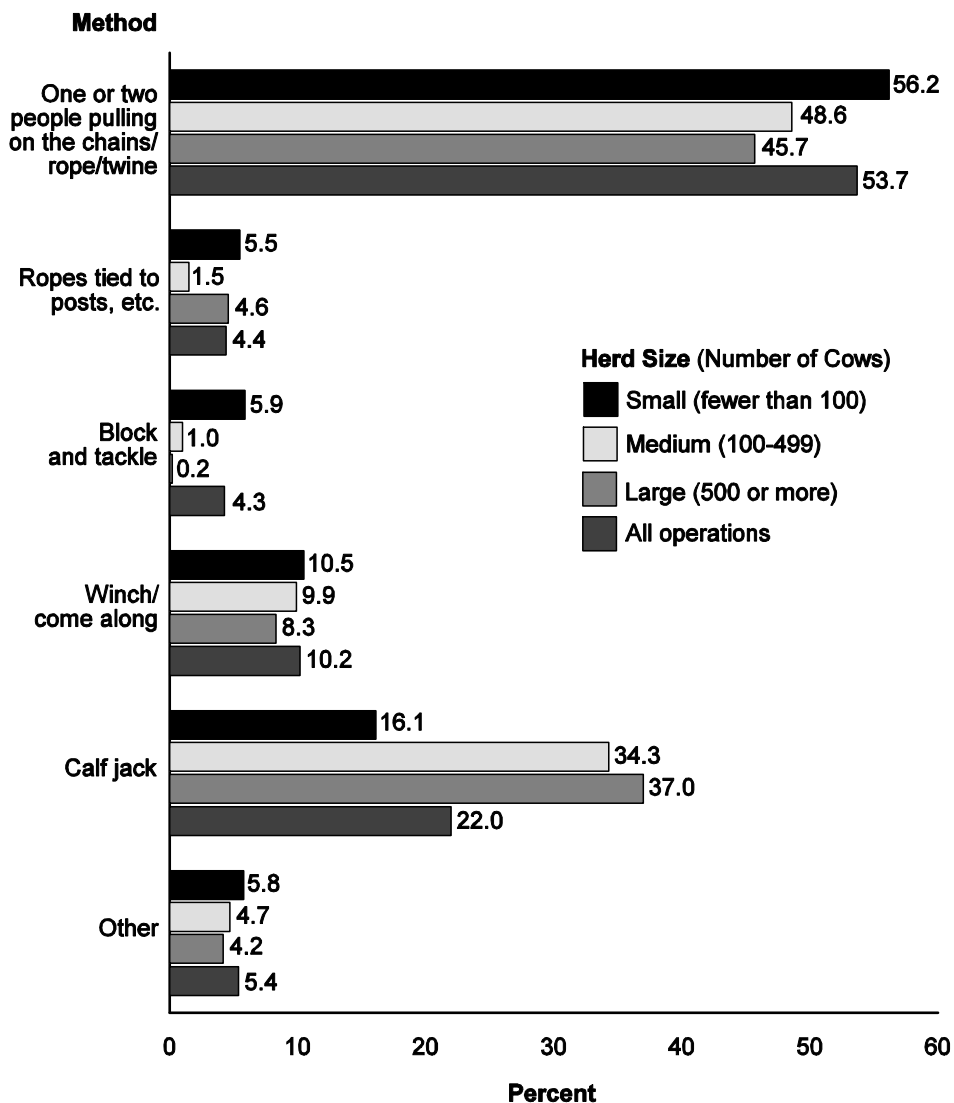
The amount of pressure exerted on the calf during an assisted delivery can cause injury or death to the cow and calf. Studies have reported that two strong people can exert a force of 400 to 600 lb while delivering a calf, whereas a calf jack can exert 2,000 lb of force. If two people cannot deliver a calf manually, then an alternative delivery method, such as a C-section for live calves or a fetotomy for dead calves, is usually recommended.

More than one-half of operations (53.7 percent) reported that one or two people pulling on the chains, rope, or twine was the method most commonly used to apply traction to deliver the calf. About one of five operations (22.0 percent) reported using a calf jack to apply traction. A block and tackle was used by a higher percentage of small operations compared with large operations (5.9 and 0.2 percent, respectively). A higher percentage of medium and large operations used a calf jack (34.3 and 37.0 percent, respectively) compared with small operations (16.1 percent).

e. Percentage of operations by method most commonly used to apply traction to deliver the calf, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Method	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
One or two people pulling on the chains/rope/twine	56.2	(4.0)	48.6	(4.4)	45.7	(6.3)	53.7	(3.0)
Ropes tied to posts, etc.	5.5	(2.1)	1.5	(0.8)	4.6	(2.4)	4.4	(1.4)
Block and tackle	5.9	(1.8)	1.0	(0.9)	0.2	(0.2)	4.3	(1.3)
Winch/come along	10.5	(2.7)	9.9	(2.6)	8.3	(3.3)	10.2	(2.0)
Calf jack	16.1	(2.8)	34.3	(4.1)	37.0	(5.9)	22.0	(2.2)
Other	5.8	(1.8)	4.7	(1.7)	4.2	(3.7)	5.4	(1.3)
Total	100.0		100.0		100.0		100.0	

**Percentage of Operations by Method Most Commonly Used to Apply Traction to Deliver the Calf, and by Herd Size**



To reduce the possibility of injury to the dam during calving intervention, traction should be applied when the dam is straining. More than three in four operations (77.3 percent) reported that traction is generally applied in conjunction with the dam straining, while 22.7 percent reported that traction is generally applied continuously.

f. Percentage of operations by best description of how traction is generally applied during calving intervention:

<b>Traction Application</b>	<b>Percent Operations</b>	<b>Standard Error</b>
In conjunction with dam straining	77.3	(2.5)
Continuously	22.7	(2.5)
Total	100.0	

## 6. Veterinary assistance

Although 12.9 percent of operations would call a veterinarian to assist once a decision is made to intervene during a difficult calving (see table 5a. on p 61), almost all operations, regardless of herd size or region, would ever seek veterinary assistance for difficult calvings.

a. Percentage of operations that ever seek veterinary assistance for difficult deliveries, and by herd size:

<b>Percent Operations</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
95.5	(1.5)	95.0	(1.5)	86.8	(4.4)	94.8	(1.1)

b. Percentage of operations that ever seek veterinary assistance for difficult deliveries, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
86.6	(3.9)	95.6	(1.2)

More than 90 percent of operations that ever seek veterinary assistance for difficult deliveries reported they would seek assistance to help correct the calf's position for delivery (93.5 percent), while 85.6 percent of operations would seek veterinary assistance after applying traction for a specific amount of time with no evidence of progress.

c. For the 94.8 percent of operations that ever seek veterinary assistance for difficult deliveries, percentage of operations that would seek assistance for the following situations:

Situation	Percent Operations	Standard Error
Unable to correctly position calf for delivery	93.5	(1.4)
Applied traction for a specific amount of time without progress	85.6	(2.2)

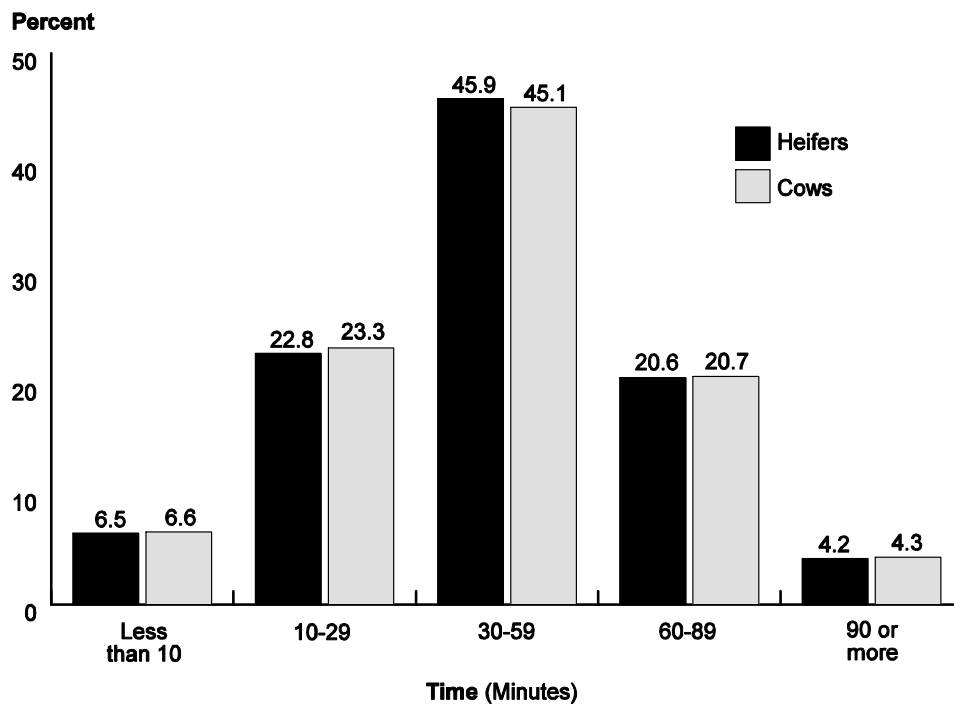
The best chance of ending up with a live calf and a healthy dam after a difficult calving requires that the method being used be reassessed if no progress is made within 15 to 20 minutes. Longer intervention times, without veterinary assistance, can lead to death of the calf and possibly of the dam. The length of time operations intervened before calling for assistance was about the same for both heifers and cows. About 30 percent of operations reported that they would call for veterinary assistance within 30 minutes of intervening in a calving. The highest single percentage of operations would seek assistance within 30 to 59 minutes of intervening for both heifers and cows. About one-fourth of operations (24.8 percent for heifers and 25.0 percent for cows) would work to relieve the dystocia for 1 hour or more before calling for veterinary assistance.

d. For the 94.8 percent of operations that ever seek veterinary assistance for difficult deliveries, percentage of operations by length of time from beginning intervention during calving until calling for veterinary assistance, for heifers and for cows:

Percent Operations				
Heifers			Cows	
Time (Minutes)	Percent	Std. Error	Percent	Std. Error
Less than 10	6.5	(1.5)	6.6	(1.5)
10 to 29	22.8	(2.7)	23.3	(2.7)
30 to 59	45.9	(3.2)	45.1	(3.2)
60 to 89	20.6	(2.5)	20.7	(2.5)
90 or more	4.2	(1.1)	4.3	(1.1)
Total	100.0		100.0	



**For the 94.8 Percent of Operations that Ever Seek Veterinary Assistance for Difficult Deliveries, Percentage of Operations by Length of Time from Beginning Intervention During Calving Until Calling for Veterinary Assistance, for Heifers and for Cows**



Heifers generally require more assistance than cows at calving because of their immature frame size. A higher percentage of cows (79.4 percent) than heifers (69.0 percent) calved unassisted during the previous 12 months. A higher percentage of heifers than cows experienced severe dystocia (6.8 percent of heifers and 3.5 percent of cows) or mild dystocia (11.8 percent of heifers and 7.3 percent of cows).

e. Percentage of heifers and cows that calved during the previous 12 months, by calving difficulty:

<b>Calving Difficulty</b>	<b>Percent Heifers<sup>1</sup></b>	<b>Std. Error</b>	<b>Percent Cows<sup>2</sup></b>	<b>Std. Error</b>
Severe dystocia (surgical or mechanical extraction)	6.8	(0.7)	3.5	(0.3)
Mild dystocia	11.8	(0.8)	7.3	(0.5)
No dystocia, but assistance provided anyway	12.4	(1.0)	9.8	(0.9)
No assistance	69.0	(1.4)	79.4	(1.3)
Total	100.0		100.0	

<sup>1</sup>As a percentage of dairy cow replacements entering the milking herd in 2006.

<sup>2</sup>As a percentage of cows on the operation at the time of VS Initial Visit interview.

## 7. Stillbirths

**NOTE: Stillbirths were reported on p 61 of Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007. The stillbirth estimates in Part I are slightly lower (6.5 percent of all calves) than those reported below.**

Stillbirths are usually defined as calves that are born dead or die within 48 hours of birth. Analysis of DHIA records indicates that the percentage of calves that are stillborn has increased since the 1980s.

All medium and large operations (100.0 percent) had at least one stillborn calf during the previous 12 months, and almost all small operations (94.7 percent) had at least one stillborn calf. For all operations, 96.3 percent had one or more stillborn calves. Overall, 8.1 percent of calves were stillborn during the previous 12 months, with no difference in percentage of stillbirths by herd size.

a. Percentage of operations with stillborn calves and percentage of calves that were stillborn (including calves that were born dead or died within 48 hours of birth) during the previous 12 months, and by herd size:

<b>Percent</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Population</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Operations	94.7	(1.8)	100.0	(0.0)	100.0	(0.0)	96.3	(1.3)
Calves*	8.9	(0.4)	8.6	(0.4)	7.2	(0.5)	8.1	(0.3)

\*Number of calves stillborn x 100 / number of calves born during 2006.

A higher percentage of operations in the West region (100.0 percent) had at least one stillbirth compared with operations in the East region (96.0 percent), although the difference was small. The West region had a lower percentage of stillborn calves than the East region, however (6.6 and 8.9 percent, respectively).

b. Percentage of operations with stillborn calves and percentage of calves that were stillborn (including calves that were born dead or died within 48 hours of birth) during the previous 12 months, by region:

<b>Percent</b>				
<b>Region</b>				
<b>Population</b>	<b>West</b>		<b>East</b>	
	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Operations	100.0	(0.0)	96.0	(1.4)
Calves*	6.6	(0.5)	8.9	(0.3)

\*Number of calves stillborn x 100 / number of calves born during 2006.

The majority of stillborn calves were born dead (78.6 percent), while the remaining 21.4 percent were born alive but died within 48 hours of birth.

c. For the 8.1 percent of calves that were stillborn during the previous 12 months, percentage of stillborn calves by time of death:

Time of Death	Percent Calves*	Standard Error
Born dead	78.6	(1.4)
Born alive, but died within 48 hr	21.4	(1.4)
Total	100.0	

\*As a percentage of stillborn calves.

### 8. Assistance for compromised calves

Calves that experience a dystocia are more likely to be stillborn. Calves that experience a dystocia but are born alive can be given assistance, such as supplemental oxygen, that increases their chances of survival. Depending on the environmental conditions, all the procedures listed below, with the exception of hanging the calf upside down, are considered beneficial to the health of the calf. Hanging the calf upside down, which was once promoted to assist in removing fluid from the calf's lungs, might actually be harmful for two reasons: most of the liquid comes from the abomasum and not the lungs, making the calf more susceptible to dehydration, and hanging the calf upside down increases pressure on the chest, making it more difficult for the calf to breathe. Calves that experience dystocia are likely to have low levels of oxygen in their blood (hypoxia), and their blood pH is frequently acidic (acidosis) instead of neutral. These impairments lead to other problems, such as decreased ability to nurse and decreased absorption of IgG, and can negatively affect temperature regulation. In many cases, the administration of oxygen to calves after dystocia may have the single largest impact on calf survival.

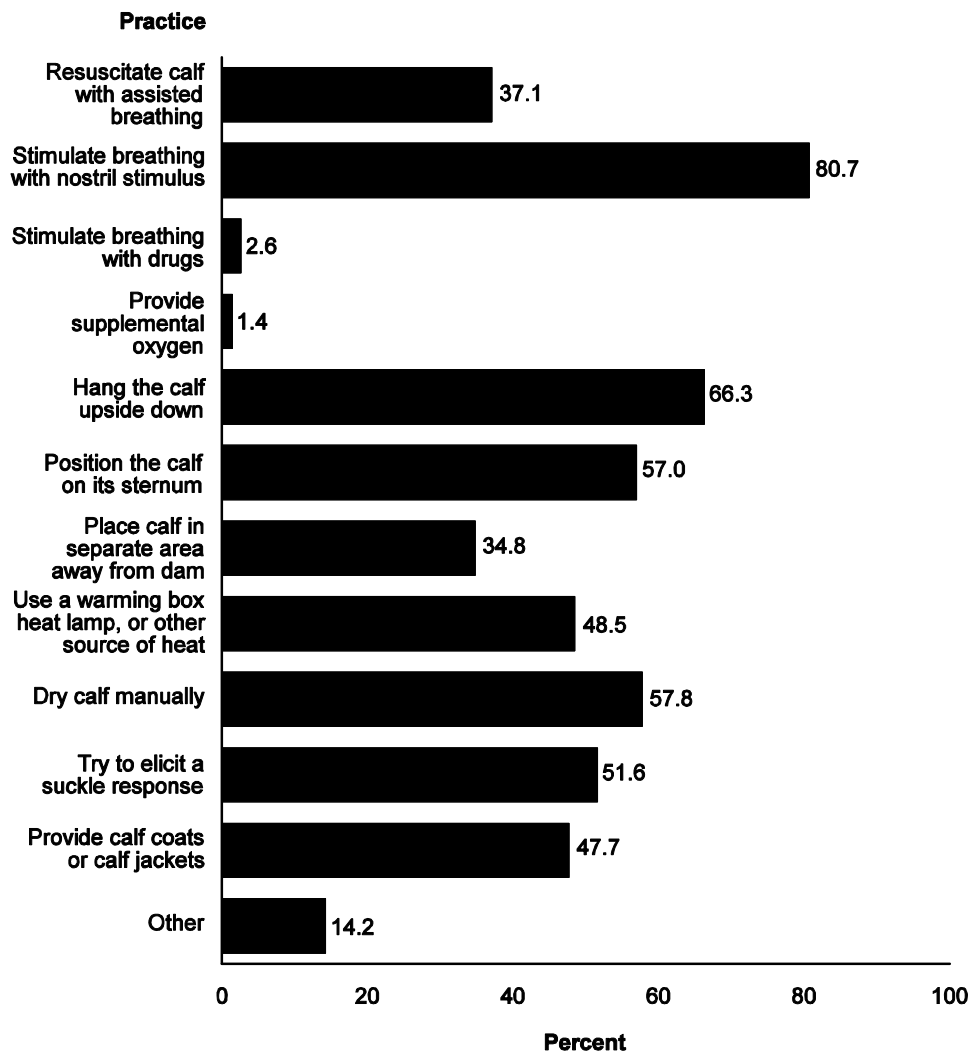
On 80.7 percent of operations, a calf that experienced a difficult birth would receive nostril stimulation to initiate breathing. Hanging the calf upside down would be performed on 66.3 percent of operations. Three of the practices that are simple to perform and do not require special equipment or materials—positioning the calf on its sternum, drying the calf manually with towels or a hair dryer, and trying to elicit a suckle response—were performed by at least one-half of operations. Few operations (1.4 percent) would provide supplemental oxygen. “Other” practices (14.2 percent of operations) would include allowing the dam to lick/stimulate the calf and feeding colostrum.

Use of some practices varied with the size of the operation. Almost two-thirds of large operations (62.5 percent) resuscitated the calf via assisted breathing, compared with slightly more than one-third of small and medium operations (35.0 and 36.6 percent, respectively). A higher percentage of small and medium operations (61.5 and 55.6 percent, respectively) than large operations (27.4 percent) dried the calf manually with towels, hair dryer, etc. Additionally, a higher percentage of small and medium operations (45.8 and 58.5 percent, respectively) provided calf coats or calf jackets compared with large operations (26.6 percent).

a. Percentage of operations by practice generally done within 1 hour after delivery for a calf that experienced a difficult birth, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Practice	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Resuscitate calf with assisted breathing	35.0	(3.9)	36.6	(4.3)	62.5	(5.9)	37.1	(2.9)
Stimulate breathing with nostril stimulus	77.3	(3.4)	88.3	(2.7)	87.7	(4.2)	80.7	(2.5)
Stimulate breathing with drugs (Dopram, etc.)	0.6	(0.5)	6.7	(2.4)	7.9	(3.4)	2.6	(0.7)
Provide supplemental oxygen	0.0	(--)	5.2	(2.2)	2.3	(2.1)	1.4	(0.6)
Hang the calf upside down	66.3	(3.8)	66.2	(4.3)	67.0	(6.0)	66.3	(2.8)
Position the calf on its sternum	54.3	(4.0)	63.4	(4.4)	61.2	(6.2)	57.0	(3.0)
Place the calf in separate area away from the dam	32.6	(3.8)	39.1	(4.5)	41.5	(6.0)	34.8	(2.9)
Use a warming box, heat lamp, or other source of heat during cold weather	45.7	(4.1)	59.3	(4.4)	36.6	(5.0)	48.5	(3.0)
Dry calf manually with towels, hair dryer, etc.	61.5	(3.8)	55.6	(4.5)	27.4	(5.3)	57.8	(2.8)
Try to elicit a suckle response	53.9	(4.0)	48.6	(4.4)	39.2	(6.4)	51.6	(3.0)
Provide calf coats or calf jackets after calf is dry	45.8	(4.1)	58.5	(4.3)	26.6	(4.9)	47.7	(3.0)
Other	16.9	(3.2)	7.7	(2.8)	10.7	(4.1)	14.2	(2.4)

**Percentage of Operations by Practice Generally Done Within 1 Hour After Delivery for a Calf that Experienced a Difficult Birth**



A higher percentage of operations in the West region (54.3 percent) generally resuscitated calves that experienced a difficult birth with assisted breathing compared with operations in the East region (35.5 percent). Alternatively, a higher percentage of operations in the East region dried calves manually with towels, hair dryer, etc. (60.1 percent) or provided calf coats or jackets after the calf was dry (50.5 percent), compared with 34.5 and 18.7 percent of operations in the West region, respectively.

b. Percentage of operations by practice generally done within 1 hour after delivery for a calf that experienced a difficult birth, by region:

Practice	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Resuscitate calf with assisted breathing	54.3	(5.4)	35.5	(3.1)
Stimulate breathing with nostril stimulus	84.1	(4.1)	80.4	(2.7)
Stimulate breathing with drugs (Dopram, etc.)	2.5	(1.4)	2.6	(0.8)
Provide supplemental oxygen	3.3	(2.0)	1.3	(0.6)
Hang the calf upside down	67.0	(5.9)	66.3	(3.1)
Position the calf on its sternum	60.2	(6.0)	56.7	(3.2)
Place the calf in separate area away from the dam	34.6	(5.9)	34.8	(3.1)
Use a warming box, heat lamp, or other source of heat during cold weather	38.7	(5.5)	49.4	(3.3)
Dry calf manually with towels, hair dryer, etc.	34.5	(5.5)	60.1	(3.0)
Try to elicit a suckle response	37.6	(5.7)	53.0	(3.2)
Provide calf coats or calf jackets after calf is dry	18.7	(4.4)	50.5	(3.3)
Other	6.5	(2.7)	15.0	(2.6)

C. Surgical Procedures

1. Dehorning

Removing the horns of dairy cattle reduces the risk of injury to other cattle and to people. The two major approaches for removing horns are breeding programs to produce animals without horns and manual removal. Cattle born without horns, referred to as polled, were previously suspected of having decreased productivity compared with horned cattle. It now appears that the tremendous amount of genetic selection, primarily for milk production, that has occurred in horned dairy breeds has made them appear superior in terms of productivity. With the same intensity of selection of polled cattle, productivity might not be a concern. Disbudding refers to removal of the horn bud in young cattle, whereas dehorning refers to removal of the horns of cattle. In the European Union, it is illegal to disbud or dehorn calves more than 14 days old without using a local anesthetic.

The Animal Welfare Committee of the American Veterinary Medical Association (AVMA) states the following: “Because castration and dehorning cause pain and discomfort, the AVMA recommends the use of procedures and practices that reduce or eliminate these effects, including the use of approved or AMDUCA-permissible clinically effective medications whenever possible.” AVMA also states that dehorning should be done at the youngest age possible and “disbudding is the preferred method of dehorning calves. Local anesthetic should be considered for other dehorning procedures.”

Overall, 94 percent of operations routinely dehorned heifer calves while they were on the operation during the previous 12 months. A lower percentage of large operations (64.3 percent) dehorned heifer calves than small or medium operations (97.3 and 92.6 percent, respectively). More than 95 percent of operations in the East region (95.6 percent) routinely dehorned heifer calves, compared with 77.6 percent of operations in the West region. Herd-size and regional differences are likely related to large operations moving calves to heifer-raising facilities when calves are still too young for disbudding/dehorning.

a. Percentage of operations that routinely dehorned heifer calves while on the operation during the previous 12 months, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
97.3	(1.6)	92.6	(2.8)	64.3	(6.3)	94.0	(1.4)



b. Percentage of operations that routinely dehorned heifer calves while on the operation during the previous 12 months, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
77.6	(4.6)	95.6	(1.4)

For operations that routinely dehorned heifer calves during the previous 12 months, more than two-thirds (69.1 percent) used a hot iron; 28.2 percent used a tube, spoon, or gouge; and 16.3 percent used saws, wire, or Barnes dehorers. For operations that used a hot iron to dehorn calves, 13.8 percent used analgesics or anesthetics when dehorning calves. More than 90 percent of operations (94.0 percent) dehorned calves, and 17.7 percent of these operations used analgesics or anesthetics during the dehorning procedure.

c. Percentage of operations by dehorning method, and corresponding percentage of operations using that method that used analgesics/anesthetics:

Method	Percent Operations		Percent Operations that Used Analgesics/Anesthetics	
	Percent Operations	Std. Error	Percent Operations that Used Analgesics/Anesthetics	Std. Error
Hot iron	69.1	(2.8)	13.8	(2.6)
Caustic paste	9.2	(1.8)	14.2	(5.8)
Tube, spoon, or gouge	28.2	(2.9)	21.5	(5.1)
Saws, wire, or Barnes	16.3	(2.3)	21.5	(6.7)
Other	1.7	(0.9)	17.1	(16.5)
Any	94.0	(1.4)	17.7	(2.3)



Photo courtesy of “Dairy Herd Management”/“Bovine Veterinarian”

The majority of heifer calves on operations that routinely dehorned calves were dehorned by hot iron (67.5 percent of calves) at an average age of 7.6 weeks. Caustic paste was used on 12.2 percent of calves at 2.7 weeks of age. A similar percentage was observed for the tube, spoon, or gouge method, but the average age increased to 16.9 weeks. Saws, wire, or Barnes dehorner were used on 7.1 percent of heifer calves at an average age of 23.5 weeks.

d. For the 94.0 percent of operations that routinely dehorned heifer calves while on the operation during the previous 12 months, percentage of calves dehorned and average age at dehorning, by method used to dehorn calves:

Method	Percent Heifers*	Std. Error	Average Age (Weeks)	Std. Error
Hot iron	67.5	(3.1)	7.6	(0.4)
Caustic paste	12.2	(2.6)	2.7	(0.3)
Tube, spoon, or gouge	13.0	(1.7)	16.9	(1.2)
Saws, wire, or Barnes	7.1	(1.1)	23.5	(2.6)
Other	0.2	(0.1)	32.7	(6.9)
Total	100.0			

\*Dairy heifer calves weaned during the previous 12 months.

Of the dehorning equipment used on operations, tubes, spoons, gouges, saws, wire, and Barnes dehorners commonly cause bleeding. More than 4 of 10 operations (42.0 percent) used dehorning equipment that causes bleeding. A higher percentage of small and medium operations (42.9 and 43.5 percent, respectively) used dehorning equipment that causes bleeding compared with large operations (18.9 percent).

e. For the 94.0 percent of operations that routinely dehorned heifer calves while on the operation during the previous 12 months, percentage of operations that dehorned heifer calves with equipment that can cause bleeding, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
42.9	(4.0)	43.5	(4.6)	18.9	(5.7)	42.0	(3.1)

Disinfection of dehorning equipment that causes bleeding reduces the possibility of transmitting diseases such as bovine leukosis virus. Approximately one-half of operations (46.4 percent) disinfected dehorning equipment for each calf.

f. For the 42.0 percent of operations that routinely dehorned heifer calves with equipment that can cause bleeding, percentage of operations that chemically disinfected surgical dehorning equipment for each calf:

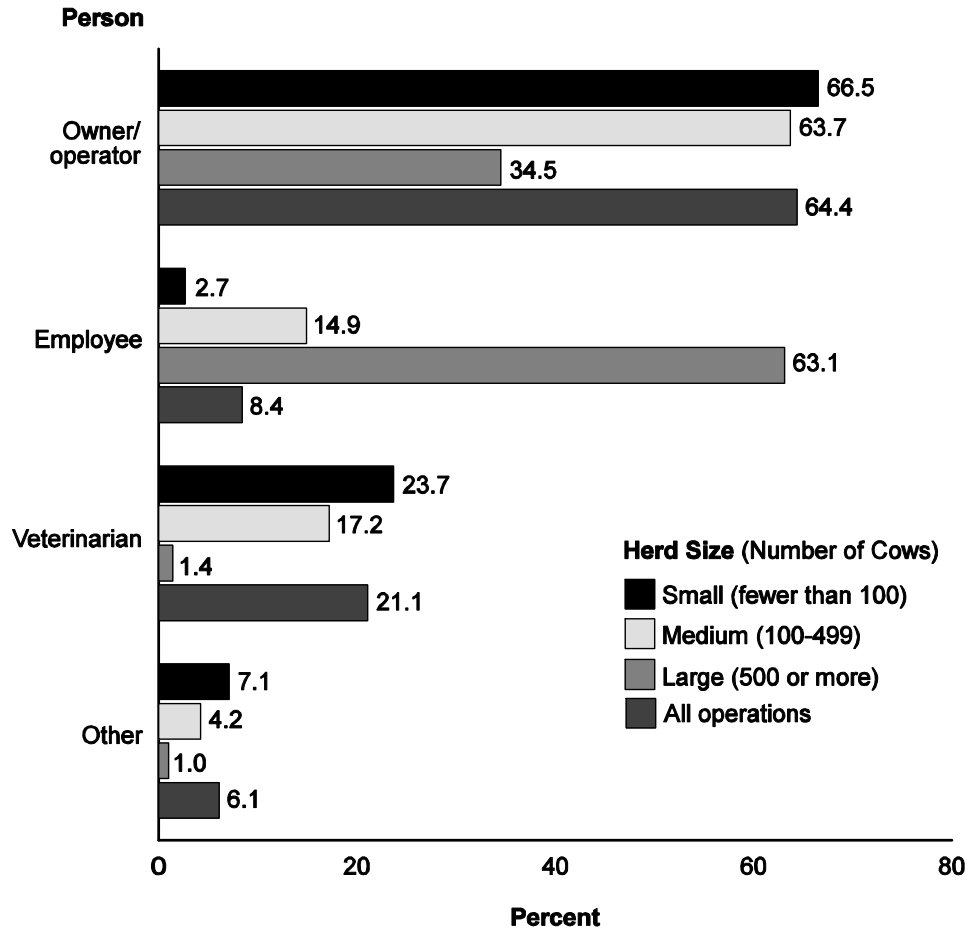
Percent Operations	Standard Error
46.4	(4.9)

On almost two-thirds of operations (64.4 percent), the owner/operator was identified as dehorning the majority of calves. The person who dehorned the majority of calves differed with operation size, however, with the owner/operator dehorning the majority of heifer calves on about two-thirds of small and medium operations (66.5 percent and 63.7 percent, respectively) but only about one-third of large operations (34.5 percent). An employee dehorned the majority of calves on 63.1 percent of large operations, compared with 2.7 percent of small operations and 14.9 percent of medium operations. Veterinarians performed the majority of dehorning on 23.7 percent of small operations, 17.2 percent of medium operations, and 1.4 percent of large operations.

g. For the 94.0 percent of operations that routinely dehorned heifer calves during the previous 12 months, percentage of operations by person who dehorned the majority of heifer calves on the operation, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Person</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Owner/operator	66.5	(3.8)	63.7	(4.2)	34.5	(7.5)	64.4	(2.9)
Employee	2.7	(1.1)	14.9	(2.9)	63.1	(7.4)	8.4	(1.1)
Veterinarian	23.7	(3.4)	17.2	(3.4)	1.4	(0.5)	21.1	(2.6)
Other	7.1	(2.2)	4.2	(1.8)	1.0	(0.6)	6.1	(1.6)
Total	100.0		100.0		100.0		100.0	

**For the 94.0 Percent of Operations that Routinely Dehorned Heifer Calves During the Previous 12 Months, Percentage of Operations by Person Who Dehorned the Majority of Heifer Calves on the Operation, and by Herd Size**



Employees dehorned the majority of heifer calves on a higher percentage of operations in the West region (33.4 percent) than in the East region (6.4 percent).

h. For the 94.0 percent of operations that routinely dehorned heifer calves during the previous 12 months, percentage of operations by person who dehorned the majority of heifer calves on the operation, by region:

Percent Operations				
Region				
West			East	
Person	Percent	Std. Error	Percent	Std. Error
Owner/operator	55.1	(6.8)	65.2	(3.1)
Employee	33.4	(5.5)	6.4	(1.1)
Veterinarian	11.5	(4.6)	21.8	(2.8)
Other	0.0	(--)	6.6	(1.8)
Total	100.0		100.0	

## 2. Extra teat removal

Extra teats on dairy cows can interfere with milking and lead to mastitis, and they are not acceptable in show cattle. As with dehorning, removal of extra teats should be done at an early age to facilitate a quick recovery.

About one-half of operations (50.3 percent) routinely removed extra teats from heifer calves during the previous 12 months. The percentage of operations that removed extra teats did not differ by herd size.

a. Percentage of operations that routinely removed extra teats from heifer calves during the previous 12 months, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
46.4	(4.0)	57.1	(4.4)	66.4	(6.2)	50.3	(3.0)

About one-fifth of operations (20.3 percent) that routinely removed extra teats from heifer calves removed the teats when the heifers were less than 12.0 weeks old, while one-third (32.2 percent) removed teats at 12.0 to 17.9 weeks of age. About 20 percent of operations removed extra teats from animals in each of the next two age categories (18.0 to 23.9 weeks and 24.0 to 29.9 weeks).

b. For the 50.3 percent of operations that routinely removed extra teats from heifer calves during the previous 12 months, percentage of operations by age at which extra teats were removed:

Age (Weeks)	Percent Operations	Standard Error
Less than 12.0	20.3	(3.4)
12.0 to 17.9	32.2	(3.8)
18.0 to 23.9	20.1	(3.4)
24.0 to 29.9	18.6	(3.5)
30.0 or more	8.8	(1.9)
Total	100.0	

One of 10 operations (10.6 percent) routinely used analgesia or anesthesia during extra teat removal, which is similar to usage for dehorning.

c. For the 50.3 percent of operations that routinely removed extra teats from heifer calves during the previous 12 months, percentage of operations that used analgesics or anesthesia while removing extra teats:

Percent Operations	Standard Error
10.6	(3.0)

### 3. Tail docking

Tail docking was initially promoted to reduce the incidence of leptospirosis in milking personnel in New Zealand, but subsequent research demonstrated leptospiral titers of milkers had no relationship with tail docking. Tail docking is currently prohibited and must not be performed as a routine management procedure in the European Union.

The AVMA is opposed to tail docking, and the American Association of Bovine Practitioners (AABP) states the following: “The AABP is not aware of sufficient scientific evidence in the literature to support tail docking in cattle. If it is deemed necessary for proper care and management of production animals in certain conditions, veterinarians should counsel clients on proper procedures, benefits and risks.”

Almost half of operations (48.6 percent) had one or more tail-docked cows. A higher percentage of operations in the West region (81.3 percent) had no tail-docked cows than in the East region (48.5 percent of operations). On about one of seven operations (14.6 percent), all cows had a docked tail.

a. Percentage of operations by percentage of tail-docked cows, and by region:

Percent Operations						
Region						
West			East		All Operations	
Percent Cows	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
0	81.3	(4.3)	48.5	(3.2)	51.4	(2.9)
0.1 to 24.9	0.7	(0.7)	11.8	(2.0)	10.8	(1.9)
25.0 to 75.9	9.6	(3.7)	8.8	(1.7)	8.9	(1.6)
76.0 to 99.9	5.5	(1.9)	15.1	(2.4)	14.3	(2.2)
100.0	2.9	(1.5)	15.8	(2.2)	14.6	(2.0)
Total	100.0		100.0		100.0	



Overall, about 4 of 10 cows (38.8 percent) had a docked tail. A higher percentage of cows on medium operations (55.5 percent) than on small or large operations (27.1 and 34.5 percent, respectively) had a docked tail.

b. Percentage of tail-docked cows, and by herd size:

<b>Percent Tail-Docked Cows*</b>						
<b>Herd Size (Number of Cows)</b>						
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>
<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>
27.1	(3.2)	55.5	(3.6)	34.5	(4.3)	38.8
						(2.4)

\*As a percentage of cows on the operation at the time of VS Initial Visit interview.

The majority of operations that had tail-docked cows most commonly used a band to dock tails (87.2 percent); these operations represented 90.4 percent of tail-docked cows. About 1 of 10 operations did not know what procedure was used, which suggests the cattle were purchased with the tail already docked.

c. For the 48.6 percent of operations with tail-docked cows, percentage of operations (and percentage of tail-docked cows on those operations) by procedure most commonly used to dock tails:

<b>Procedure</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Tail-Docked Cows*</b>	<b>Standard Error</b>
Band	87.2	(2.9)	90.4	(2.9)
Surgical removal	2.0	(1.0)	5.2	(2.4)
Hot knife	0.0	(--)	0.0	(--)
Other	1.9	(0.9)	2.7	(1.2)
Unknown procedure	8.9	(2.7)	1.7	(1.2)
Total	100.0		100.0	

\*Number of cows with the tail docked as a percentage of cows on the operation at the time of VS Initial Visit interview.

For operations with tail-docked cows, 61.0 percent of operations (accounting for 38.0 percent of tail-docked cows) performed tail-docking on the majority of animals when they were at least 2 years old. The tail was docked on almost 3 of 10 cows (28.1 percent) at less than 2 months of age. About 10 percent of operations docked tails when cattle were less than 2 months of age (10.2 percent) or from 2 months to less than 6 months old (10.5 percent).

d. For the 48.6 percent of operations with tail-docked cows, percentage of operations (and percentage of tail-docked cows on those operations) by age of the majority of cattle when the tail was docked:

<b>Age</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Tail-Docked Cows*</b>	<b>Standard Error</b>
Less than 2 months	10.2	(2.0)	28.1	(5.0)
2 months to less than 6 months	10.5	(2.6)	17.1	(3.4)
6 months to less than 2 years	9.5	(2.0)	16.3	(3.5)
2 years or older	61.0	(4.0)	38.0	(4.9)
Unknown	8.8	(2.7)	0.5	(0.2)
<b>Total</b>	<b>100.0</b>		<b>100.0</b>	

\*Number of cows with the tail docked as a percentage of cows on the operation at the time of VS Initial Visit interview.

The majority of operations (90.3 percent) did not routinely use analgesics or anesthetics for tail docking, compared with 1.1 percent that routinely used analgesics or anesthetics. Operations that routinely used analgesics or anesthetics represented 0.9 percent of tail-docked cows.

e. For the 48.6 percent of operations with tail-docked cows, percentage of operations (and percentage of tail-docked cows on those operations) by routine use of analgesia or anesthesia:

<b>Analgesia or Anesthesia Use</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Tail-Docked Cows*</b>	<b>Standard Error</b>
Yes	1.1	(0.6)	0.9	(0.6)
Don't know	8.6	(2.6)	1.3	(0.6)
No	90.3	(2.7)	97.8	(0.9)
<b>Total</b>	<b>100.0</b>		<b>100.0</b>	

\*Number of cows with the tail docked as a percentage of cows on the operation at the time of VS Initial Visit interview.

#### 4. Castration

Castration is considered necessary in the management of cattle. As with other surgical procedures of cattle, castration should be done at the youngest age possible. In the European Union, it is illegal to castrate calves over 6 months of age without using a local anesthetic. The AVMA recommends the preoperative use of nonsteroidal anti-inflammatory agents and the administration of local anesthetics to minimize pain associated with castration.

About two-fifths of operations (40.5 percent) routinely castrated bull calves on the operation during the previous 12 months. Because many dairy operations do not keep bull calves for more than a day or two, it is likely that many operations do not have bull calves long enough to castrate them. A higher percentage of small operations (45.7 percent) routinely castrated bull calves compared with large operations (16.9 percent).

a. Percentage of operations that routinely castrated bull calves while on the operation during the previous 12 months, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
45.7	(3.9)	32.0	(4.1)	16.9	(4.1)	40.5	(2.9)

Bands were used most commonly to castrate calves on 60.8 percent of operations, with 26.9 percent of operations using a knife and 12.2 percent using a burdizzo most commonly. Calves were castrated at an operation average age of 8.9 weeks, and 3.2 percent of operations that castrated calves routinely used analgesics or anesthesia.

b. For the 40.5 percent of operations that routinely castrated bull calves during the previous 12 months, percentage of operations by method most commonly used to castrate bull calves:

Method	Percent Operations	Standard Error
Burdizzo	12.2	(3.2)
Knife	26.9	(4.6)
Band	60.8	(4.9)
Other	0.1	(0.1)
Total	100.0	

c. For the 40.5 percent of operations that routinely castrated bull calves during the previous 12 months, operation average age of calves at castration:

Operation Average Age (Weeks)	Standard Error
8.9	(0.6)

d. For the 40.5 percent of operations that routinely castrated bull calves during the previous 12 months, percentage of operations that routinely used analgesics or anesthesia for castration:

Percent Operations	Standard Error
3.2	(1.7)

## D. Hoof Health

### 1. Lameness

Lameness in dairy cattle can result from many causes, including infectious agents, such as *Fusobacterium necrophorus* and *Bacteroides melaninogenicus*, which cause foot rot; digital dermatitis (hairy heel warts), which is most likely caused by spirochetes; excessive intake of rapidly fermentable carbohydrates, leading to rumen acidosis and subsequent laminitis; and trauma. Lameness was the second leading health problem in dairy cows, affecting 14.0 percent of cows in 2006 (reported on p 84 of Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007).

**Note: For the purposes of this report, an animal could have had more than one case of lameness (gait abnormality) if the animal recovered and became lame again during the previous 12 months.**

Approximately 1 of 10 bred heifers (11.4 percent) and 1 of 4 cows (23.9 percent) were lame at least once during the previous 12 months. There were no herd-size differences in the operation average percent of bred heifers that were lame, but medium operations had a higher percentage of cows with lameness (30.8 percent) than small operations (21.1 percent).

a. Operation average percentage of lameness cases by cattle class during the previous 12 months, and by herd size:

Operation Average Percent Lameness Cases								
Herd Size (Number of Cows)								
Cattle Class	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Bred Heifers <sup>1</sup>	12.4	(3.5)	8.3	(1.2)	12.1	(2.8)	11.4	(2.5)
Cows <sup>2</sup>	21.1	(1.4)	30.8	(3.1)	28.4	(2.9)	23.9	(1.3)

<sup>1</sup>Number of cases as a percentage of dairy cow replacements entering the milking herd in 2006.

<sup>2</sup>Number of cases as a percentage of cows on the operation at the time of VS Initial Visit interview.

Lameness is much more common in cows than in heifers. While 3.6 percent of operations had no cases of lameness in cows, 41.3 percent of operations had no cases of lameness in heifers. Fewer than 1 of 20 operations (2.8 percent) had lameness cases in 50.0 percent or more bred heifers, while 12.0 percent of operations had lameness cases in 50.0 percent or more cows.

b. Percentage of operations by percentage of lameness cases occurring by cattle class on the operation during the previous 12 months:

Percent Operations				
Cattle Class				
Percent Lameness Cases in Bred Heifers <sup>1</sup> or Cows <sup>2</sup>	Bred Heifers		Cows	
	Percent	Std. Error	Percent	Std. Error
0	41.3	(3.1)	3.6	(1.1)
0.1 to 24.9	49.6	(3.0)	63.9	(2.7)
25.0 to 49.9	6.3	(1.7)	20.5	(2.3)
50.0 or more	2.8	(1.0)	12.0	(1.8)
Total	100.0		100.0	

<sup>1</sup>Number of cases as a percentage of dairy cow replacements entering the milking herd in 2006.

<sup>2</sup>Number of cases as a percentage of cows on the operation at the time of VS Initial Visit interview.

About 3 of 10 operations (28.7 percent) had at least 1 case of digital dermatitis in bred heifers while 70.2 percent of operations had at least 1 case in cows. A lower percentage of small operations had any digital dermatitis in bred heifers compared with medium and large operations. A higher percentage of large operations (95.0 percent) had any digital dermatitis in cows compared with medium and small operations (79.1 and 64.9 percent, respectively).

c. Percentage of operations with at least one case of digital dermatitis (hairy heel warts) in bred heifers or cows in the previous 12 months, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Cattle Class</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Bred heifers	22.4	(3.2)	40.3	(4.6)	57.4	(6.7)	28.7	(2.6)
Cows	64.9	(3.9)	79.1	(3.8)	95.0	(2.4)	70.2	(2.9)

Digital dermatitis caused 61.8 percent of lameness cases in bred heifers and 49.1 percent of lameness cases in cows during the previous 12 months.

d. Percentage of cases of lameness due to digital dermatitis (hairy heel warts) in bred heifers and cows during the previous 12 months:

<b>Percent Cases</b>			
<b>Bred Heifers<sup>1</sup></b>		<b>Cows<sup>2</sup></b>	
<b>Percent</b>	<b>Standard Error</b>	<b>Percent</b>	<b>Standard Error</b>
61.8	(5.5)	49.1	(2.8)

<sup>1</sup>Number of cases as a percentage of dairy cow replacements entering the milking herd in 2006.

<sup>2</sup>Number of cases as a percentage of cows on the operation at the time of VS Initial Visit interview.

## 2. Footbath use

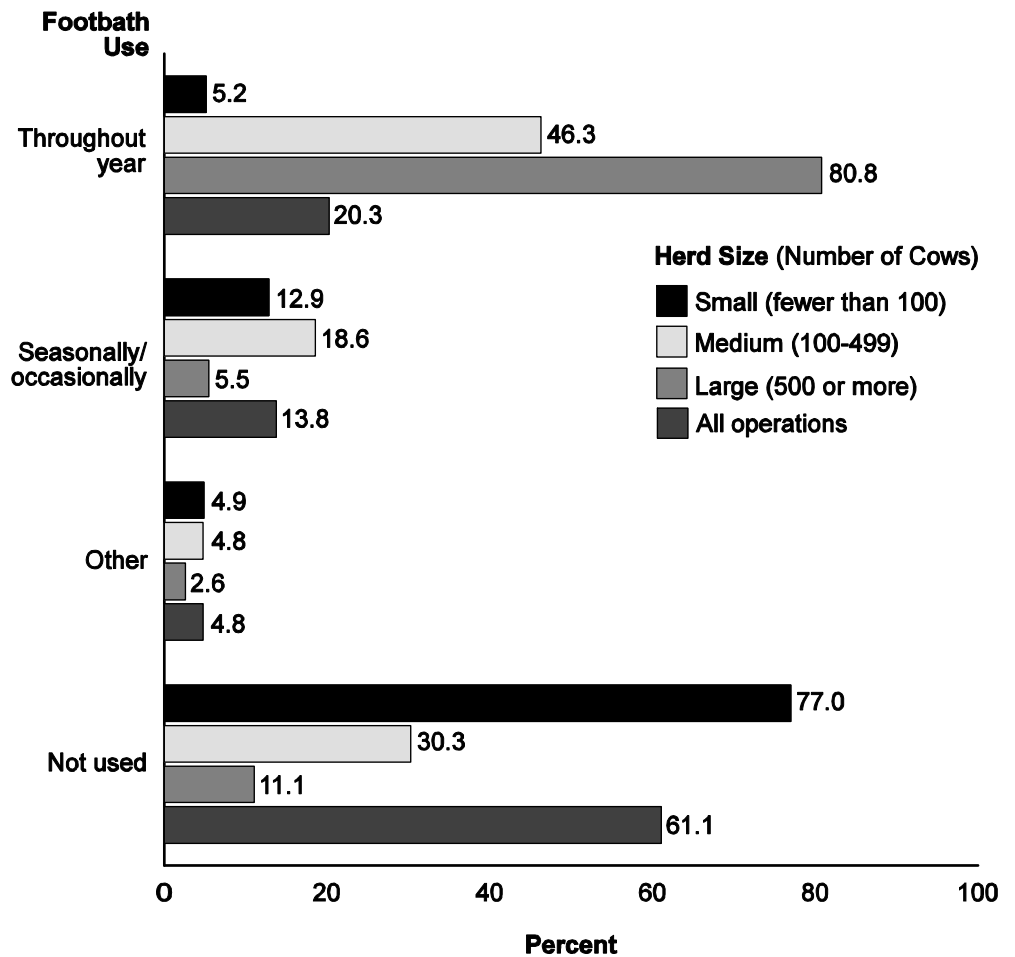
Footbaths are used to medicate the feet of cattle and aid in preventing lameness. The majority of operations (61.1 percent) used no footbaths during the previous 12 months. Of the 38.9 percent of operations that used footbaths, 20.3 percent of operations used a footbath throughout the year. Use of a footbath throughout the year increased as operation size increased, from 5.2 percent of small operations to 46.3 percent of medium operations and 80.8 percent of large operations. Conversely, the percentage of operations that did not use a footbath decreased as operation size increased, from 77.0 percent of small operations to 11.1 percent of large operations.

a. Percentage of operations by use of a footbath for cows during the previous 12 months, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Footbath Use	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Throughout year	5.2	(1.5)	46.3	(4.2)	80.8	(5.1)	20.3	(1.7)
Seasonally/occasionally	12.9	(2.5)	18.6	(3.7)	5.5	(2.4)	13.8	(1.9)
Other	4.9	(2.1)	4.8	(2.1)	2.6	(2.2)	4.8	(1.5)
Not used	77.0	(3.3)	30.3	(3.9)	11.1	(4.2)	61.1	(2.6)
Total	100.0		100.0		100.0		100.0	



**Percentage of Operations by Use of a Footbath for Cows During the Previous 12 Months, and by Herd Size**



A higher percentage of operations in the West region than in the East region (49.7 and 17.4 percent, respectively) used a footbath throughout the year. A higher percentage of operations in the East region used footbaths occasionally or not at all (14.9 and 62.8 percent, respectively) compared with the West region (3.1 and 43.4 percent, respectively).

b. Percentage of operations by use of a footbath for cows during the previous 12 months, by region:

Percent Operations				
Region				
West			East	
Footbath Use	Percent	Std. Error	Percent	Std. Error
Throughout year	49.7	(5.2)	17.4	(1.8)
Seasonally/ occasionally	3.1	(1.4)	14.9	(2.1)
Other	3.8	(2.1)	4.9	(1.7)
Not used	43.4	(5.0)	62.8	(2.8)
Total	100.0		100.0	



Photo courtesy of “Dairy Herd Management”/ “Bovine Veterinarian”

For operations that used footbaths, almost 8 of 10 cows (78.0 percent) were on operations that used footbaths throughout the year. Of cows on medium and large operations, the majority were on operations that used a footbath throughout the year (73.2 and 87.0 percent of cows, respectively). Almost 6 of 10 cows (57.0 percent) on small operations were on operations that used a footbath seasonally or occasionally.

c. For the 38.9 percent of operations that used footbaths during the previous 12 months, percentage of cows on those operations by footbath use, and by herd size:

<b>Percent Cows*</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Footbath Use</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Throughout year	29.1	(7.3)	73.2	(4.5)	87.0	(7.1)	78.0	(4.5)
Seasonally/ occasionally	57.0	(8.8)	21.5	(4.3)	10.6	(6.9)	17.7	(4.3)
Other	13.9	(5.9)	5.3	(2.3)	2.4	(2.2)	4.3	(1.6)
Total	100.0		100.0		100.0		100.0	

\*As a percentage of cows on the operation at the time of VS Initial Visit interview.

For operations that used footbaths, the majority (66.6 percent) used copper sulfate most commonly as the footbath medication; these operations accounted for the majority of cows (63.6 percent). Footbath medications specified for the “Other” category, which represented 11.6 percent of operations and 18.0 percent of cows, were primarily a combination of the medications listed in the table.

d. For the 38.9 percent of operations that used footbaths during the previous 12 months, percentage of operations (and percentage of cows on those operations) by the footbath medication used most commonly:

<b>Footbath Medication</b>	<b>Percent Operations</b>	<b>Standard Error</b>	<b>Percent Cows*</b>	<b>Standard Error</b>
Copper sulfate	66.6	(3.9)	63.6	(4.7)
Formalin/formaldehyde	10.9	(2.0)	16.4	(3.4)
Oxytetracycline	10.9	(3.3)	2.0	(0.6)
Hydrogen peroxide	0.0	(--)	0.0	(--)
Other	11.6	(2.3)	18.0	(4.1)
Total	100.0		100.0	

\*As a percentage of cows on the operation at the time of VS Initial Visit interview.

### 3. Hoof trimming

Routine hoof trimming is important in identifying hoof disorders and maintaining proper hoof health. More than 80 percent of operations performed at least some hoof trimming, with a higher percentage of large operations and medium operations (99.4 and 95.6 percent, respectively) performing some trimming than small operations (79.4 percent).

a. Percentage of operations that trimmed any hooves during the previous 12 months, and by herd size:

<b>Percent Operations</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
79.4	(3.4)	95.6	(1.7)	99.4	(0.6)	84.8	(2.4)

More than one-third of operations (38.2 percent) trimmed the hooves of all cows during the previous 12 months, while 15.2 percent of operations did not perform any hoof trimming.

b. Percentage of operations by percentage of cows that had their hooves trimmed at least once during the previous 12 months:

Percent Cows	Percent Operations	Standard Error
0	15.2	(2.4)
0.1 to 33.9	18.3	(2.4)
34.0 to 66.9	10.2	(1.7)
67.0 to 99.9	18.1	(2.2)
100.0	38.2	(2.9)
Total	100.0	

About three-fourths of operations (76.7 percent) used a professional hoof trimmer to do the majority of trimming. The owner or the operation's personnel performed the hoof trimming on 17.2 percent of operations.

c. For the 84.8 percent of operations that had cows' hooves trimmed during the previous 12 months, percentage of operations by the person who trimmed the majority of the hooves, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Person</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Professional hoof trimmer (not the operation's personnel)	72.3	(4.0)	85.9	(3.1)	80.3	(4.7)	76.7	(2.8)
Veterinarian (not the operation's personnel)	8.2	(2.7)	0.5	(0.3)	0.2	(0.2)	5.5	(1.8)
Owner or the operation's personnel	19.0	(3.5)	12.9	(3.1)	18.3	(4.6)	17.2	(2.4)
Other	0.5	(0.5)	0.7	(0.6)	1.2	(1.1)	0.6	(0.4)
Total	100.0		100.0		100.0		100.0	

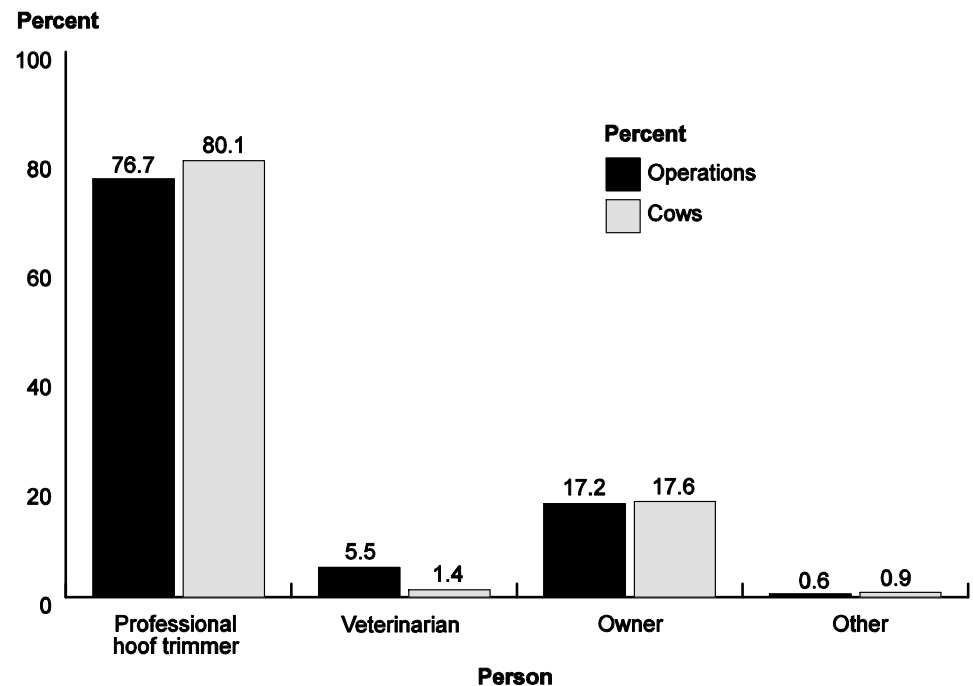
The majority of cows (80.1 percent) were on operations where cows' hooves were trimmed by a professional hoof trimmer during the previous 12 months. Almost 2 of 10 cows (17.6 percent) were on operations where the owner or the operation's personnel trimmed the majority of hooves. Veterinarians trimmed the hooves on 5.7 percent of cows on small operations compared with less than 1 percent of cows on medium or large operations.

d. For the 84.8 percent of operations that had cows' hooves trimmed during the previous 12 months, percentage of cows on those operations by the person who trimmed the majority of the hooves, and by herd size:

Percent Cows*								
Person	Herd Size (Number of Cows)							
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Professional hoof trimmer (not the operation's personnel)	74.7	(3.8)	85.2	(3.1)	79.3	(5.8)	80.1	(3.2)
Veterinarian (not the operation's personnel)	5.7	(2.0)	0.5	(0.4)	0.2	(0.2)	1.4	(0.4)
Owner or the operation's personnel	19.1	(3.4)	13.2	(3.1)	19.6	(5.8)	17.6	(3.1)
Other	0.5	(0.5)	1.1	(1.1)	0.9	(0.9)	0.9	(0.5)
Total	100.0		100.0		100.0		100.0	

\*As a percentage of cows on the operation at the time of VS Initial Visit interview.

**For the 84.8 Percent of Operations that had Cows' Hooves Trimmed During the Previous 12 Months, Percentage of Operations and Percentage of Cows on Those Operations by the Person Who Trimmed the Majority of the Hooves**



Professional hoof trimmers made an average of 7.1 visits during the previous 12 months to operations to trim hooves or evaluate lame cows, while veterinarians made 1.1 visits. The number of visits made by professional hoof trimmers increased from 2.0 visits for small operations to 9.0 for medium and 44.5 visits for large operations.

e. For the 82.2 percent of operations visited by a professional hoof trimmer or veterinarian to trim hooves (as part of a routine trimming program) or to evaluate lame cows, operation average number of visits during the previous 12 months, and by herd size:

<b>Operation Average Number Visits</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Professional</b>	<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
	<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>	<b>Avg.</b>	<b>Std. Error</b>
Hoof trimmer	2.0	(0.2)	9.0	(0.5)	44.5	(4.0)	7.1	(0.5)
Veterinarian	1.3	(0.3)	0.7	(0.2)	0.2	(0.2)	1.1	(0.2)



## E. Hemorrhagic Bowel Syndrome

### 1. Signs

Hemorrhagic bowel syndrome (HBS) is a fatal intestinal disease of milking cows and is characterized by sudden onset of bloody feces, with or without intestinal obstruction. Sudden death without prior signs is common. Both medical and surgical treatments have been relatively unsuccessful. A bloody bowel accompanied by a blood clot that obstructs the intestine may be observed at necropsy.

Results of the Dairy 2002 study suggest that management practices implemented to achieve high milk production, such as increased consumption of a high energy diet, might increase the risk of cattle developing HBS.

Overall, one-fifth of operations (19.7 percent) had at least one cow with signs of HBS on the operation during the previous 5 years. The percentage of operations that had at least one apparent HBS case increased with herd size, from 12.8 percent of small operations to 48.4 percent of large operations. In the West region, 33.2 percent of operations had at least one cow with signs of HBS during the previous 5 years, compared with 18.5 percent of operations in the East region.

a. Percentage of operations that had at least one cow with signs consistent with HBS on the operation during the previous 5 years, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
12.8	(2.6)	31.7	(4.1)	48.4	(6.2)	19.7	(2.1)

b. Percentage of operations that had at least one cow with signs consistent with HBS on the operation during the previous 5 years, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
33.2	(5.1)	18.5	(2.3)

For 19.3 percent of operations that had observed a cow with HBS signs during the previous 5 years, the first case occurred prior to 2000.

c. For the 19.7 percent of operations that had at least one cow with signs consistent with HBS during the previous 5 years, percentage of operations by year first suspected case of HBS occurred:

Year	Percent Operations	Standard Error
1999 or before	19.3	(5.7)
2000-01	13.9	(3.8)
2002-03	25.6	(5.0)
2004-05	22.0	(5.3)
2006-07*	19.2	(4.7)
Total	100.0	

\*Through day of VS Second Visit interview.

For operations that had at least one cow with clinical signs consistent with HBS, less than 1 percent of cows (0.8 percent) had clinical signs during the previous 12 months, with no differences by herd size. The percentage of cows with signs consistent with HBS on all operations was 0.3 percent or less, depending on herd size.

d. For the 19.7 percent of operations that had at least one cow with signs consistent with HBS during the previous 5 years and for all operations, operation average percentage of cows that had signs of HBS during the previous 12 months, and by herd size:

Operation Average Percent Cows*								
Herd Size (Number of Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Population	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Operations with HBS	0.9	(0.3)	0.9	(0.3)	0.5	(0.1)	0.8	(0.2)
All Operations	0.1	(0.0)	0.3	(0.1)	0.2	(0.0)	0.2	(0.0)

\*As a percentage of cows on the operation at the time of VS Initial Visit interview.

There were no regional differences in the operation average percentage of cows displaying clinical signs consistent with HBS.

e. For the 19.7 percent of operations that had at least one cow with signs consistent with HBS during the previous 5 years, operation average percentage of cows that had signs of HBS during the previous 12 months, by region:

<b>Operation Average Percent Cows*</b>			
<b>Region</b>			
<b>West</b>		<b>East</b>	
<b>Percent</b>	<b>Standard Error</b>	<b>Percent</b>	<b>Standard Error</b>
0.4	(0.1)	0.9	(0.2)

\*As a percentage of cows on the operation at the time of VS Initial Visit interview.

## 2. Preventive measures

Almost one-third of operations that had cows with signs consistent with HBS during the previous 5 years (31.1 percent) had implemented preventive measures during that time specifically to reduce or eliminate HBS. There were no differences in the implementation of preventive measures by herd size or region.

a. For the 19.7 percent of operations that had at least one cow with signs of HBS during the previous 5 years, percentage of operations that implemented preventive measures during that time specifically to reduce or eliminate HBS, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
23.5	(8.5)	34.0	(6.6)	45.7	(7.9)	31.1	(4.9)

Even though the cause of HBS is unknown, multiple preventive measures are recommended based on current knowledge. With the exception of vaccination with an autogenous *Clostridium* type A vaccine, all other preventive measures listed were implemented by about 40 to 50 percent of operations that implemented some type of measure.

b. For the 31.1 percent of operations that implemented preventive measures for HBS within the previous 5 years, percentage of operations by measure used specifically to reduce or eliminate HBS:

Preventive Measure	Percent Operations	Standard Error
Vaccination with a commercial <i>Clostridium</i> type A vaccine	43.8	(8.0)
Vaccination with an autogenous <i>Clostridium</i> type A vaccine	13.5	(5.3)
Vaccination with a 7-way clostridial vaccine	50.5	(8.2)
Incorporated a feed additive (e.g., Omnigen AF®)	41.7	(8.0)
Changed feed ingredients/composition of ration	50.4	(8.4)
Changed forage management (chop size, source, etc.)	40.7	(8.1)

Of the operations that implemented preventive measures specifically to reduce or eliminate HBS, 60.1 percent perceived a great reduction (75 to 100 percent decrease) in HBS cases. An additional 20.1 percent of operations believed they had moderate reduction (50 to 74 percent decrease) in HBS cases, while 3.1 percent of operations experienced no reduction in HBS cases.

c. For the 31.1 percent of operations that implemented preventive measures for HBS within the previous 5 years, percentage of operations by perceived benefit from using the measures:

Perceived Benefit	Percent Operations	Standard Error
Great reduction in HBS cases (75-100 percent)	60.1	(8.1)
Moderate reduction in HBS cases (50-74 percent)	20.1	(6.7)
Reduction in HBS cases (25-49 percent)	11.6	(4.5)
Slight reduction in HBS cases (1-24 percent)	5.1	(2.5)
No reduction in HBS cases	3.1	(2.0)
Total	100.0	

**F. Treatment Practices****1. General**

Injections for dairy cows can be administered for a variety of reasons, including preventive measures, such as vaccination; treatment of disease (e.g., antibiotic injections); manipulation of the estrous cycle for improvements in breeding; and production enhancement using bovine somatotropin (bST).

Producers were asked to report the number of injections of any kind a dairy cow typically received during the previous 12 months. For all operations, the operation average number of injections typically received by a cow was 13.8, or an average of slightly more than 1 injection per month. The number of injections per cow increased as herd size increased, with cows on small operations receiving 6.4 injections and cows on large operations receiving 17.3 injections.

a. Operation average number of injections per cow during the previous 12 months, and by herd size:

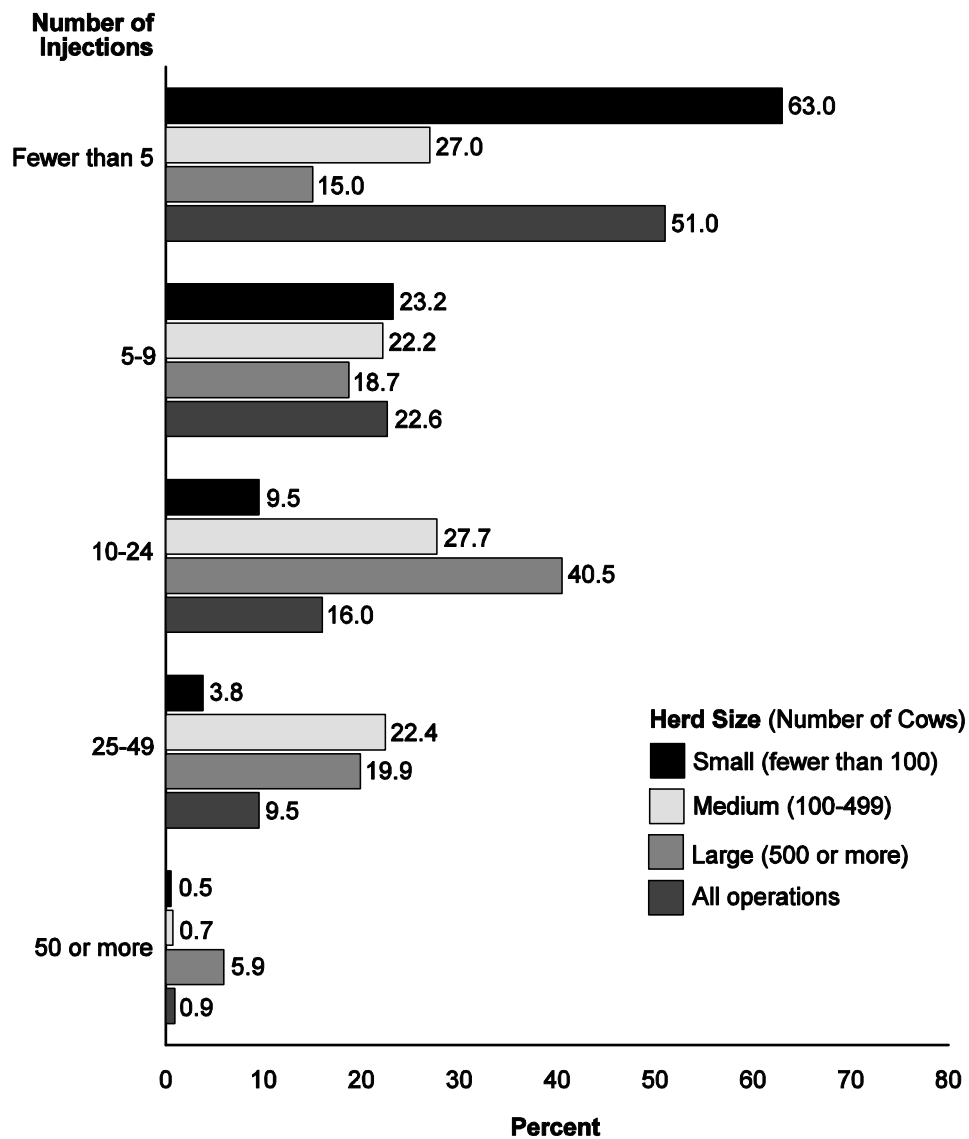
<b>Operation Average Number Injections</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>No.</b>	<b>Std. Error</b>	<b>No.</b>	<b>Std. Error</b>	<b>No.</b>	<b>Std. Error</b>	<b>No.</b>	<b>Std. Error</b>
6.4	(0.7)	14.4	(1.0)	17.3	(1.6)	13.8	(0.8)

On about one-half of operations (51.0 percent), cows received fewer than five injections during the previous 12 months. In general, the number of injections a cow received increased with herd size; 63.0 percent of small operations gave fewer than five injections, compared with 27.0 percent of medium operations and 15.0 percent of large operations. About two-fifths of large operations (40.5 percent) gave 10 to 24 injections per cow during the previous 12 months, compared with 9.5 percent of small operations.

b. Percentage of operations by number of injections a cow typically received during the previous 12 months, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Number of Injections</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Fewer than 5	63.0	(3.9)	27.0	(4.1)	15.0	(4.7)	51.0	(2.9)
5 to 9	23.2	(3.5)	22.2	(3.5)	18.7	(4.8)	22.6	(2.6)
10 to 24	9.5	(2.2)	27.7	(4.0)	40.5	(6.4)	16.0	(1.9)
25 to 49	3.8	(1.3)	22.4	(3.7)	19.9	(4.3)	9.5	(1.4)
50 or more	0.5	(0.5)	0.7	(0.5)	5.9	(3.2)	0.9	(0.4)
Total	100.0		100.0		100.0		100.0	

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**Percentage of Operations by Number of Injections a Cow Typically Received During the Previous 12 Months, and by Herd Size**



A higher percentage of operations in the East region (52.7 percent) administered fewer than five injections to cows during the previous 12 months, compared with 32.9 percent of operations in the West region.

c. Percentage of operations by number of injections a cow typically received during the previous 12 months, by region:

Percent Operations				
Region				
Number of Injections	West		East	
	Percent	Std. Error	Percent	Std. Error
Fewer than 5	32.9	(5.6)	52.7	(3.2)
5 to 9	28.4	(5.4)	22.1	(2.7)
10 to 24	33.1	(5.5)	14.4	(2.0)
25 to 49	4.0	(1.9)	9.9	(1.5)
50 or more	1.6	(1.3)	0.9	(0.5)
Total	100.0		100.0	

Overall, 80.1 percent of cows were on operations that typically gave cows fewer than 25 injections during the previous 12 months, with 26.2 percent receiving fewer than 5 injections, 24.7 percent receiving 5 to 9 injections, and 29.2 percent receiving 10 to 24 injections. For small operations, the majority of cows were on operations on which cows typically received fewer than five injections (60.8 percent), compared with 21.0 percent of cows on medium operations and 11.7 percent of cows on large operations. In contrast, a higher percentage of cows on medium operations and on large operations (55.0 and 62.6 percent, respectively) typically received 10 or more injections than cows on small operations (15.4 percent).

d. Percentage of cows on operations by number of injections a cow typically received during the previous 12 months, and by herd size:

<b>Percent Cows*</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Number of Injections</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Fewer than 5	60.8	(3.9)	21.0	(3.4)	11.7	(4.3)	26.2	(2.7)
5 to 9	23.8	(3.5)	24.0	(3.7)	25.7	(7.5)	24.7	(3.8)
10 to 24	9.9	(2.2)	30.9	(4.3)	38.0	(7.1)	29.2	(3.6)
25 to 49	5.0	(1.7)	23.4	(3.7)	19.5	(4.5)	17.2	(2.4)
50 or more	0.5	(0.5)	0.7	(0.4)	5.1	(2.6)	2.7	(1.2)
Total	100.0		100.0		100.0		100.0	

\*As a percentage of cows on the operation at the time of VS Initial Visit interview.

Almost 9 of 10 injections (89.1 percent) given to dairy cows were administered by farm personnel, with no differences observed by herd size.

e. Operation average percentage of injections administered by farm personnel, and by herd size:

<b>Operation Average Percent Injections</b>							
<b>Herd Size (Number of Cows)</b>							
<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
87.8	(1.9)	91.7	(1.7)	92.8	(1.9)	89.1	(1.4)



Photo courtesy of "Dairy Herd Management"/ "Bovine Veterinarian"

## 2. Injection route, purpose, and location

**Note:** The average number of injections a cow typically received for each operation was applied to every cow on that operation to calculate the number of injections by route, purpose, and location of administration.

There are three primary injection routes: intramuscular (IM), subcutaneous (SQ), and intravenous (IV). The selection and use of appropriate injection route and body location (or site) are important to both product efficacy and carcass quality at slaughter. In the 1990s, the National Cattlemen’s Association (now the National Cattlemen’s Beef Association, or NCBA) began conducting the Non-Fed Beef/Market Cow and Bull Quality Audits. Designed in part to evaluate the incidence of injection-site lesions, the audits include dairy cattle, which represent about 20 percent of all beef consumed in the United States. Injection-site lesions in the muscle cuts of the upper hip (sirloins and rounds) have decreased substantially since the first audits were conducted. In 2007, 11 percent of dairy cows had injection-site lesions, compared with 49 percent from 1998 to 2000. The 1999 audit estimated a loss of \$1.46 per head due to trim loss associated with injection-site lesions. Although injection-site lesions are not a food-safety issue, the scar tissue affects meat quality. Scar tissue, which forms after IM injections, toughens muscle tissue, producing a product that may be unacceptable to consumers. Because muscle cuts of the upper hip (sirloins and rounds) are frequently marketed as whole cuts, injection lesions may not be noticed prior to retail sale. Producers are advised to follow Beef Quality Assurance guidelines and administer products labeled for IM injection in front of the shoulder—not in the hip or round.

Almost all operations (97.4 percent) administered IM injections during the previous 12 months. SQ and IV injections were administered on 69.1 and 70.3 percent of operations, respectively. A higher percentage of medium operations (84.6 percent) administered SQ injections compared with small operations (63.3 percent).

a. Percentage of operations that administered intramuscular (IM), subcutaneous (SQ), or intravenous (IV) injections, and by herd size:

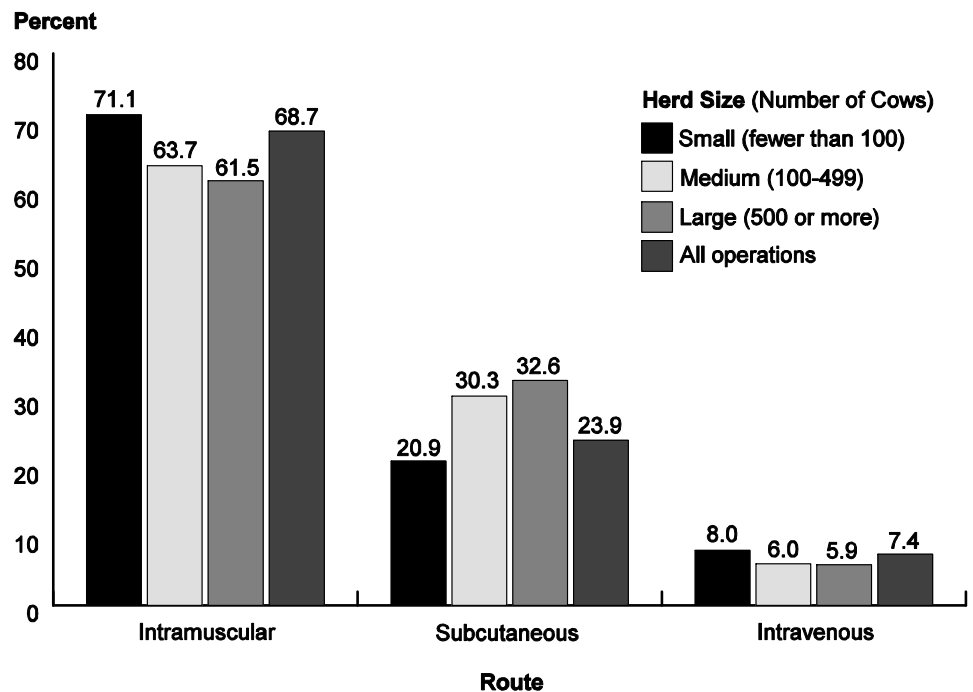
Percent Operations								
Herd Size (Number of Cows)								
Route	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Intramuscular	96.8	(1.1)	98.7	(0.8)	99.4	(0.6)	97.4	(0.8)
Subcutaneous	63.3	(4.0)	84.6	(3.2)	71.6	(6.0)	69.1	(2.9)
Intravenous	68.6	(3.8)	76.0	(3.6)	66.1	(6.3)	70.3	(2.8)

About two-thirds of injections (68.7 percent) were administered IM, compared with 23.9 percent administered SQ and 7.4 percent IV. There were no differences in injection route by herd size.

b. Operation average percentage of injections by injection route, and by herd size:

Operation Average Percent Injections								
Herd Size (Number of Cows)								
Route	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Intramuscular	71.1	(2.3)	63.7	(2.5)	61.5	(4.0)	68.7	(1.7)
Subcutaneous	20.9	(2.1)	30.3	(2.6)	32.6	(3.8)	23.9	(1.6)
Intravenous	8.0	(1.1)	6.0	(0.8)	5.9	(1.0)	7.4	(0.8)
Total	100.0		100.0		100.0		100.0	

Operation Average Percentage of Injections by Injection Route, and by Herd Size



Of IM injections administered on the operation, more than two-fifths (41.3 percent) were given for vaccination, while reproductive and antibiotic injections each accounted for about one-fourth of IM injections (27.3 and 23.1 percent, respectively).

c. For the 97.4 percent of operations that administered IM injections, operation average percentage of IM injections administered for the following purposes, and by herd size:

<b>Operation Average Percent IM Injections</b>								
<b>Herd Size (Number of Cows)</b>								
	<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All</b> <b>Operations</b>	
<b>Purpose</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Antibiotic	24.7	(2.2)	18.9	(2.0)	22.3	(3.8)	23.1	(1.6)
Production enhancement (e.g., bST)	3.1	(1.3)	8.9	(2.1)	5.6	(1.4)	4.7	(1.1)
Reproduction	25.5	(2.1)	31.9	(2.8)	28.0	(2.4)	27.3	(1.6)
Vaccination	42.9	(2.8)	36.5	(2.8)	43.8	(3.2)	41.3	(2.1)
Other	3.8	(1.3)	3.8	(1.5)	0.3	(0.2)	3.6	(1.0)
Total	100.0		100.0		100.0		100.0	

The primary locations for IM injections were hind leg (45.3 percent) and neck (34.2 percent). A higher percentage of IM injections were administered in the neck on large operations (50.9 percent) compared with small or medium operations (11.8 and 16.5 percent, respectively). Conversely, a lower percentage of IM injections were administered in the hind leg on large operations (37.1 percent) than small operations (65.5 percent).

d. For the 97.4 percent of operations that administered IM injections, percentage of IM injections by location administered, and by herd size:

<b>Percent IM Injections</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Location</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Neck	11.8	(2.9)	16.5	(3.4)	50.9	(6.3)	34.2	(4.0)
Shoulder	3.3	(1.4)	3.0	(1.1)	1.3	(0.6)	2.1	(0.5)
Upper hip	16.3	(3.5)	17.4	(3.2)	8.3	(2.0)	12.4	(1.7)
Hind leg	65.5	(5.0)	50.2	(4.8)	37.1	(6.1)	45.3	(3.7)
Other	3.1	(1.4)	12.9	(4.6)	2.4	(1.1)	6.0	(1.8)
Total	100.0		100.0		100.0		100.0	

More than 4 of 10 production enhancement injections (41.4 percent) were given in “Other” locations. The most common production enhancement injection, bST (Posilac), is recommended to be given subcutaneously around the tailhead.

e. For the 97.4 percent of operations that administered IM injections, percentage of IM injections by location administered, by purpose of injection:

Percent IM Injections								
Purpose								
Location	Antibiotics		Production Enhancement		Reproduction		Vaccination	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Neck	41.6	(5.9)	20.5	(8.8)	28.3	(5.7)	47.5	(5.4)
Shoulder	2.9	(1.1)	8.7	(3.4)	1.6	(0.6)	1.4	(0.4)
Upper hip	14.5	(2.6)	8.6	(3.1)	11.7	(2.2)	12.5	(2.0)
Hind leg	39.9	(4.6)	20.8	(8.9)	58.1	(5.5)	37.6	(5.0)
Other	1.1	(0.6)	41.4	(9.4)	0.3	(0.2)	1.0	(0.3)
Total	100.0		100.0		100.0		100.0	

Almost all operations gave injections to heifers and cows (96.9 and 98.8 percent, respectively). More than 9 of 10 operations gave IM injections to heifers and cows (94.0 and 96.1 percent, respectively). Approximately 5 of 10 operations (51.6 percent) administered IV injections to heifers while 65.9 percent of operations administered IV injections to cows.

f. Percentage of operations that administered injections to heifers and cows during the previous 12 months, by injection route:

Percent Operations								
Injection Route								
Cattle Class	Intramuscular		Subcutaneous		Intravenous		Any	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Heifers	94.0	(1.4)	62.2	(3.0)	51.6	(3.0)	96.9	(1.1)
Cows	96.1	(1.0)	66.8	(3.0)	65.9	(2.9)	98.8	(0.6)



Cattle-handling facilities present on an operation dictate where the majority of animals are handled. This is reflected in the similarity of facility type used across injection routes for both heifers and cows. To restrain heifers for IM injections, most operations primarily used lock-up (30.4 percent of operations), tie stall/stanchion (28.8 percent), or chute/head gate (22.6 percent) facilities. These same types of facilities also were primarily used for SQ and IV injections for heifers. Less than 11 percent of operations gave any injections to heifers loose in freestalls, in a palpation rail, or in the parlor.

g. For the 96.9 percent of operations that administered IM, SQ, and/or IV injections to **heifers**, percentage of operations by type of cattle-handling facility primarily used, by injection route:

Percent Operations						
Injection Route—Heifers						
Cattle-handling Facility Type	Intramuscular		Subcutaneous		Intravenous	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Tie stall/stanchion	28.8	(2.9)	24.2	(3.4)	36.3	(4.1)
Lock-up	30.4	(2.5)	36.4	(3.3)	31.6	(3.6)
Chute/head gate	22.6	(2.5)	23.4	(2.8)	20.1	(3.0)
Loose in freestall	10.2	(2.0)	7.5	(2.1)	5.7	(1.7)
Palpation rail	0.3	(0.1)	0.5	(0.2)	0.2	(0.2)
Parlor	5.5	(1.2)	4.3	(1.3)	2.4	(1.2)
Other	2.2	(1.1)	3.7	(1.7)	3.7	(1.6)
Total	100.0		100.0		100.0	

The majority of operations (59.0 percent) administered IM injections to cows in a tie stall/stanchion, while 17.4 percent of operations used the parlor and 12.4 percent used lock-ups. Tie stall/stanchion also was the primary facility used for administering SQ (52.4 percent of operations) or IV injections (64.0 percent of operations) to cows.

h. For the 98.8 percent of operations that administered IM, SQ, and/or IV injections to **cows**, percentage of operations by type of cattle-handling facility primarily used, by injection route:

Percent Operations						
Injection Route—Cows						
Cattle-handling Facility Type	Intramuscular		Subcutaneous		Intravenous	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Tie stall/stanchion	59.0	(2.7)	52.4	(3.3)	64.0	(3.1)
Lock-up	12.4	(1.4)	17.0	(2.1)	11.5	(1.8)
Chute/head gate	5.3	(1.2)	7.6	(1.6)	11.9	(1.7)
Loose in freestall	4.1	(1.3)	2.7	(1.5)	4.7	(1.5)
Palpation rail	1.6	(0.5)	1.6	(0.5)	0.5	(0.2)
Parlor	17.4	(1.8)	18.5	(2.3)	5.0	(1.4)
Other	0.2	(0.2)	0.2	(0.2)	2.4	(1.0)
Total	100.0		100.0		100.0	

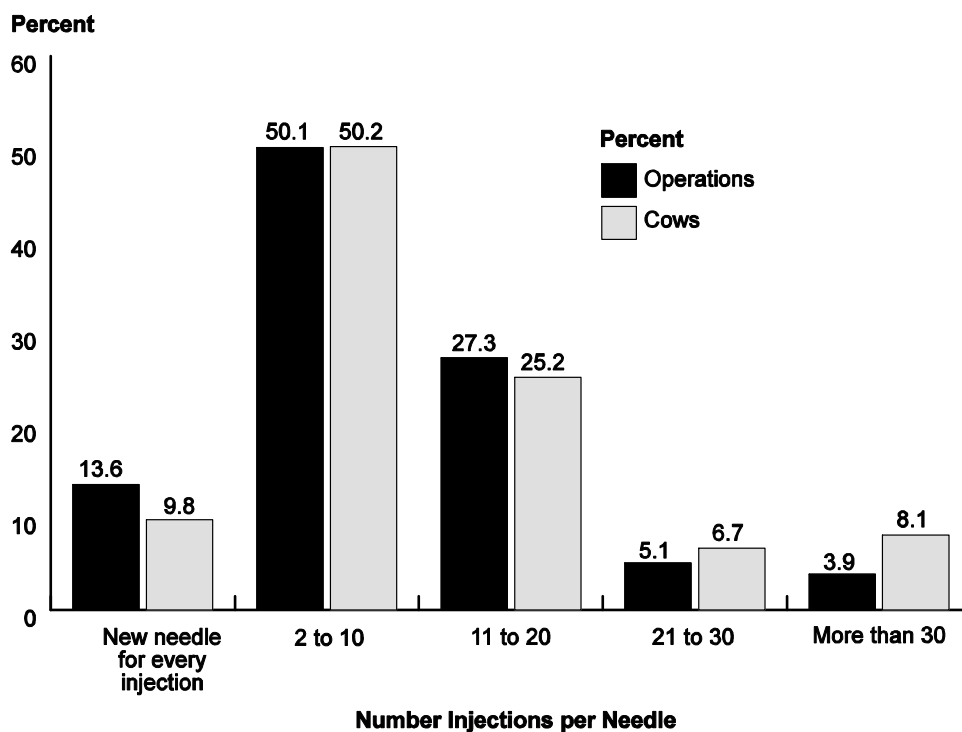
Using a new needle for each cow can decrease disease transmission and also reduce potential injury to the cow by minimizing the possibility of broken needles. About one of seven operations (13.6 percent) used a new needle for every injection during the previous 12 months; these operations represented 9.8 percent of all cows. The majority of operations (50.1 percent), representing 50.2 percent of cows, used each needle to give 2 to 10 injections. Approximately one-fourth of operations (27.3 percent), which represented 25.2 percent of cows, used each needle to give 11 to 20 injections. Although less than 4 percent of operations used needles for more than 30 injections, these operations represented 8.1 percent of cows, suggesting that this practice is more common on larger operations.

i. For the 98.8 percent of operations that administered IM, SQ, and/or IV injections to **cows**, percentage of operations (and percentage of cows on those operations) by number of injections administered per needle by farm personnel during the previous 12 months:

Number Injections per Needle	Percent Operations	Standard Error	Percent Cows*	Standard Error
New needle for every injection	13.6	(2.2)	9.8	(1.6)
2 to 10	50.1	(3.0)	50.2	(4.0)
11 to 20	27.3	(2.8)	25.2	(3.2)
21 to 30	5.1	(1.1)	6.7	(1.9)
More than 30	3.9	(1.0)	8.1	(2.3)
Total	100.0		100.0	

As a percentage of cows on the operation at the time of VS Initial Visit interview.

**For the 98.8 Percent of Operations that Administered IM, SQ, and/or IV Injections to Cows, Percentage of Operations and Percentage of Cows\* on Those Operations by Number of Injections Administered Per Needle by Farm Personnel During the Previous 12 Months**



\*As a percentage of cows on the operation at time of Initial VS interview.

3. Record keeping

Keeping a record of each treatment a cow receives is important to make sure that the appropriate length of therapy and withdrawal are followed. Overall, about three-fifths of operations (58.2 percent) reported keeping a written or computerized record for each cow that received a treatment requiring a withdrawal time. A higher percentage of large operations (94.4 percent) than small operations (51.7 percent) and medium operations (67.4 percent) reported keeping a written or computerized record of each treatment.

Percentage of operations that kept a written or computerized record for each cow that received a treatment requiring a withdrawal time before the cow could be sent to market, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
51.7	(4.0)	67.4	(4.2)	94.4	(2.4)	58.2	(3.0)

## G. Nutrient Management

### 1. Housing facilities

Nutrient management systems are usually dependent on the type and design of cattle housing, land costs, ambient temperatures, precipitation amounts, and nutrient use. In general, the West region is more arid than the East region, with the East region having more cold weather and precipitation during the winter months.

Of the 92.3 percent of operations that housed weaned heifers, about one-third housed the heifers primarily in a multiple-animal inside area (34.6 percent), while one-fourth housed weaned heifers in a drylot/multiple-animal outside area (22.9 percent). A majority of small operations primarily housed weaned heifers in drylots/multiple-animal outside and multiple-animal inside areas (22.3 and 37.8 percent, respectively). More than 4 of 10 large operations primarily housed weaned heifers in a drylot/multiple-animal outside area (43.2 percent). The percentage of operations that did not house weaned heifers increased as herd size increased, with almost one-fourth of large operations not housing weaned heifers (24.8 percent).

a. Percentage of operations by primary housing facility/outside area used for *weaned heifers* during 2006, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Primary Housing Type	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Tie stall/stanchion	6.7	(1.0)	4.6	(1.1)	0.5	(0.2)	5.9	(0.7)
Freestall	10.2	(1.1)	18.2	(1.8)	13.7	(2.2)	12.1	(0.9)
Individual pen/hutch	6.3	(0.9)	3.0	(0.9)	1.9	(0.8)	5.3	(0.7)
Drylot/multiple-animal outside area	22.3	(1.4)	19.8	(1.8)	43.2	(2.7)	22.9	(1.1)
Multiple-animal inside area	37.8	(1.8)	29.8	(2.0)	10.1	(1.9)	34.6	(1.4)
Pasture	11.7	(1.1)	9.4	(1.2)	4.6	(1.0)	10.8	(0.9)
Not housed on operation	4.6	(0.7)	13.8	(1.6)	24.8	(2.4)	7.7	(0.7)
Other	0.4	(0.2)	1.4	(0.7)	1.2	(0.7)	0.7	(0.2)
Total	100.0		100.0		100.0		100.0	

Almost one-half of operations in the West region (46.2 percent) housed weaned heifers primarily in a drylot/multiple-animal outside area. Approximately 1 of 8 operations in the West housed weaned heifers in freestalls (12.7 percent), multiple-animal inside area (12.1 percent), or pasture (12.7 percent) or did not house weaned heifers on the operation (12.1 percent). About one-third of operations in the East region (36.4 percent) housed weaned heifers primarily in a multiple-animal inside area, while 20.9 percent of operations housed weaned heifers in a multiple-animal outside area.

b. Percentage of operations by primary housing facility/outside area used for ***weaned heifers*** during 2006, by region:

Primary Housing Type	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Tie stall/stanchion	0.4	(0.2)	6.4	(0.8)
Freestall	12.7	(2.0)	12.1	(0.9)
Individual pen/hutch	3.3	(1.2)	5.5	(0.7)
Drylot/multiple-animal outside area	46.2	(2.9)	20.9	(1.2)
Multiple-animal inside area	12.1	(1.9)	36.4	(1.5)
Pasture	12.7	(2.3)	10.7	(0.9)
Not housed on operation	12.1	(1.9)	7.3	(0.7)
Other	0.5	(0.3)	0.7	(0.2)
Total	100.0		100.0	

Almost one-half of operations (49.2 percent) housed lactating cows primarily in a tie stall/stanchion facility. About 1 of 3 operations (32.6 percent) housed cows in freestalls. The use of tie stall/stanchion facilities decreased from 63.0 percent for small operations to 0.7 percent for large operations. Alternatively, a higher percentage of medium and large operations housed lactating cows in freestalls (67.5 and 72.6 percent, respectively) compared with small operations (19.0 percent). Almost one-fourth of large operations housed lactating cows primarily in drylots/multiple-animal outside areas (24.2 percent).

c. Percentage of operations by primary housing facility/outside area used for ***lactating cows*** during 2006, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Primary Housing Type	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Tie stall/stanchion	63.0	(1.6)	15.7	(1.9)	0.7	(0.3)	49.2	(1.3)
Freestall	19.0	(1.3)	67.5	(2.1)	72.6	(2.3)	32.6	(1.1)
Individual pen	0.1	(0.0)	0.3	(0.2)	0.2	(0.1)	0.1	(0.1)
Drylot/multiple-animal outside area	3.4	(0.6)	4.1	(0.7)	24.2	(2.3)	4.6	(0.5)
Multiple-animal inside area	3.5	(0.7)	3.3	(0.7)	0.8	(0.5)	3.4	(0.6)
Pasture	10.8	(1.1)	8.8	(1.2)	1.0	(0.3)	9.9	(0.8)
Other	0.2	(0.1)	0.3	(0.2)	0.5	(0.4)	0.2	(0.1)
Total	100.0		100.0		100.0		100.0	

Almost one-half of operations in the West region housed lactating cows primarily in freestall housing (49.7 percent), while 29.8 percent of operations housed cows in drylot/multiple-animal outside areas and 15.0 percent housed cows on pasture. The majority of operations in the East region housed lactating cows primarily in tie stall/stanchions (53.1 percent). A lower percentage of operations in the East region housed cows in freestalls (31.2 percent) compared with the West region. Pasture was the primary housing type for lactating cows on about 1 of 10 operations in the East region (9.4 percent).

d. Percentage of operations by primary housing facility/outside area used for ***lactating cows*** during 2006, by region:

Primary Housing Type	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Tie stall/stanchion	1.3	(0.5)	53.1	(1.4)
Freestall	49.7	(2.9)	31.2	(1.1)
Individual pen	0.8	(0.5)	0.1	(0.0)
Drylot/multiple-animal outside area	29.8	(2.6)	2.6	(0.5)
Multiple-animal inside area	2.6	(0.9)	3.4	(0.6)
Pasture	15.0	(2.7)	9.4	(0.9)
Other	0.8	(0.5)	0.2	(0.1)
Total	100.0		100.0	



## 2. Manure-handling methods

The method used to handle the majority of manure in weaned-heifer housing areas varied among operations. About one-fourth of operations (23.5 percent) used an alley scraper to handle the majority of manure, while 22.6 percent of operations used bedded pack (manure pack), 17.5 percent scraped the drylot, 15.4 percent left manure on pasture, and 14.6 percent used a gutter cleaner. A higher percentage of small and medium operations than large operations left manure from weaned-heifer housing areas on pasture or used a bedded pack. Compared with medium and small operations, a higher percentage of large operations scraped drylots. More than 1 of 10 large operations flushed the alley with recycled water (10.6 percent), which was higher than the percentage of small operations (0.0 percent). Alley scrapers were used on a higher percentage of medium operations (40.1 percent) compared with small operations (17.1 percent).

a. For the 92.3 percent of operations that housed weaned heifers, percentage of operations by method used to handle the majority of manure in ***weaned-heifer housing*** areas, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Handling Method	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Manure left on pasture	17.4	(2.8)	12.6	(3.0)	3.1	(1.7)	15.4	(2.1)
Drylot scraped	17.0	(3.1)	12.7	(2.9)	41.0	(6.3)	17.5	(2.3)
Gutter cleaner	19.3	(3.4)	4.4	(2.4)	0.0	(--)	14.6	(2.5)
Alley scraper (mechanical or tractor)	17.1	(3.1)	40.1	(4.6)	33.3	(6.4)	23.5	(2.5)
Alley flush with fresh water	0.0	(--)	0.0	(--)	0.0	(--)	0.0	(--)
Alley flush with recycled water	0.0	(--)	1.2	(0.8)	10.6	(4.1)	0.9	(0.3)
Slotted floor	1.1	(0.7)	2.8	(1.5)	0.9	(0.7)	1.5	(0.6)
Bedded pack (manure pack)	23.0	(3.4)	25.4	(4.0)	7.2	(2.8)	22.6	(2.6)
Manure vacuum	0.0	(--)	0.1	(0.1)	0.0	(--)	0.0	(0.0)
Other	5.1	(2.0)	0.7	(0.7)	3.9	(2.2)	4.0	(1.4)
Total	100.0		100.0		100.0		100.0	

Because the West region has a higher percentage of large herds than the East region, differences in manure-handling methods in weaned-heifer housing areas by region were similar to differences by herd size. Almost one-half of operations in the West region (46.3 percent) scraped drylots, compared with 14.6 percent of operations in the East region. A similar percentage of operations in both regions used an alley scraper for handling the majority of manure—26.0 percent in the West region and 23.3 percent in the East region. About 1 in 10 operations in the West region (9.2 percent) flushed alleys with recycled water. A higher percentage of operations in the East region than in the West region used gutter cleaners or bedded packs.

b. For the 92.3 percent of operations that housed weaned heifers, percentage of operations by method used to handle the majority of manure in ***weaned-heifer housing*** areas, by region:

Handling Method	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Manure left on pasture	11.1	(3.1)	15.8	(2.3)
Drylot scraped	46.3	(5.5)	14.6	(2.5)
Gutter cleaner	0.0	(--)	16.0	(2.7)
Alley scraper (mechanical or tractor)	26.0	(5.2)	23.3	(2.7)
Alley flush with fresh water	0.0	(--)	0.0	(--)
Alley flush with recycled water	9.2	(3.3)	0.1	(0.1)
Slotted floor	0.0	(--)	1.7	(0.7)
Bedded pack (manure pack)	5.5	(2.6)	24.3	(2.8)
Manure vacuum	0.0	(--)	0.0	(0.0)
Other	1.9	(1.5)	4.2	(1.5)
Total	100.0		100.0	

Almost one-third of operations that housed weaned heifers primarily in a freestall/multiple-animal inside area (31.8 percent) used an alley scraper to handle the majority of manure in weaned-heifer housing areas. Bedded packs were used by 22.7 percent of operations that housed heifers primarily in freestall/multiple-animal inside areas. For operations that housed weaned heifers in a drylot/multiple-animal outside area, 33.8 percent scraped the drylot and 30.7 percent used a bedded pack to handle the majority of manure. Of operations that used pasture as the primary housing type for weaned heifers, 54.4 percent of operations left the majority of manure on the pasture and 19.5 percent used a bedded pack for the manure.

c. For the 92.3 percent of operations that housed weaned heifers, percentage of operations by method used to handle the majority of manure in ***weaned-heifer housing*** areas, by primary housing type for ***weaned heifers***:

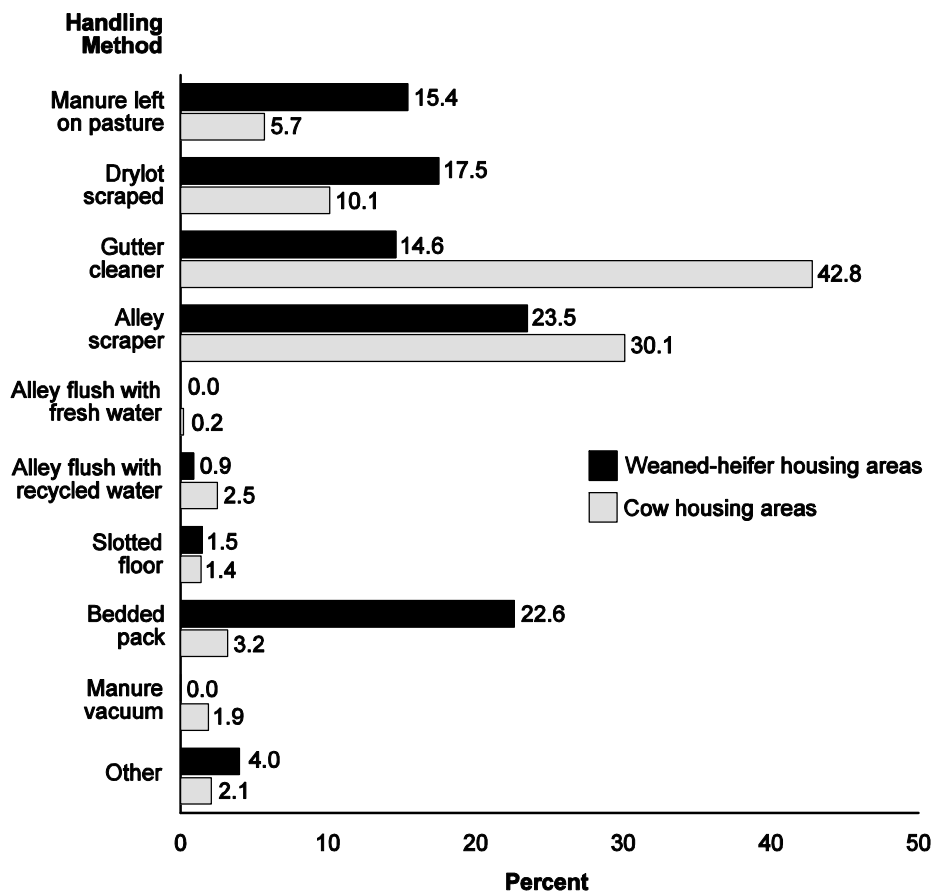
Handling Method	Percent Operations					
	Primary Housing Type					
	Freestall/ Multiple-animal Inside Area		Drylot/ Multiple-animal Outside Area		Pasture	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Manure left on pasture	10.5	(2.5)	14.2	(4.0)	54.4	(10.3)
Drylot scraped	14.0	(3.1)	33.8	(6.1)	3.6	(1.7)
Gutter cleaner	12.9	(3.3)	5.6	(2.5)	11.5	(9.4)
Alley scraper (mechanical or tractor)	31.8	(4.1)	13.0	(4.0)	9.0	(5.1)
Alley flush with fresh water	0.0	(--)	0.0	(--)	0.0	(--)
Alley flush with recycled water	0.6	(0.4)	2.1	(1.1)	0.0	(--)
Slotted floor	3.1	(1.3)	0.0	(--)	0.0	(--)
Bedded pack (manure pack)	22.7	(3.6)	30.7	(5.8)	19.5	(8.6)
Manure vacuum	0.1	(0.0)	0.0	(--)	0.0	(--)
Other	4.3	(2.1)	0.6	(0.5)	2.0	(2.0)
Total	100.0		100.0		100.0	

In areas used to house cows, more than two-fifths of operations (42.8 percent) used a gutter cleaner to handle the majority of manure, while 30.1 percent used an alley scraper. A higher percentage of small operations (58.5 percent) used a gutter cleaner to handle the majority of manure in cow housing areas, compared with 11.1 percent of medium operations and 0.0 percent of large operations. Because gutter cleaners are the primary manure-handling method for tie stall/stanchion facilities, their increased use on small operations was expected (see table 1c on p 125). The majority of medium operations (64.1 percent) used an alley scraper to handle the majority of manure in cow housing areas. About 3 of 10 large operations used an alley scraper (33.5 percent), scraped drylots (30.1 percent), or flushed alleys with recycled water (27.4 percent).

d. Percentage of operations by method used to handle the majority of manure in **cow housing** areas, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Handling Method	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Manure left on pasture	6.0	(1.7)	6.2	(2.2)	0.6	(0.6)	5.7	(1.3)
Drylot scraped	8.7	(2.0)	8.7	(2.0)	30.1	(5.8)	10.1	(1.5)
Gutter cleaner	58.5	(3.9)	11.1	(3.3)	0.0	(--)	42.8	(3.0)
Alley scraper (mechanical or tractor)	17.2	(2.8)	64.1	(4.3)	33.5	(4.6)	30.1	(2.4)
Alley flush with fresh water	0.0	(--)	0.5	(0.4)	1.4	(1.3)	0.2	(0.1)
Alley flush with recycled water	0.0	(--)	2.9	(1.3)	27.4	(5.7)	2.5	(0.5)
Slotted floor	1.6	(0.9)	1.4	(1.0)	0.5	(0.2)	1.4	(0.6)
Bedded pack (manure pack)	3.4	(1.6)	3.4	(1.5)	0.0	(--)	3.2	(1.2)
Manure vacuum	2.5	(1.6)	0.3	(0.2)	1.5	(1.3)	1.9	(1.1)
Other	2.1	(1.1)	1.4	(1.1)	5.0	(2.6)	2.1	(0.8)
Total	100.0		100.0		100.0		100.0	

**Percentage of Operations by Method Used to Handle the Majority of Manure in Weaned-heifer\* and Cow Housing Areas**



\*For operations that housed weaned heifers.

The highest percentages of operations in the West region scraped drylots (38.2 percent), used an alley scraper (23.4 percent), or flushed alleys with recycled water (21.0 percent) to handle the majority of manure in cow housing areas. In the East region, gutter cleaners (47.0 percent of operations) and alley scrapers (30.7 percent) were the primary manure-handling methods in cow housing areas.

e. Percentage of operations by method used to handle the majority of manure in **cow housing** areas, by region:

Handling Method	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Manure left on pasture	6.1	(2.5)	5.6	(1.4)
Drylot scraped	38.2	(5.9)	7.3	(1.5)
Gutter cleaner	0.0	(0.0)	47.0	(3.2)
Alley scraper (mechanical or tractor)	23.4	(5.1)	30.7	(2.6)
Alley flush with fresh water	1.7	(1.2)	0.1	(0.1)
Alley flush with recycled water	21.0	(4.4)	0.7	(0.3)
Slotted floor	1.2	(1.2)	1.5	(0.7)
Bedded pack (manure pack)	2.8	(2.0)	3.2	(1.3)
Manure vacuum	1.5	(1.1)	1.9	(1.2)
Other	4.1	(2.1)	2.0	(0.9)
Total	100.0		100.0	

The percentage of operations by primary housing type for lactating cows and manure-handling methods was predictable because facility designs are usually associated with specific manure-handling methods. More than 8 of 10 tie stall/stanchion operations (82.5 percent) used a gutter cleaner to handle the majority of manure in cow housing areas. The predominant manure-handling method used by 72.1 percent of freestall operations was an alley scraper, and 50.3 percent of operations that housed cows in a drylot/multiple-animal outside area scraped the drylot. Of operations that used pasture as the primary housing facility/outside area for lactating cows, 40.7 percent used gutter cleaners and 27.3 percent left manure on pasture as the handling method for the majority of manure. Those pasture operations that used gutter cleaners as the method for handling the majority of manure in cow housing areas likely house cattle indoors during a particular season or inclement weather.

f. Percentage of operations by method used to handle the majority of manure in **cow housing** areas, by primary housing type for ***lactating cows***:

Percent Operations								
Primary Housing Type								
Handling Method	Tie stall/ stanchion		Freestall		Drylot/ Multiple-animal Outside Area		Pasture	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Manure left on pasture	2.7	(1.6)	1.4	(1.1)	12.4	(8.0)	27.3	(8.6)
Drylot scraped	3.1	(1.5)	11.6	(2.8)	50.3	(12.8)	11.6	(5.4)
Gutter cleaner	82.5	(3.8)	1.2	(0.8)	0.0	(--)	40.7	(11.6)
Alley scraper (mechanical or tractor)	4.3	(2.0)	72.1	(3.5)	2.1	(1.5)	11.4	(4.8)
Alley flush with fresh water	0.0	(--)	0.4	(0.3)	1.2	(1.2)	0.0	(--)
Alley flush with recycled water	0.0	(--)	6.2	(1.3)	1.4	(1.4)	2.2	(2.2)
Slotted floor	0.7	(0.7)	3.1	(1.5)	0.0	(--)	0.0	(--)
Bedded pack (manure pack)	0.0	(--)	1.3	(0.8)	32.6	(14.3)	6.8	(6.4)
Manure vacuum	3.7	(2.3)	0.5	(0.3)	0.0	(--)	0.0	(--)
Other	3.0	(1.5)	2.2	(1.1)	0.0	(--)	0.0	(--)
Total	100.0		100.0		100.0		100.0	

More than 75 percent of operations left manure on pasture or scraped a drylot as a manure-handling method for weaned-heifer and cow housing areas. Bedded packs were used in heifer areas on 60.6 percent of operations and in cow areas on 40.0 percent of operations. Alley scrapers were used by a similar percentage of operations for heifer (47.3 percent) and cow (54.9 percent) housing areas. Gutter cleaners were more frequently used in cow housing than in heifer housing (58.0 and 23.6 percent, respectively). Less than 10 percent of operations used alley flush with fresh or recycled water, slotted floor, or a manure vacuum for managing manure.

g. Percentage of operations by all manure-handling methods used in weaned-heifer and cow housing areas:

Handling Method	Percent Operations			
	Weaned-heifer Housing Area*		Cow Housing Area	
	Percent	Std. Error	Percent	Std. Error
Manure left on pasture	88.5	(1.9)	85.3	(2.3)
Drylot scraped	75.3	(3.1)	82.5	(2.5)
Gutter cleaner	23.6	(2.8)	58.0	(2.5)
Alley scraper (mechanical or tractor)	47.3	(3.1)	54.9	(2.9)
Alley flush with fresh water	1.0	(0.4)	1.5	(0.4)
Alley flush with recycled water	3.5	(0.7)	5.0	(0.8)
Slotted floor	4.9	(1.2)	6.2	(1.2)
Bedded pack (manure pack)	60.6	(3.0)	40.0	(2.9)
Manure vacuum	0.6	(0.2)	1.5	(0.8)
Other	6.5	(1.7)	5.3	(1.5)

\*For operations that housed weaned heifers.

### 3. Waste storage and treatment systems

To store or treat waste, more than one-half of operations used a manure pack inside a barn (56.1 percent), while more than 40 percent used a manure spreader to store manure (46.1 percent) or outside storage for solid manure not in drylot or pen (42.5 percent). A higher percentage of small and medium operations stored manure in a spreader (50.4 and 44.0 percent, respectively) or as a manure pack inside a barn (55.8 and 63.4 percent, respectively), compared with large operations (9.7 and 31.0 percent, respectively). Conversely, a lower



percentage of small operations stored manure untreated in an earthen basin (24.4 percent), compared with medium operations (45.7 percent), or in a treatment lagoon that was not mechanically aerated (3.2 percent), compared with medium and large operations (12.3 and 49.7 percent, respectively). A higher percentage of large operations (36.2 percent) used a solid separator than medium or small operations (3.2 and 0.3 percent, respectively).

a. Percentage of operations by waste storage and/or treatment system used, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
System	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Stored in manure spreader	50.4	(3.9)	44.0	(4.3)	9.7	(3.7)	46.1	(2.9)
Below-floor slurry or deep pit	8.5	(2.0)	18.3	(3.2)	18.8	(4.3)	11.6	(1.6)
Slurry stored in tank	9.6	(2.2)	21.6	(3.6)	11.7	(3.4)	12.7	(1.8)
Slurry or liquid manure stored in earthen basin and NOT treated	24.4	(3.3)	45.7	(4.2)	43.1	(6.2)	30.9	(2.6)
Treatment lagoon—NOT mechanically aerated	3.2	(0.9)	12.3	(2.7)	49.7	(6.2)	8.5	(1.1)
Treatment lagoon— mechanically aerated	1.0	(0.6)	0.6	(0.4)	18.7	(4.9)	2.1	(0.5)
Manure pack (inside barn)	55.8	(3.9)	63.4	(4.2)	31.0	(4.4)	56.1	(2.9)
Outside storage for solid manure NOT in drylot or pen	44.0	(4.0)	32.4	(3.9)	65.2	(5.9)	42.5	(3.0)
Outside storage for solid manure within drylot or pen	24.0	(3.4)	20.9	(3.6)	29.1	(5.5)	23.5	(2.5)
Storage of solid manure in a building without cattle access	2.7	(1.1)	9.2	(2.3)	8.6	(4.0)	4.7	(1.0)
Storage of solid manure with picket dam	3.1	(1.3)	3.1	(1.1)	3.9	(2.3)	3.2	(0.9)
Composted	11.3	(2.7)	6.6	(2.1)	26.4	(5.4)	11.1	(2.0)
Collection of methane/biogas	0.0	(--)	0.2	(0.2)	0.9	(0.5)	0.1	(0.0)
Solid separator	0.3	(0.3)	3.2	(1.0)	36.2	(6.1)	3.4	(0.5)
Other system	4.5	(1.7)	2.9	(1.5)	7.4	(2.9)	4.3	(1.2)

A higher percentage of operations in the West region compared with the East region stored or treated manure in a treatment lagoon, mechanically aerated or not; in outside storage, either within a drylot or pen or outside the pen; or with a solid separator system. A lower percentage of operations in the West region used a manure spreader (7.5 percent) or manure pack (12.4 percent) to store manure, compared with operations in the East region (49.9 and 60.4 percent, respectively).

b. Percentage of operations by waste storage and/or treatment system used, by region:

Percent Operations				
Region				
System	West		East	
	Pct.	Std. Error	Pct.	Std. Error
Stored in manure spreader	7.5	(2.5)	49.9	(3.1)
Below-floor slurry or deep pit	16.9	(3.8)	11.1	(1.7)
Slurry stored in tank	11.8	(3.9)	12.8	(2.0)
Slurry or liquid manure stored in earthen basin and NOT treated	44.1	(5.4)	29.7	(2.8)
Treatment lagoon—NOT mechanically aerated	49.5	(5.4)	4.5	(1.0)
Treatment lagoon—mechanically aerated	15.6	(4.0)	0.7	(0.4)
Manure pack (inside barn)	12.4	(3.3)	60.4	(3.1)
Outside storage for solid manure NOT in drylot or pen	65.5	(5.6)	40.2	(3.2)
Outside storage for solid manure within drylot or pen	43.1	(5.1)	21.6	(2.7)
Storage of solid manure in a building without cattle access	13.7	(4.0)	3.8	(1.0)
Storage of solid manure with picket dam	7.5	(3.0)	2.7	(1.0)
Composted	17.0	(3.9)	10.5	(2.1)
Collection of methane/biogas	0.5	(0.4)	0.1	(0.0)
Solid separator	28.8	(4.9)	0.9	(0.3)
Other system	4.0	(2.0)	4.3	(1.3)

Approximately 4 of 10 operations (42.0 percent) stored and/or treated only solid manure, while 58.0 percent stored and treated both solid and liquid manure. Storage and treatment of manure differed by herd size. The percentage of operations that stored and treated only solid manure decreased as herd size increased, from 52.4 percent of small operations to 0.2 percent of large operations.

c. Percentage of operations that stored and/or treated solid manure only or both solid and liquid manure, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Manure Type	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Solid only	52.4	(3.9)	24.5	(3.7)	0.2	(0.1)	42.0	(2.9)
Both solid and liquid	47.6	(3.9)	75.5	(3.7)	99.8	(0.1)	58.0	(2.9)
Total	100.0		100.0		100.0		100.0	

Almost all operations in the West region (96.0 percent) stored and/or treated both solid and liquid manure, compared with 54.3 percent of operations in the East region.

d. Percentage of operations that stored and/or treated solid manure only or both solid and liquid manure, by region:

Percent Operations				
Region				
Manure Type	West		East	
	Percent	Std. Error	Percent	Std. Error
Solid only	4.0	(1.7)	45.7	(3.1)
Both solid and liquid	96.0	(1.7)	54.3	(3.1)
Total	100.0		100.0	

More than 4 of 10 operations (43.0 percent) used a manure spreader to store the majority of solid manure. About one-fifth of operations used a manure pack (19.6 percent) or outside storage not in drylot or pen (19.0 percent) as the storage or treatment system for the majority of solid manure. A higher percentage of small and medium operations (48.5 and 37.7 percent, respectively) than large operations (4.1 percent) stored solid manure in a manure spreader. A higher percentage of large operations used outside storage for solid manure either outside of (45.8 percent) or within a drylot or pen (22.0 percent) compared with medium (21.3 and 6.6 percent, respectively) or small operations (15.6 and 9.6 percent, respectively).

e. Percentage of operations by waste storage and/or treatment system used for the majority of **solid** manure, and by herd size:

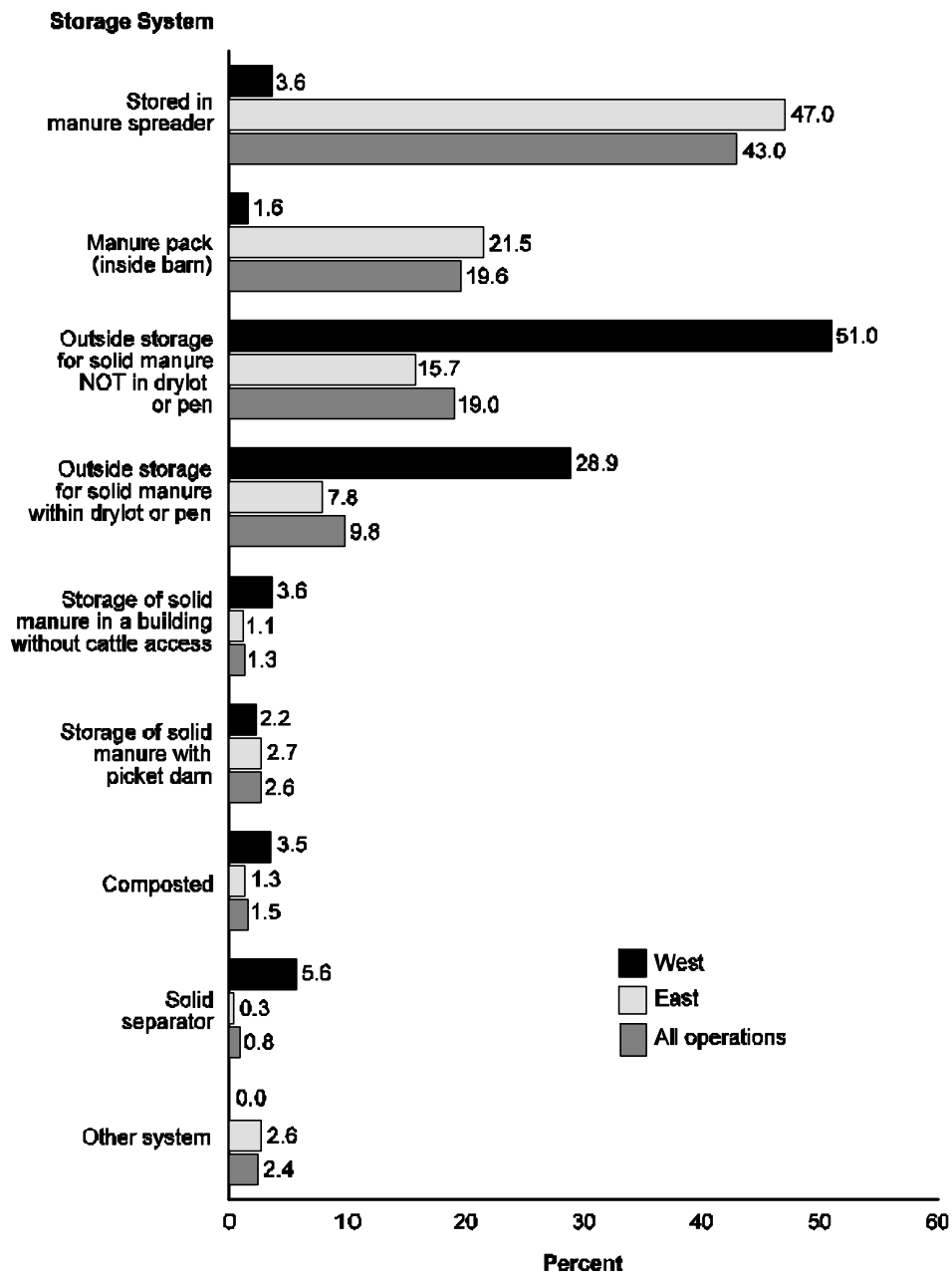
Percent Operations								
Herd Size (Number of Cows)								
System	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Stored in manure spreader	48.5	(4.2)	37.7	(4.9)	4.1	(3.3)	43.0	(3.2)
Manure pack (inside barn)	18.1	(3.2)	27.2	(4.4)	9.6	(3.2)	19.6	(2.5)
Outside storage for solid manure NOT in drylot or pen	15.6	(2.7)	21.3	(3.6)	45.8	(7.1)	19.0	(2.1)
Outside storage for solid manure within drylot or pen	9.6	(2.2)	6.6	(2.1)	22.0	(5.7)	9.8	(1.7)
Storage of solid manure in a building without cattle access	0.8	(0.5)	3.1	(1.2)	0.7	(0.3)	1.3	(0.5)
Storage of solid manure with picket dam	3.5	(1.7)	0.0	(0.0)	2.9	(2.2)	2.6	(1.2)
Composted	1.0	(0.9)	1.9	(1.1)	6.0	(2.8)	1.5	(0.7)
Solid separator	0.0	(0.0)	1.2	(0.7)	7.7	(3.7)	0.8	(0.3)
Other system	2.9	(1.6)	1.0	(0.8)	1.2	(0.7)	2.4	(1.2)
Total	100.0		100.0		100.0		100.0	

More than one-half of operations in the West region (51.0 percent) stored solid manure outside but not in a drylot or pen. Almost 3 of 10 operations in the West region (28.9 percent) stored solid manure outside within a drylot or pen. In the East region, the majority of solid manure was stored in a manure spreader on 47.0 percent of operations and as a manure pack on 21.5 percent of operations.

f. Percentage of operations by waste storage and/or treatment system used for the majority of **solid** manure, by region:

Percent Operations				
Region				
West			East	
System	Percent	Std. Error	Percent	Std. Error
Stored in manure spreader	3.6	(2.0)	47.0	(3.4)
Manure pack (inside barn)	1.6	(1.6)	21.5	(2.7)
Outside storage for solid manure NOT in drylot or pen	51.0	(6.1)	15.7	(2.2)
Outside storage for solid manure within drylot or pen	28.9	(5.3)	7.8	(1.8)
Storage of solid manure in a building without cattle access	3.6	(1.9)	1.1	(0.5)
Storage of solid manure with picket dam	2.2	(1.6)	2.7	(1.3)
Composted	3.5	(2.1)	1.3	(0.8)
Solid separator	5.6	(2.7)	0.3	(0.2)
Other system	0.0	(0.0)	2.6	(1.3)
Total	100.0		100.0	

**Percentage of Operations by Waste Storage and/or Treatment System Used for the Majority of Solid Manure, and by Region**



Almost one-half of operations that stored and/or treated liquid or slurry manure stored the majority of manure in an earthen basin without treatment (49.4 percent). More than 10 percent of operations stored liquid or slurry manure in a tank (16.7 percent), in a below-floor slurry or deep pit (13.4 percent), or in a treatment lagoon that was not mechanically aerated (11.8 percent). Compared with large operations, a higher percentage of small operations used a below-floor slurry or deep pit. Compared with large operations, a higher percentage of small and medium operations stored slurry or liquid manure that was not treated in an earthen basin. A treatment lagoon—mechanically aerated or not—was used on a higher percentage of large operations compared with medium or small operations.

g. For the 58.0 percent of operations that stored and/or treated both solid and liquid manure, percentage of operations by waste storage and treatment system used for the majority of **liquid or slurry** manure, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
System	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Below-floor slurry or deep pit	16.6	(4.0)	11.2	(3.2)	3.0	(1.4)	13.4	(2.5)
Slurry stored in tank (either above or below ground)	17.3	(4.2)	18.4	(3.9)	7.5	(2.6)	16.7	(2.7)
Slurry or liquid manure stored in earthen basin and NOT treated	50.6	(5.5)	53.8	(5.0)	26.9	(5.1)	49.4	(3.6)
Treatment lagoon—NOT mechanically aerated	5.1	(1.6)	13.5	(3.5)	44.5	(6.6)	11.8	(1.7)
Treatment lagoon—mechanically aerated	1.1	(0.6)	0.5	(0.5)	15.4	(5.2)	2.3	(0.7)
Other system	9.3	(3.6)	2.6	(1.9)	2.7	(1.4)	6.4	(2.1)
Total	100.0		100.0		100.0		100.0	

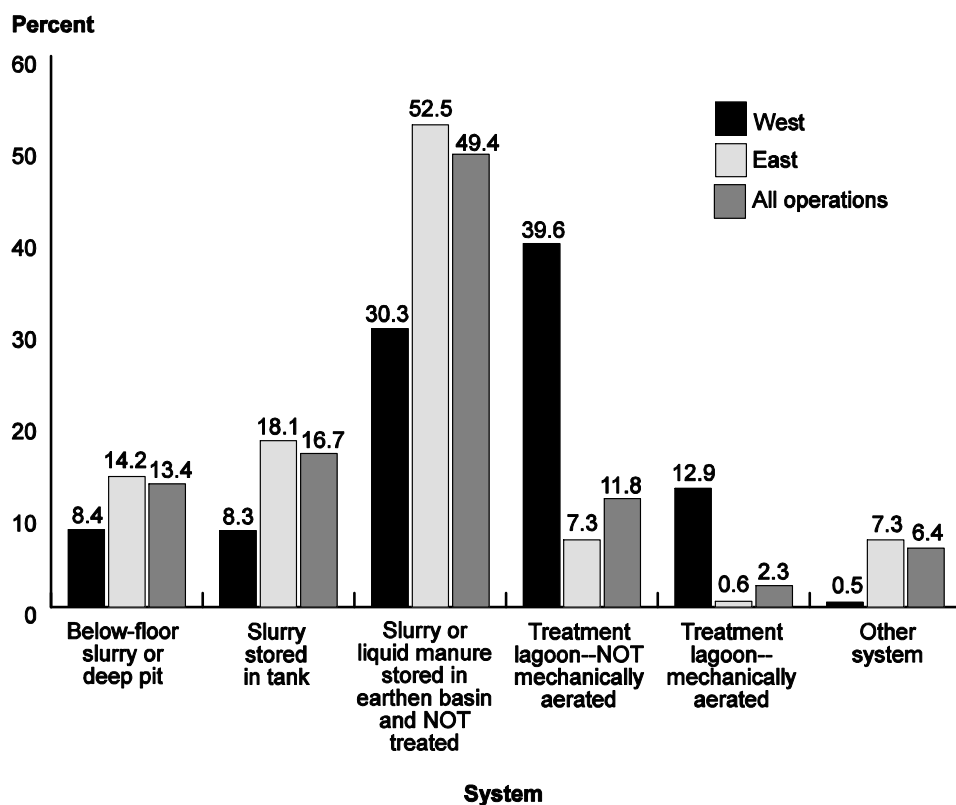
A higher percentage of operations in the West region used treatment lagoons, either not mechanically aerated (39.6 percent of operations) or mechanically aerated (12.9 percent), for the majority of liquid or slurry manure, compared with operations in the East region (7.3 and 0.6 percent, respectively). More than one-half of operations in the East region (52.5 percent) stored the majority of liquid or slurry manure untreated in an earthen basin, compared with 30.3 percent of operations in the West region.

h. For the 58.0 percent of operations that stored and/or treated both solid and liquid manure, percentage of operations by waste storage and treatment system used for the majority of *liquid or slurry* manure, by region:

System	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Below-floor slurry or deep pit	8.4	(3.3)	14.2	(2.9)
Slurry stored in tank (either above or below ground)	8.3	(3.9)	18.1	(3.1)
Slurry or liquid manure stored in earthen basin and NOT treated	30.3	(4.5)	52.5	(4.1)
Treatment lagoon—NOT mechanically aerated	39.6	(5.6)	7.3	(1.7)
Treatment lagoon—mechanically aerated	12.9	(4.1)	0.6	(0.4)
Other system	0.5	(0.5)	7.3	(2.5)
Total	100.0		100.0	



**For the 58.0 Percent of Operations that Stored and/or Treated Both Solid and Liquid Manure, Percentage of Operations by Waste Storage and Treatment System Used for the Majority of Liquid or Slurry Manure, and by Region**



#### 4. Maximum manure storage capacity

Producers were asked the following: “Assuming your facility was completely emptied of manure and was operating at full animal capacity, how many days could you operate and store manure before the manure had to be removed from the storage facility?” Overall, 27.7 percent of operations had fewer than 7 days of manure storage capacity and 59.5 percent had 90 days or more. Manure storage capacity tended to increase as herd size increased. For example, the percentage of operations that had 90 days or more of manure storage capacity ranged from 53.9 percent of small operations to 87.6 percent of large operations.

Percentage of operations by maximum manure storage capacity (in days), and by herd size (table revised 6/11/2009):

Percent Operations								
Herd Size (Number of Cows)								
Capacity (Days)	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Fewer than 7	32.6	(3.7)	21.7	(3.6)	0.2	(0.2)	27.7	(2.7)
7 to 29	8.2	(2.4)	4.1	(1.8)	6.3	(3.4)	7.1	(1.7)
30 to 59	2.4	(0.9)	4.0	(1.5)	2.9	(1.5)	2.9	(0.7)
60 to 89	2.9	(1.2)	2.6	(1.3)	3.0	(2.0)	2.8	(0.9)
90 to 179	10.8	(2.2)	16.7	(3.2)	15.7	(4.5)	12.6	(1.7)
180 to 364	26.4	(3.4)	37.4	(4.3)	32.3	(5.7)	29.5	(2.6)
365 or more	16.7	(3.0)	13.5	(3.0)	39.6	(6.3)	17.4	(2.2)
Total	100.0		100.0		100.0		100.0	



Photo courtesy of Dr. Jason Lombard

## 5. Manure use

Almost all operations applied manure—solid or liquid or both—to land either owned or rented (99.1 percent). A higher percentage of large operations sold manure or received other compensation, gave manure away, or used composted manure as bedding compared with small operations.

a. Percentage of operations by method of manure use, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Method	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Applied manure to land either owned or rented	99.5	(0.5)	99.6	(0.4)	93.8	(3.4)	99.1	(0.4)
Sold manure or received other compensation	4.9	(1.7)	7.2	(2.1)	28.9	(5.8)	7.1	(1.3)
Gave manure away	13.9	(2.7)	20.7	(3.5)	32.3	(5.5)	16.8	(2.0)
Used composted manure as bedding	3.5	(1.9)	1.7	(0.8)	35.7	(5.8)	5.1	(1.4)
Other	0.3	(0.3)	2.3	(1.1)	2.0	(1.8)	0.9	(0.4)

A higher percentage of operations in the West region sold manure or received other compensation (20.6 percent), gave manure away (44.8 percent), or used composted manure as bedding (26.4 percent) compared with operations in the East region.

b. Percentage of operations by method of manure use, by region:

Percent Operations				
Region				
West			East	
Method	Percent	Std. Error	Percent	Std. Error
Applied manure to land either owned or rented	94.5	(2.7)	99.6	(0.4)
Sold manure or received other compensation	20.6	(4.5)	5.7	(1.4)
Gave manure away	44.8	(5.2)	14.0	(2.2)
Used composted manure as bedding	26.4	(4.5)	3.1	(1.4)
Other	4.6	(2.4)	0.5	(0.3)

For operations that used solid or liquid manure, the majority of manure, whether solid or liquid, was applied to land either rented or owned.

c. Percentage of operations by method of use for the majority of manure, by manure type:

Percent Operations				
Manure Type				
Solid			Liquid or Slurry	
Method	Percent	Std. Error	Percent	Std. Error
Applied manure to land either owned or rented	97.4	(0.6)	98.6	(0.5)
Sold manure or received other compensation	0.8	(0.4)	0.3	(0.2)
Gave manure away	0.6	(0.3)	0.6	(0.3)
Used composted manure as bedding	0.7	(0.3)	0.0	(--)
Other	0.5	(0.2)	0.5	(0.3)
Total	100.0		100.0	

## 6. Manure application

More than 9 of 10 operations (91.5 percent) used a broadcast/solid spreader to apply manure to land. Surface application was used by 34.6 percent of small operations, 57.5 percent of medium operations, and 40.3 percent of large operations. More than one-half of large operations (56.5 percent) used irrigation/sprinkler to apply manure, compared with only 1.3 percent of small and 11.6 percent of medium operations.

a. For the 99.1 percent of operations that applied manure to land, percentage of operations by manure application method used, and by herd size:

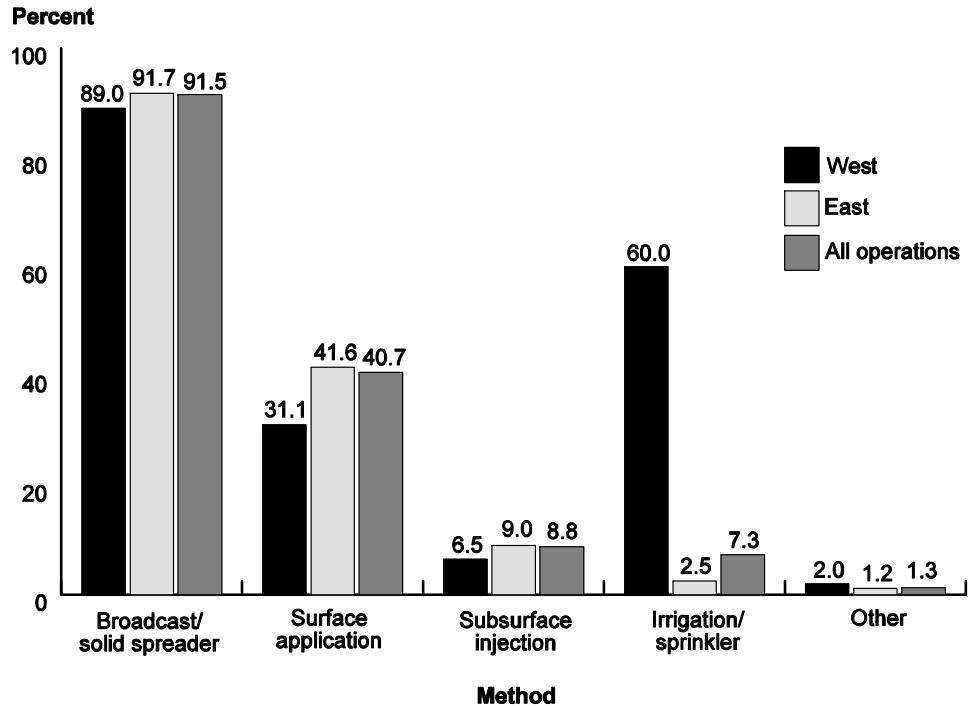
Percent Operations								
Herd Size (Number of Cows)								
Method	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Broadcast/ solid spreader	92.4	(2.2)	90.2	(2.8)	86.8	(4.2)	91.5	(1.7)
Surface application	34.6	(3.7)	57.5	(4.2)	40.3	(5.4)	40.7	(2.8)
Subsurface injection	5.5	(1.7)	16.4	(3.3)	14.3	(3.5)	8.8	(1.5)
Irrigation/ sprinkler	1.3	(0.5)	11.6	(2.1)	56.5	(6.3)	7.3	(0.8)
Other	1.0	(0.9)	1.7	(0.8)	2.4	(1.6)	1.3	(0.7)

A higher percentage of operations in the West region applied manure using irrigation/sprinkler compared with operations in the East region.

b. For the 99.1 percent of operations that applied manure to land, percentage of operations by manure application method used, by region:

Percent Operations				
Region				
Method	West		East	
	Percent	Std. Error	Percent	Std. Error
Broadcast/solid spreader	89.0	(3.6)	91.7	(1.8)
Surface application	31.1	(5.8)	41.6	(3.1)
Subsurface injection	6.5	(2.5)	9.0	(1.6)
Irrigation/sprinkler	60.0	(5.1)	2.5	(0.5)
Other	2.0	(1.4)	1.2	(0.7)

**For the 99.1 Percent of Operations that Applied Manure to Land, Percentage of Operations by Manure Application Method Used, and by Region**



Overall, 22.0 percent of operations that applied manure to land always or almost always incorporated it into the soil within 24 hours of application, with 52.7 percent of large operations using this practice. Manure was sometimes incorporated within 24 hours on 42.0 percent of operations, and 36.0 percent of operations never incorporated manure into the soil.

c. For the 99.1 percent of operations that applied manure to land, percentage of operations by frequency that manure was incorporated into soil within 24 hours after application, including subsurface injection, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Frequency	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Always or almost always	18.5	(2.8)	24.1	(3.8)	52.7	(6.3)	22.0	(2.2)
Sometimes	43.2	(4.0)	41.4	(4.5)	31.3	(5.6)	42.0	(3.0)
Never	38.3	(4.0)	34.5	(4.1)	16.0	(5.0)	36.0	(2.9)
Total	100.0		100.0		100.0		100.0	

A higher percentage of operations in the West region (40.1 percent) always or almost always incorporated manure into the soil within 24 hours of application, compared with operations in the East region (20.3 percent). A higher percentage of operations in the East region (37.5 percent) than in the West region (19.4 percent) never incorporated manure into the soil.

d. For the 99.1 percent of operations that applied manure to land, percentage of operations by frequency that manure was incorporated into soil within 24 hours after application, including subsurface injection, by region:

Percent Operations				
Region				
West		East		
Frequency	Percent	Std. Error	Percent	Std. Error
Always or almost always	40.1	(5.3)	20.3	(2.4)
Sometimes	40.5	(5.2)	42.2	(3.2)
Never	19.4	(4.1)	37.5	(3.2)
Total	100.0		100.0	



Photo Courtesy of "Dairy Herd Management"/ "Bovine Veterinarian"



About one-fourth of operations analyzed manure for nitrogen, phosphorus, or potassium during the previous 12 months. A lower percentage of small operations analyzed manure (less than 18.0 percent) compared with medium or large operations (42.9 and 60.3 percent, respectively).

e. For the 99.1 percent of operations that applied manure to land, percentage of operations that analyzed manure for the following nutrients during the previous 12 months, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Nutrient</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Nitrogen	17.9	(3.0)	42.9	(4.4)	60.3	(6.0)	26.9	(2.4)
Phosphorus	17.3	(2.9)	42.9	(4.4)	60.3	(6.0)	26.4	(2.3)
Potassium	17.3	(2.9)	42.9	(4.4)	60.3	(6.0)	26.4	(2.3)

There were no regional differences in the percentage of operations that analyzed nutrient content of manure.

f. For the 99.1 percent of operations that applied manure to land, percentage of operations that analyzed manure for the following nutrients during the previous 12 months, by region:

<b>Percent Operations</b>				
<b>Region</b>				
<b>Nutrient</b>	<b>West</b>		<b>East</b>	
	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Nitrogen	39.4	(5.0)	25.7	(2.5)
Phosphorus	39.4	(5.0)	25.2	(2.5)
Potassium	39.4	(5.0)	25.2	(2.5)

The criteria operations used most commonly to determine frequency and quantity of manure application were based on soil quality improvement (70.7 percent of operations) and manure volume/acreage available (70.3 percent of operations). About 50 percent of operations used crop requirement for nitrogen or phosphorous to determine application rate and frequency, even though only about one-fourth of operations reported analyzing manure for these nutrients during the previous 12 months (see table 6e. on p 151). The only herd-size difference was that a higher percentage of medium operations (61.6 percent) than small operations (44.3 percent) used the crop phosphorus requirement in determining manure application rates. Criteria used for determining how much or how frequently manure is applied to the land did not differ by region.

g. For the 99.1 percent of operations that applied manure to land, percentage of operations by criteria used to determine how much or how frequently manure is applied to the land, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Criteria</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Crop nitrogen requirement	52.9	(4.1)	65.2	(4.4)	58.6	(6.4)	56.3	(3.0)
Crop phosphorus requirement	44.3	(4.1)	61.6	(4.4)	52.9	(6.2)	49.2	(3.1)
Manure volume/acreage available	69.3	(3.8)	75.1	(3.9)	61.8	(6.5)	70.3	(2.8)
Soil quality improvement	73.1	(3.6)	65.5	(4.4)	65.5	(6.4)	70.7	(2.8)
Other	6.8	(2.1)	5.4	(2.3)	2.7	(1.3)	6.2	(1.5)

Manure was applied to land fewer than 100 feet from surface water on 24.4 percent of operations and 1,000 feet or more on 30.8 percent of operations. A higher percentage of operations in the West region applied manure 1,000 feet or more from surface water (52.1 percent) compared with 28.8 percent of operations in the East region. Alternatively, a higher percentage of operations in the East region applied manure 200 to 499 feet from surface water (21.8 percent) compared with the West region (4.5 percent).

h. For the 99.1 percent of operations that applied manure to land, percentage of operations by minimum distance (in feet) between location of manure application and surface water, such as a lake, pond, stream, or river, and by region:

Percent Operations						
Region						
West			East		All Operations	
Distance (Feet)	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Fewer than 100	23.4	(4.7)	24.5	(2.7)	24.4	(2.5)
100 to 199	14.6	(3.8)	16.9	(2.3)	16.7	(2.2)
200 to 499	4.5	(2.3)	21.8	(2.7)	20.3	(2.5)
500 to 999	5.4	(2.4)	8.0	(1.8)	7.8	(1.7)
1,000 or more	52.1	(5.3)	28.8	(3.1)	30.8	(2.9)
Total	100.0		100.0		100.0	

More than 9 of 10 operations (94.2 percent) spread solid manure on land, whereas about two-thirds of operations (66.3 percent) applied liquid manure. The percentage of operations that applied liquid manure increased as herd size increased, from 56.9 percent of small operations to 94.6 percent of large operations.

i. Percentage of all operations that applied solid or liquid manure to land, and by herd size:

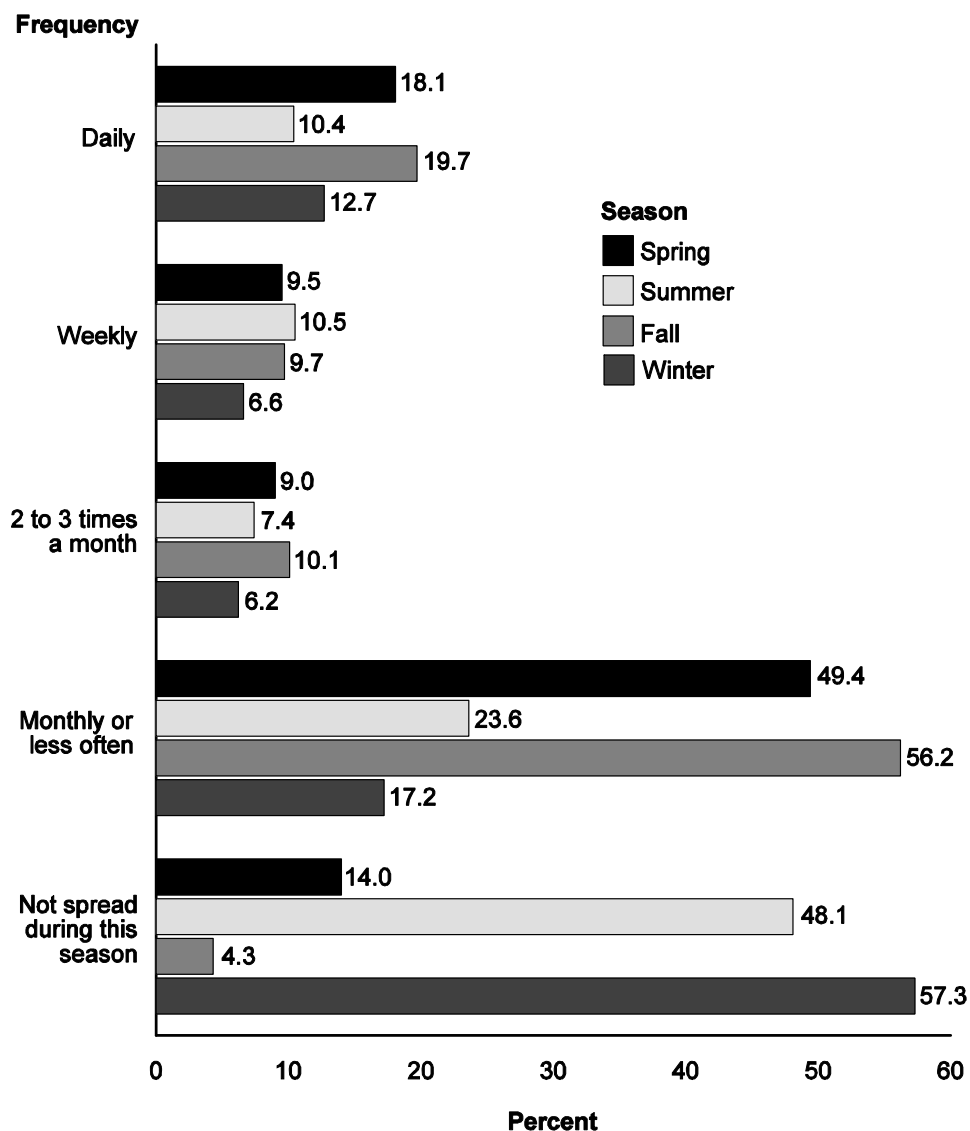
Percent Operations								
Herd Size (Number of Cows)								
Manure Type	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Solid	93.9	(2.2)	96.1	(1.8)	89.5	(4.0)	94.2	(1.6)
Liquid	56.9	(4.0)	84.8	(3.4)	94.6	(3.0)	66.3	(2.9)

Operations spread liquid or slurry manure more often during spring or fall than summer or winter. About 50 percent of operations did not apply liquid manure during the summer (48.1 percent) or winter (57.3 percent).

j. For the 66.3 percent of operations that applied **liquid** manure to land, percentage of operations by frequency that liquid manure was applied to owned or rented land, by season:

Percent Operations								
Season								
Frequency	Spring		Summer		Fall		Winter	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Daily	18.1	(2.7)	10.4	(2.1)	19.7	(2.8)	12.7	(2.4)
Weekly	9.5	(2.0)	10.5	(2.2)	9.7	(2.0)	6.6	(1.8)
2 to 3 times a month	9.0	(1.6)	7.4	(1.3)	10.1	(1.7)	6.2	(1.4)
Monthly or less often	49.4	(3.4)	23.6	(2.4)	56.2	(3.4)	17.2	(2.2)
Not spread during this season	14.0	(2.7)	48.1	(3.4)	4.3	(1.0)	57.3	(3.3)
Total	100.0		100.0		100.0		100.0	

**For the 66.3 Percent of Operations that Applied Liquid Manure to Land, Percentage of Operations by Frequency that Liquid Manure was Applied to Owned or Rented Land, by Season**

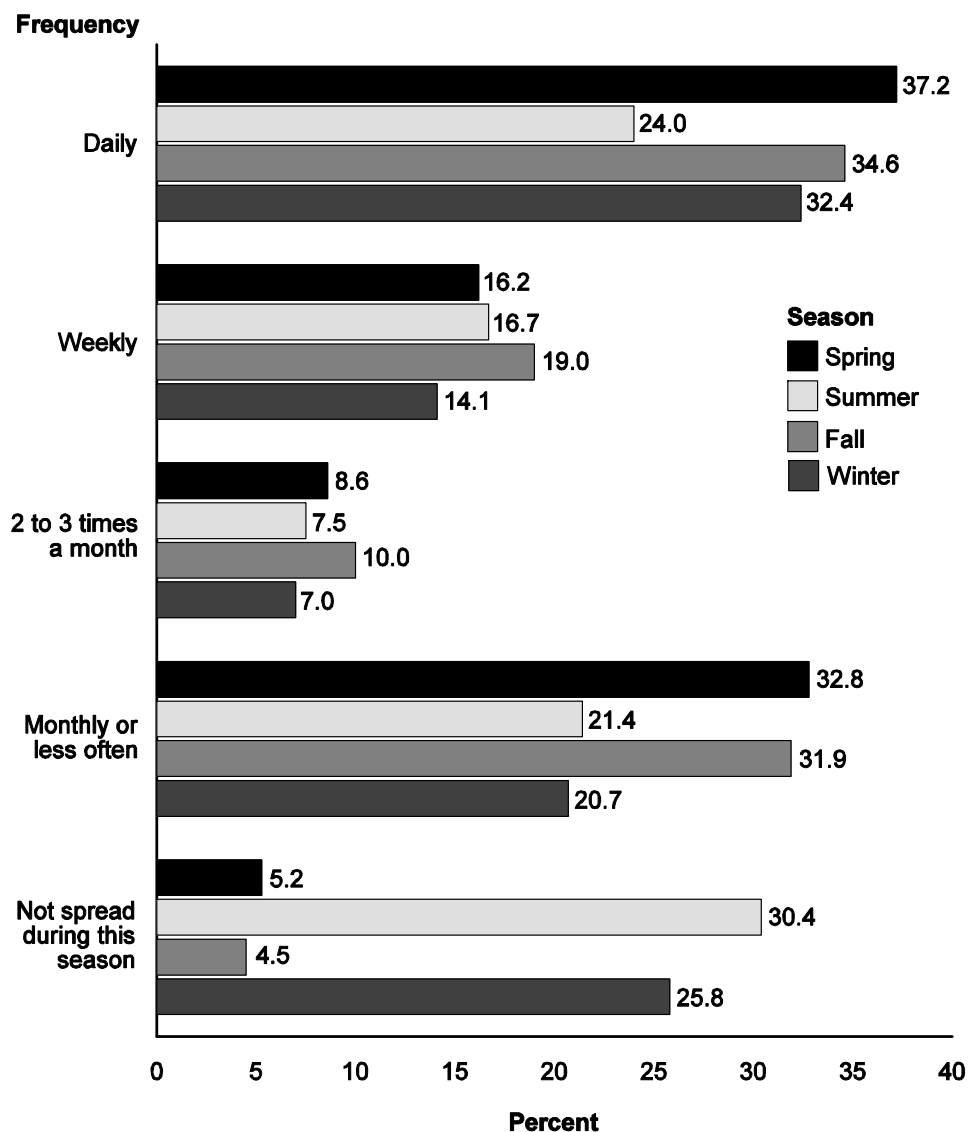


Operations also spread solid manure more commonly in spring or fall than summer or winter. During spring, 37.2 percent of operations spread solid manure on a daily basis. About 30 percent of operations did not spread solid manure in summer (30.4 percent) or winter (25.8 percent).

k. For the 94.2 percent of operations that applied **solid** manure to land, percentage of operations by frequency that solid manure was applied to owned or rented land, by season:

Percent Operations								
Frequency	Season							
	Spring		Summer		Fall		Winter	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Daily	37.2	(3.0)	24.0	(2.7)	34.6	(3.0)	32.4	(2.9)
Weekly	16.2	(2.3)	16.7	(2.5)	19.0	(2.5)	14.1	(2.2)
2 to 3 times a month	8.6	(1.6)	7.5	(1.5)	10.0	(1.7)	7.0	(1.5)
Monthly or less often	32.8	(2.7)	21.4	(2.2)	31.9	(2.6)	20.7	(2.1)
Not spread during this season	5.2	(1.1)	30.4	(2.8)	4.5	(1.1)	25.8	(2.4)
Total	100.0		100.0		100.0		100.0	

**For the 94.2 Percent of Operations that Applied Solid Manure to Land, Percentage of Operations by Frequency that Solid Manure was Applied to Owned or Rented Land, by Season**



The practice of spreading manure on growing crops and then feeding those crops to livestock can spread disease from pathogens in the manure. Pathogens on dairy operations that potentially could be spread through grazing on manure-fertilized forages include *E. coli* O157:H7, *Salmonella* spp., and *Mycobacterium avium* subspecies *paratuberculosis* (MAP). Of these pathogens, MAP appears to be the most persistent, surviving for 6 months on pasture. Some methods and additives for ensiling forages appear to decrease the survival of MAP. The general recommendation is to avoid spreading manure on growing plants that will be grazed by cattle. In the case of MAP, to which young cattle appear to be more susceptible, grazing on fertilized pasture by cattle less than 1 year old is not recommended.

About one-half of operations (52.2 percent) applied manure to pasture or hay crops during the growing season. Almost two-thirds of all operations applied manure to any actively growing crops. Manure was applied to forage to be ensiled or any crops on 57.0 and 85.1 percent, respectively, of large operations.

I. Percentage of all operations that applied manure to actively growing plants by crop type, and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Crop	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Pasture or hay	52.6	(4.0)	52.4	(4.4)	46.1	(6.1)	52.2	(2.9)
Forage to be ensiled	23.9	(3.3)	31.7	(3.9)	57.0	(6.3)	28.0	(2.5)
Other forage	10.9	(2.5)	16.9	(3.3)	26.1	(5.8)	13.4	(1.9)
Grain or oilseed	9.6	(2.2)	11.2	(2.5)	19.2	(5.0)	10.7	(1.7)
Other	5.3	(2.0)	0.1	(0.1)	3.1	(2.2)	3.9	(1.4)
Any	63.7	(3.9)	60.8	(4.4)	85.1	(4.2)	64.4	(2.9)



A higher percentage of operations in the West region applied manure to forage to be ensiled (47.9 percent), other forage crops (27.7 percent), or any crops (79.4 percent) compared with operations in the East region (26.1, 12.0, and 62.9 percent, respectively).

m. Percentage of all operations that applied manure to actively growing plants by crop type, by region:

Percent Operations				
Region				
West			East	
Crop	Percent	Std. Error	Percent	Std. Error
Pasture or hay	49.7	(5.0)	52.4	(3.2)
Forage to be ensiled	47.9	(5.3)	26.1	(2.7)
Other forage	27.7	(5.2)	12.0	(2.0)
Grain or oilseed	15.7	(4.1)	10.2	(1.8)
Other	2.1	(1.7)	4.0	(1.5)
Any	79.4	(4.1)	62.9	(3.1)

## 7. Written nutrient management plan

About one-third of small operations (35.1 percent) had a written plan addressing nutrient management compared with 62.1 percent of medium and 62.7 percent of large operations.

a. Percentage of operations that had a written nutrient management plan addressing topics such as land treatment practices or manure storage structures, and by herd size:

Percent Operations							
Herd Size (Number of Cows)							
Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
35.1	(3.8)	62.1	(4.4)	62.7	(5.9)	43.6	(2.9)

A higher percentage of operations in the West region (67.7 percent) had a written nutrient management plan than in the East region (41.3 percent).

b. Percentage of operations that had a written nutrient management plan addressing topics such as land treatment practices or manure storage structures, by region:

Percent Operations			
Region			
West		East	
Percent	Standard Error	Percent	Standard Error
67.7	(4.9)	41.3	(3.1)

Of the operations that had a written nutrient management plan, 9 of 10 operations (89.2 percent) developed the plan in cooperation with the USDA Natural Resource Conservation Service (NRCS) or a local conservation district. Compared with medium and large operations, a higher percentage of small operations (78.0 percent) developed a plan as part of a USDA voluntary cost-share program. A higher percentage of large operations developed a plan to help satisfy a State or local regulatory requirement (86.9 percent) compared with small operations (53.7 percent).

c. For the 43.6 percent of operations that had a written nutrient management plan, percentage of operations that developed or implemented the plan in cooperation with Federal, State, or local agencies or requirements, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Plan Was...</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Developed in cooperation with the USDA Natural Resource Conservation Service (NRCS) or a local conservation district	92.2	(3.2)	88.0	(3.4)	75.9	(6.2)	89.2	(2.2)
Implemented to help satisfy a State or local regulatory requirement	53.7	(6.6)	71.0	(5.0)	86.9	(6.7)	62.9	(4.2)
Part of USDA voluntary cost-share program	78.0	(4.7)	51.2	(5.3)	34.5	(6.6)	64.5	(3.6)

A higher percentage of operations in the West region (88.4 percent) than in the East region (58.9 percent) implemented a written nutrient management plan to help satisfy a State or local regulatory requirement. A higher percentage of operations in the East region developed a plan in cooperation with the USDA NRCS or a local conservation district (92.0 percent) or as part of a USDA voluntary cost-share program (71.3 percent) compared with operations in the West region (71.4 and 20.9 percent, respectively).

d. For the 43.6 percent of operations that had a written nutrient management plan, percentage of operations that developed or implemented the plan in cooperation with Federal, State, or local agencies or requirements, by region:

Plan Was...	Percent Operations			
	Region			
	West		East	
	Percent	Std. Error	Percent	Std. Error
Developed in cooperation with the USDA Natural Resource Conservation Service (NRCS) or a local conservation district	71.4	(7.0)	92.0	(2.3)
Implemented to help satisfy a State or local regulatory requirement	88.4	(5.2)	58.9	(4.7)
Part of USDA voluntary cost-share program	20.9	(4.8)	71.3	(3.9)

### 8. Waste-management consultant

More than 20 percent of operations consulted with an agronomist/crop consultant (45.2 percent), NRCS personnel (32.8 percent), or a private nutrient management consultant (23.8 percent) about waste management on their operations during the previous 12 months. Almost two-thirds (63.9 percent) of operations contacted a waste management consultant during the previous 12 months. Compared with small operations, a higher percentage of large operations consulted with a private nutrient management consultant, State or local department of natural resources or department of agriculture, consulting nutritionist, or environmental engineering consultant. Any consultant was used on a higher percentage of medium operations (82.3 percent) than small operations (56.2 percent).

a. Percentage of operations that consulted with the following people about waste management for their operations during the previous 12 months, and by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Consultant</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
University/extension personnel	15.0	(2.8)	24.2	(4.0)	29.4	(5.4)	18.2	(2.2)
Private nutrient management consultant	18.7	(3.0)	31.2	(4.1)	49.3	(6.1)	23.8	(2.4)
Natural Resource Conservation Service (NRCS) personnel	27.6	(3.4)	45.2	(4.2)	41.2	(5.9)	32.8	(2.6)
State or local department of natural resources personnel	4.1	(1.4)	14.4	(2.6)	31.2	(5.5)	8.4	(1.2)
State or local department of agriculture personnel	9.1	(2.1)	18.9	(3.4)	30.4	(5.2)	12.9	(1.7)
Agronomist/crop consultant	40.5	(3.9)	56.7	(4.4)	50.7	(5.8)	45.2	(2.9)
Consulting nutritionist	12.3	(2.5)	19.8	(3.6)	35.6	(6.0)	15.7	(2.0)
Environmental engineering consultant	3.4	(1.4)	10.6	(2.9)	30.7	(5.2)	7.0	(1.3)
Private veterinary practitioner	2.2	(0.9)	5.7	(1.8)	9.4	(3.8)	3.5	(0.8)
Other	1.2	(1.0)	1.2	(0.6)	0.3	(0.2)	1.2	(0.7)
Any	56.2	(3.9)	82.3	(3.5)	74.6	(5.6)	63.9	(2.8)

A higher percentage of operations in the West region consulted with State or local departments of natural resources (19.8 percent) or agriculture personnel (32.3 percent) compared with operations in the East region (7.3 and 11.0 percent, respectively). A higher percentage of operations in the East region consulted with an agronomist/crop consultant (46.7 percent) compared with the West region (28.8 percent).

b. Percentage of operations that consulted with the following people about waste management for their operations during the previous 12 months, by region:

	Percent Operations			
	Region			
	West		East	
Consultant	Percent	Std. Error	Percent	Std. Error
University/extension personnel	16.0	(3.6)	18.4	(2.4)
Private nutrient management consultant	29.8	(4.9)	23.2	(2.5)
Natural Resource Conservation Service (NRCS) personnel	38.0	(5.1)	32.3	(2.8)
State or local department of natural resources personnel	19.8	(4.1)	7.3	(1.3)
State or local department of agriculture personnel	32.3	(5.3)	11.0	(1.8)
Agronomist/crop consultant	28.8	(4.8)	46.7	(3.1)
Consulting nutritionist	19.0	(4.5)	15.3	(2.1)
Environmental engineering consultant	14.2	(3.4)	6.3	(1.3)
Private veterinary practitioner	3.9	(2.2)	3.5	(0.8)
Other	1.0	(1.0)	1.2	(0.7)
Any	67.1	(6.0)	63.6	(3.1)

### 9. Knowledge of concentrated animal feeding operation classification

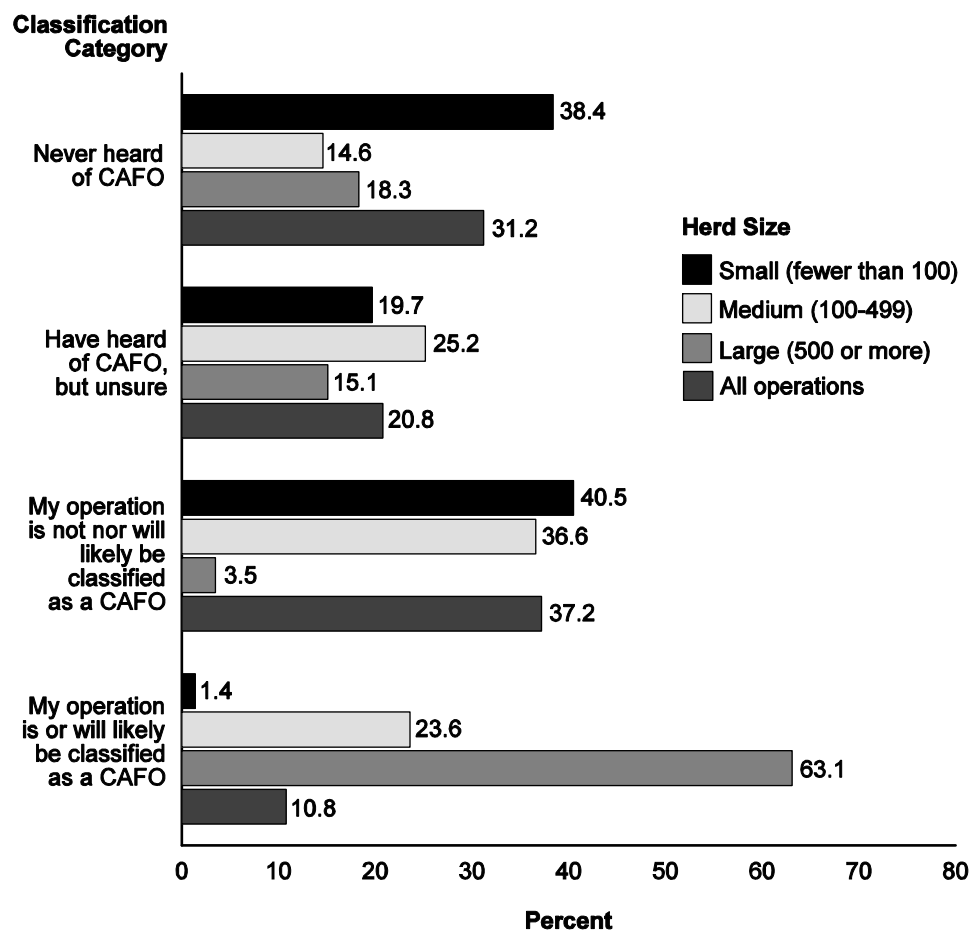
The Environmental Protection Agency (EPA) has guidelines to determine whether an operation should be classified as a concentrated animal feeding operation (CAFO). An operation with 200 to 699 mature cows can be designated a CAFO by the permitting authority or by regulatory definition if the operation meets one of the medium category discharge criteria. Large CAFOs have at least 700 mature cows, with no other criteria. Additionally, an operation that is not classified as a CAFO by size can be designated a CAFO by the permitting authority if the operation is a significant contributor of pollutants to surface water.

Producers were asked how their operation is or would be classified under current Federal EPA guidelines regarding CAFOs. A higher percentage of small and medium operations were not nor would likely be classified as CAFOs (40.5 and 36.6 percent, respectively) compared with large operations (3.5 percent). Almost two-thirds of large operations (63.1 percent) were or would likely be classified as CAFOs, compared with 23.6 percent of medium operations and 1.4 percent of small operations. Overall, 37.2 percent of operations were not considered to be CAFOs and 10.8 percent were considered to be CAFOs.

a. Percentage of operations by actual or perceived classification under current Federal EPA guidelines regarding concentrated animal feeding operations (CAFOs), and by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Classification Category	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Never heard of CAFO	38.4	(3.9)	14.6	(3.3)	18.3	(5.1)	31.2	(2.8)
Have heard of CAFO, but unsure	19.7	(3.5)	25.2	(4.1)	15.1	(4.9)	20.8	(2.7)
My operation is not nor will likely be classified as a CAFO	40.5	(3.7)	36.6	(4.2)	3.5	(1.4)	37.2	(2.8)
My operation is or will likely be classified as a CAFO	1.4	(0.8)	23.6	(3.7)	63.1	(6.3)	10.8	(1.3)
Total	100.0		100.0		100.0		100.0	

**Percentage of Operations by Actual or Perceived Classification Under Current Federal EPA Guidelines Regarding Concentrated Animal Feeding Operations (CAFOs), and by Herd Size**





A higher percentage of operations in the West region were or were likely to be classified as CAFOs than in the East region (35.2 and 8.5 percent, respectively).

b. Percentage of operations by actual or perceived classification under current Federal EPA guidelines regarding concentrated animal feeding operations (CAFOs), by region:

	Percent Operations			
	Region			
	West		East	
Classification Category	Percent	Std. Error	Percent	Std. Error
Never heard of CAFO	21.8	(4.7)	32.1	(3.1)
Have heard of CAFO, but unsure	14.5	(4.0)	21.3	(2.9)
My operation is not nor will likely be classified as a CAFO	28.5	(4.4)	38.1	(3.0)
My operation is or will likely be classified as a CAFO	35.2	(4.8)	8.5	(1.3)
Total	100.0		100.0	

## Section II: Methodology

### A. Needs Assessment

NAHMS develops study objectives by exploring existing literature and contacting industry members and other stakeholders about their informational needs and priorities during a needs-assessment phase. The objective of the needs assessment for the NAHMS Dairy 2007 study was to conduct a national survey to collect information from U.S. dairy producers and other dairy specialists about what they perceived to be the most important dairy health and productivity issues. A driving force of the needs assessment was the desire of NAHMS researchers to receive as much input as possible from a variety of producers, industry experts and representatives, veterinarians, extension specialists, universities, and dairy organizations. Information was collected via focus groups and through a Needs-Assessment Survey.

Focus group teleconferences and meetings were held to help determine the focus of the study.

Teleconference, March 30, 2006  
National Johne's Working Group

Meeting, Louisville, KY, April 2, 2006  
National Johne's Working Group  
National Institute for Animal Agriculture

Meeting, Louisville, KY, April 3, 2006  
National Milk Producers Federation Animal Health Committee

Teleconference, December 15, 2006  
Bovine Alliance on Management and Nutrition

In addition, a Needs-Assessment Survey was designed to ascertain the top three management issues, diseases/disorders, and producer incentives from producers, veterinarians, extension personnel, university researchers, and allied industry groups. The survey, created in SurveyMonkey, was available online from early February through late April 2006. The survey was promoted via electronic newsletters, magazines, and Web sites. Organizations/magazines promoting the study included Vance Publishing's "Dairy Herd Management–Dairy Alert," "Dairy Today," "Hoard's Dairyman," NMC, "Journal of the American Veterinary Medical Association," and the American Association of Bovine Practitioners. E-mail messages requesting input were also sent to cooperative members of the National Milk Producers Federation as well as State and Federal personnel. A total of 313 people completed the questionnaire.

Respondents to the needs assessment represented the following affiliations:

- University/extension personnel—23 percent of respondents,
- Producers—22 percent,
- Veterinarians/consultants—20 percent,
- Federal or State government personnel—15 percent,
- Nutritionists—8 percent,
- Allied industry personnel—8 percent, and
- Other—4 percent.

CEAH Focus Group meeting  
Fort Collins, CO, May 18, 2006

Draft objectives for the Dairy 2007 study, based on input from teleconferences, face-to-face meetings, and the online survey, were developed prior to the focus group meeting. Attendees included producers, university/extension personnel, veterinarians, and government personnel. The day-long meeting culminated in the formulation of eight objectives for the study:

- Describe trends in dairy cattle health and management practices,
- Evaluate management factors related to cow comfort and removal rates,
- Describe dairy calf health and nutrition from birth to weaning and evaluate heifer disease-prevention practices,
- Estimate the prevalence of herds infected with bovine viral diarrhea virus (BVDV),
- Describe current milking procedures and estimate the prevalence of contagious mastitis pathogens,
- Estimate the herd-level prevalence and associated costs of *Mycobacterium avium* subspecies *paratuberculosis* (Johne's disease),
- Describe current biosecurity practices and determine producer motivation for implementing or not implementing biosecurity practices, and
- Determine the prevalence of specific food-safety pathogens and describe antimicrobial resistance patterns.

## **B. Sampling and Estimation**

### **1. State selection**

The preliminary selection of States to be included in the study was done in February 2006, using the National Agricultural Statistics Service (NASS) January 27, 2006, "Cattle Report." A goal for NAHMS national studies is to include States that account for at least 70 percent of the animals and producer population in the United States. The initial review of States identified 16 major States representing 82.0 percent of the milk cow inventory and 79.3 percent of the operations with milk cows (dairy herds). The States were California, Idaho, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New Mexico, New York, Ohio, Pennsylvania, Texas, Vermont, Washington, and Wisconsin.

A memo identifying these 16 States was provided in March 2006 to the USDA:APHIS:VS:CEAH Director and, in turn, the VS Regional Directors. Each Regional Director sought input from the respective States about being included in or excluded from the study. Virginia expressed interest in participating and was included, bringing the total number of States to 17.

### **2. Operation selection**

The list sampling frame was provided by NASS. Within each State a stratified random sample was selected. The size indicator was the number of milk cows for each operation. NASS selected a sample of dairy producers in each State for making the January 1 cattle estimates. The list sample from the January 2006 survey was used as the screening sample. Among those producers reporting 1 or more milk cows on January 1, 2006, a total of 3,554 operations were selected in the sample for contact in January 2007 during Phase I. Operations with 30 or more dairy cows that had participated in Phase I were invited to participate in data collection for Phase II. A total of 1,077 operations agreed to be contacted by Veterinary Medical Officers (VMOs) to determine whether to complete Phase II.

### **3. Population inferences**

#### **a. Phase I: General Dairy Management Report**

Inferences cover the population of dairy producers with at least 1 milk cow in the 17 participating States. As of January 1, 2007, these States accounted for 82.0 percent (7,432,000 head) of milk cows and 79.3 percent (62,110) of operations with milk cows in the United States. (See Appendix II for respective data on individual States.) All respondent data were statistically weighted to reflect the population from which they were selected. The inverse of the probability of selection for each operation was the initial selection weight. This selection weight was adjusted for nonresponse within each State and size group to allow for inferences back to the original population from which the sample was selected.

### **b. Phase II: VS Initial and Second Visits**

For operations eligible for Phase II data collection (those with 30 or more dairy cows), weights were adjusted to account for operations that did not want to continue to Phase II. In addition, weights were adjusted for nonresponse to the questionnaire in each visit. The 17-State target population of operations with 30 or more dairy cows represented 82.5 percent of dairy cows and 84.7 percent of dairy operations (Appendix II).

## **C. Data Collection**

### **1. Phase I: General Dairy Management Report**

From January 1 to 31, 2007, NASS enumerators administered the General Dairy Management Report questionnaire. The interview took slightly more than 1 hour.

### **2. Phase II: VS Initial Visit**

From February 26 to April 30, 2007, Federal and State Veterinary Medical Officers (VMOs) and/or Animal Health Technicians (AHTs) collected data from producers during an interview that lasted approximately 2 hours.

### **3. Phase II: VS Second Visit**

From May 1 to August 31, 2007, Federal and State VMOs and/or AHTs collected data from producers during an interview that lasted approximately 2 hours.

## **D. Data Analysis**

### **1. Validation and estimation**

#### **a. Phase I: Validation—General Dairy Management Report**

Initial data entry and validation for the General Dairy Management Report were performed in individual NASS State offices. Data were entered into a SAS data set. NAHMS national staff performed additional data validation on the entire data set after data from all States were combined.

#### **b. Phase II: Validation—VS Initial and Second Visit Questionnaires**

After completing the VS Initial and Second Visit questionnaires, data collectors sent them to their respective State NAHMS Coordinators, who reviewed the questionnaire responses for accuracy and sent them to NAHMS. Data entry and validation were completed by NAHMS staff using SAS.

## E. Sample Evaluation

The purpose of this section is to provide various performance measurement parameters. Historically, the term “response rate” has been used as a catchall parameter, but there are many ways to define and calculate response rates. Therefore, the table below presents an evaluation based upon a number of measurement parameters, which are defined with an “x” in categories that contribute to the measurement.

### 1. Phase I: General Dairy Management Report (GDMR)

A total of 3,554 operations were selected for the survey. Of these operations, 3,304 (93.0 percent) were contacted. There were 2,519 operations that provided usable inventory information (70.9 percent of the total selected and 76.2 percent of those contacted). In addition, there were 2,194 operations (61.7 percent) that provided “complete” information for the questionnaire. Of operations that provided complete information and were eligible to participate in Phase II of the study (2,067 operations), 1,077 (52.1 percent) consented to be contacted for consideration/discussion about further participation.

			Measurement Parameter		
Response Category	Number Operations	Percent Operations	Contacts	Usable <sup>1</sup>	Complete <sup>2</sup>
Survey complete and VMO consent	1,077	30.3	x	x	x
Survey complete, refused VMO consent	990	27.9	x	x	x
Survey complete, ineligible <sup>3</sup> for VMO	127	3.6	x	x	x
No dairy cows on January 1, 2007	214	6.0	x	x	
Out of business	111	3.1	x	x	
Out of scope	6	0.2			
Refusal of GDMR	785	22.1	x		
Office hold (NASS elected not to contact)	126	3.5			
Inaccessible	118	3.3			
Total	3,554	100.0	3,304	2,519	2,194
Percent of total operations			93.0	70.9	61.7
Percent of total operations weighted <sup>4</sup>			94.0	74.1	59.6

<sup>1</sup>Usable operation—respondent provided answers to inventory questions for the operation (either zero or positive number on hand).

<sup>2</sup>Survey complete operation—respondent provided answers to all or nearly all questions.

<sup>3</sup>Ineligible—fewer than 30 head of milk cows on January 1, 2007.

<sup>4</sup>Weighted response—the rate was calculated using the initial selection weights.

## 2. Phase II: VS Initial Visit

There were 1,077 operations that agreed to be contacted by a VMO during Phase I. Of these 1,077 operations, 582 (54.0 percent) agreed to continue in Phase II of the study and completed the VS Initial Visit questionnaire; 380 (35.3 percent) refused to participate. Approximately 10 percent of the 1,077 operations were not contacted, and 0.4 percent were ineligible because they had no dairy cows at the time they were contacted.

			Measurement Parameter		
Response Category	Number Operations	Percent Operations	Contacts	Usable <sup>1</sup>	Complete <sup>2</sup>
Survey complete	582	54.0	x	x	x
Survey refused	380	35.3	x		
Not contacted	111	10.3			
Ineligible <sup>3</sup>	4	0.4	x	x	
Total	1,077	100.0	966	586	582
Percent of total operations			89.7	54.4	54.0
Percent of total operations weighted <sup>4</sup>			87.5	50.8	50.4

<sup>1</sup>Usable operation—respondent provided answers to inventory questions for the operation (either zero or positive number on hand).

<sup>2</sup>Survey complete operation—respondent provided answers to all or nearly all questions.

<sup>3</sup>Ineligible—no dairy cows at time of interview, which occurred from February 26 through April 30, 2007

<sup>4</sup>Weighted response—the rate was calculated using the turnover weights.

### 3. Phase II: VS Second Visit

Of the 582 operations that completed the VS Initial Visit Questionnaire, 519 (including one operation that did not complete the VS Initial Visit on time) completed the VS Second Visit questionnaire; 47 (8.1 percent) refused to participate. Approximately 3 percent of the 583 operations were not contacted, and 0.3 percent were ineligible because they had no dairy cows at the time of the VS Second Visit.

			Measurement Parameter		
Response Category	Number Operations	Percent Operations	Contacts	Usable <sup>1</sup>	Complete <sup>2</sup>
Survey complete	519	89.0	x	x	x
Survey refused	47	8.1	x		
Not contacted	15	2.6			
Ineligible <sup>3</sup>	2	0.3	x	x	
Total	583	100.0	568	521	519
Percent of total operations			97.4	89.4	89.0
Percent of total operations weighted <sup>4</sup>			98.1	90.6	90.3

<sup>1</sup>Usable operation—respondent provided answers to inventory questions for the operation (either zero or positive number on hand).

<sup>2</sup>Survey complete operation—respondent provided answers to all or nearly all questions.

<sup>3</sup>Ineligible—no dairy cows at time of interview, which occurred from May 1 through August 31, 2007.

<sup>4</sup>Weighted response—the rate was calculated using the turnover weights.



## Appendix I: Sample Profile

### A. Responding Operations

#### 1. Number of responding operations, by herd size

Number of Responding Operations			
Herd Size (Number of Cows)	Phase I: General Dairy Management Report	Phase II: VS Initial Visit	Phase II: VS Second Visit
Fewer than 100	1,028	233	211
100 to 499	691	215	188
500 or more	475	134	120
Total	2,194	582	519

#### 2. Number of responding operations, by region

Number of Responding Operations			
Region	Phase I: General Dairy Management Report	Phase II: VS Initial Visit	Phase II: VS Second Visit
West	426	108	93
East	1,768	474	426
Total	2,194	582	519

## Appendix II: U.S. Milk Cow Population and Operations

Region	State	Number of Milk Cows, January 1, 2007* (Thousand Head)		Number of Operations 2006*		Average Herd Size	
		Milk cows on operations with 1 or more head	Milk cows on operations with 30 or more head	Operations with 1 or more head	Operations with 30 or more head	Operations with 1 or more head	Operations with 30 or more head
West	California	1,790	1,788.2	2,200	1,920	813.6	931.4
	Idaho	502	501.0	800	620	627.5	808.1
	New Mexico	360	358.9	450	180	800.0	1,993.9
	Texas	347	344.2	1,300	660	266.9	521.5
	Washington	235	234.3	790	540	297.5	433.9
	Total	3,234	3,226.6	5,540	3,920	583.8	823.1
East	Indiana	166	154.4	2,100	1,150	79.0	134.3
	Iowa	210	203.7	2,400	1,870	87.5	108.9
	Kentucky	93	86.5	2,000	1,180	46.5	73.3
	Michigan	327	320.5	2,700	1,910	121.1	167.8
	Minnesota	455	441.3	5,400	4,800	84.3	91.9
	Missouri	114	108.3	2,600	1,400	43.8	77.4
	New York	628	612.3	6,400	5,100	98.1	120.1
	Ohio	274	252.1	4,300	2,400	63.7	105.0
	Pennsylvania	550	536.3	8,700	7,000	63.2	76.6
	Vermont	140	137.2	1,300	1,100	107.7	124.7
	Virginia	100	97.0	1,300	820	76.9	118.3
	Wisconsin	1,245	1,213.9	14,900	12,800	83.6	94.8
	Total	4,302	4,163.5	54,100	41,530	79.5	100.3
Total (17 States)		7,536	7,390.1	59,640	45,450	126.4	162.6
Percent of U.S.		82.5	82.5	79.5	84.7		
Total U.S. (50 States)		9,132.0	8,958.5	74,980	53,680	121.8	166.9

\*Source: NASS Cattle report, February 1, 2008, and NASS Farms, Land in Farms, and Livestock Operations 2007 Summary report, February 1, 2008. An operation is any place having one or more head of milk cows, excluding cows used to nurse calves, on hand at any time during the year.

## Appendix III: Study Objectives and Related Outputs

1. Describe trends in dairy cattle health and management practices
  - Part II: Changes in the U.S. Dairy Cattle Industry 1991-2007, March 2008
  - Part V: Changes in Dairy Cattle Health and Management in the United States, 1991-2007, expected spring 2009
2. Evaluate management factors related to cow comfort and removal rates
  - Dairy Facilities and Cow Comfort on U.S. Dairy Operations, 2007, Interpretive Report, expected spring 2009
3. Describe dairy calf health and nutrition from birth to weaning and evaluate heifer disease prevention practices
  - Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, October 2007
  - Off-Site Heifer Raising on U.S. Dairy Operations, 2007, info sheet, November 2007
  - Colostrum Feeding and Management on U.S. dairy Operations, 1991-2007, info sheet, March 2008
  - **Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, January 2009**
  - Calf Health and Management Practices on U.S. Dairy Operations, 2007, Interpretive Report, expected spring 2009
  - Calving Management on U.S. Dairy Operations, 2007, info sheet, February 2009
4. Estimate the prevalence of herds infected with bovine viral diarrhea virus (BVD)
  - Bovine Viral Diarrhea (BVD) Detection in Bulk Tank Milk and BVD Management Practices in the United States, 1996-2007, info sheet, October 2008
5. Describe current milking procedures and estimate the prevalence of contagious mastitis pathogens
  - Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, September 2008
  - Milking Procedures on U.S. Dairy Operations, 2007, info sheet, September 2008
6. Estimate the herd-level prevalence and associated costs of *Mycobacterium avium* subspecies *paratuberculosis*
  - Johne's Disease on U.S. Dairies, 1991-2007 info sheet, April 2008

7. Describe current biosecurity practices and determine producer motivation for implementing or not implementing biosecurity practices

- Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, October 2007
- Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, September 2008
- Biosecurity Practices on U.S. Dairy operations, 2002-07, Interpretive Report, expected spring 2009

8. Determine the prevalence of specific food-safety pathogens and describe antimicrobial resistance patterns

- Antibiotic Use on U.S. Dairy Operations, 2002-07, info sheet, September 2008
- *Listeria* and *Salmonella* in Bulk Tank Milk on U.S. Dairy Operations, 2002-07, info sheet, expected spring 2009
- *Salmonella* and *Campylobacter* on U.S. Dairy Operations, 2002-07, info sheet, expected spring 2009
- Food Safety Pathogens Isolated from U.S. Dairy Operations, 2007, Interpretive Report, expected spring 2009

Additional informational sheets

- Dairy Cattle Identification Practices in the United States, 2007, info sheet, November 2007
- Reproduction Practices on U.S. Dairy Operations, 2007, info sheet, February 2009
- Bovine Leukosis Virus (BLV) on U.S. Dairy Operations, 2007, info sheet, September 2008
- Dairy Cattle Injection Practices in the United States, 2007, info sheet, February 2009
- Methicillin-Resistant *Staphylococcus aureus* (MRSA) Isolation from Bulk Tank Milk in the United States, 2007, info sheet, expected spring 2009





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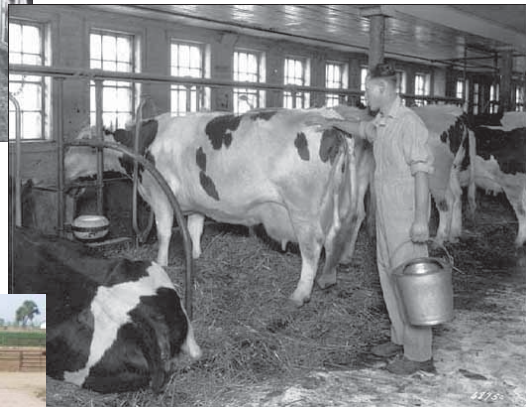
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Monitoring  
System

July 2009



# Dairy 2007

## Part V: Changes in Dairy Cattle Health and Management Practices in the United States, 1996-2007



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## Selected Highlights of Trends in the U.S. Dairy Industry

This report is Part V of the NAHMS Dairy 2007 study and provides an in-depth look at changes in the U.S. dairy industry from 1996 to 2007, as identified from three NAHMS studies: Dairy 1996, Dairy 2002, and Dairy 2007.

Here are a few highlights from the fifth report of the Dairy 2007 study:

The percentage of operations that had employees increased from 47.2 percent in 2002 to 75.7 percent in 2007. This increase was primarily driven by the percentage of small operations (fewer than 100 cows) with employees, which doubled from 32.2 percent in 2002 to 65.6 percent in 2007.

Dairy producers' familiarity with Johne's disease, *Mycoplasma* mastitis, and hemorrhagic bowel syndrome (HBS) increased from 2002 to 2007. However, the majority of producers remain unfamiliar with heartwater, screwworm, bluetongue, vesicular stomatitis, and HBS.

Participation in a Johne's disease control or certification programs and testing for Johne's has increased since 1996. Approximately one-third of operations participated in a program and /or testing in 2007.

As facilities change with the ever-increasing size of dairy operations, the use of concrete as the predominant flooring type has decreased from 85.8 percent of operations in 1996 to 51.1 percent in 2007. In 2007, pasture was the predominant flooring for lactating cows on 10.1 percent of operations and for 5.1 percent of cows. Dirt was the predominant flooring on 5.4 percent of operations and 20.0 percent of cows in 2007, which likely reflects the use of drylots on large operations.

The percentage of operations in which milkers wore gloves to milk all cows increased from 32.9 percent in 2002 to 55.2 percent in 2007. The percentage of cows on operations in which milkers wore gloves increased from 48.7 percent in 2002 to 76.8 percent in 2007.

The percentage of operations that used automatic takeoffs increased from 36.0 percent in 2002 to 45.4 percent in 2007.

The percentage of operations that administered dry-cow intramammary antibiotics at dry-off was about 90 percent in 2007.



Antibiotic use in preweaned heifers remained unchanged from 2002 to 2007.

For mastitis treatment, the percentage of operations that used cephalosporin increased from 2002 to 2007 (33.3 and 44.5 percent, respectively), while the use of noncephalosporin beta-lactam and macrolide antibiotics to treat mastitis decreased from 2002 to 2007.

More than 9 of 10 operations routinely dehorned calves in 1996 and 2007. The percentage of operations that used hot iron/electric dehorner increased from 1996 to 2007, while the percentage of operations that used a tube, spoon, gouges, saws, wire, and Barnes dehorner decreased.

Lameness in bred heifers and cows continues to be a challenge for dairy producers. The percentage of operations with cases of lameness in bred heifers increased from 36.5 percent in 2002 to 58.7 percent in 2007. The percentage of operations that had 50.0 percent or more cows affected with lameness increased from 5.0 percent in 1996 to 12.0 percent in 2007. With this increase in lameness, a higher percentage of operations used footbaths and routine hoof trimming in 2007 than in 1996.

The percentage of operations in which at least one cow showed clinical signs consistent with HBS doubled from 2002 to 2007 (9.1 and 19.7 percent, respectively).

There were no changes between 2002 and 2007 in methods used to handle the majority of manure in weaned heifer or cow housing areas. Manure storage remained relatively unchanged from 2002 to 2007. Surface application of liquid manure increased between 1996 and 2007. Written nutrient management plans were implemented by a higher percentage of operations in 2007 compared with 2002.

## Acknowledgments

This report has been prepared from material received and analyzed by the U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Veterinary Services (VS) via three national studies conducted between 1996 and 2007. All three studies focused on health management and animal health practices on U.S. dairy operations.

The Dairy 1996, Dairy 2002, and Dairy 2007 studies were cooperative efforts among State and Federal agricultural statisticians, animal health officials, university researchers, and extension personnel. We want to thank the National Agricultural Statistics Service (NASS) enumerators, State and Federal veterinary medical officers (VMOs), and animal health technicians (AHTs) who visited the farms and collected the data. Their hard work and dedication to the National Animal Health Monitoring System (NAHMS) are invaluable. The roles of the producer, Area Veterinarian in Charge (AVIC), NAHMS Coordinator, VMO, AHT, and NASS enumerator were critical in providing quality data for Dairy 2007 reports. Our appreciation also goes to the personnel at the Centers for Epidemiology and Animal Health (CEAH) for their efforts in study design, data validation, estimate generation, and report distribution. Additional support was afforded by the generous contributions of collaborators for the NAHMS dairy studies, including:

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- University of Pennsylvania, New Bolton Center;
- University of Wisconsin, Madison; and
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**Feedback**

Feedback, comments, and suggestions regarding Dairy 2007 study reports are welcomed. Please forward correspondence via e-mail at:  
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## Introduction

The National Animal Health Monitoring System (NAHMS) is a nonregulatory program of the Animal and Plant Health Inspection Service (APHIS), a branch of the U.S. Department of Agriculture (USDA). Designed to help meet the animal health information needs of a variety of stakeholders, NAHMS has collected data on dairy health and management practices through four previous studies.

The NAHMS 1991–92 National Dairy Heifer Evaluation Project (NDHEP) provided the dairy industry's first national information on the health and management of dairy cattle in the United States. Just months after the study's first results were released in 1993, cases of acute bovine viral diarrhea (BVD) surfaced in the United States following a 1993 outbreak in Canada. NDHEP information on producer vaccination and biosecurity practices helped officials address the risk of disease spread and target educational efforts on vaccination protocols. When an outbreak of human illness related to *Escherichia coli* O157:H7 was reported in 1993 in the Pacific Northwest, NDHEP data on the bacteria's prevalence in dairy cattle helped officials define public risks as well as research needs. This baseline picture of the industry also helped identify additional research and educational needs in various production areas, such as feed management and weaning age.

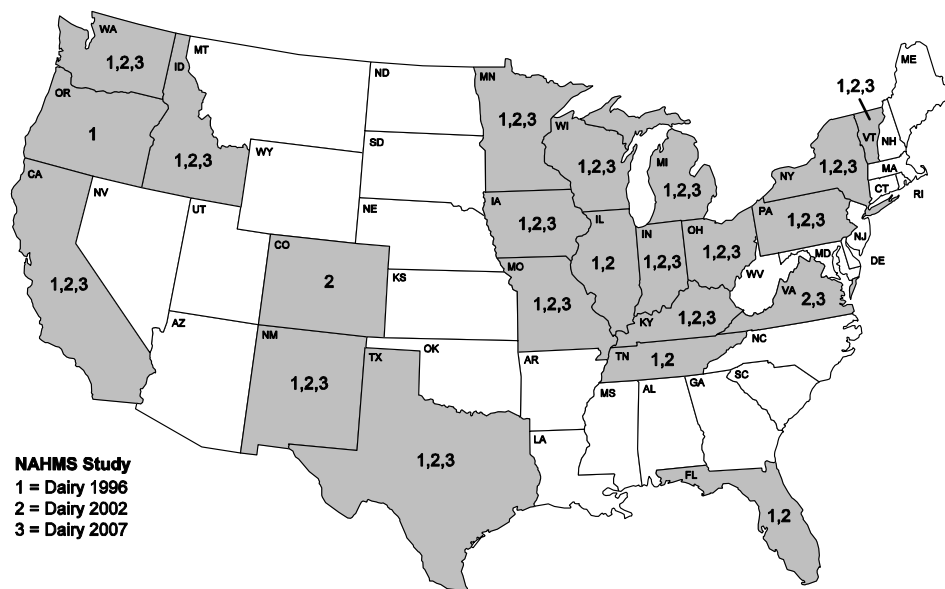
Information from the NAHMS Dairy 1996 study helped the U.S. dairy industry identify educational needs and prioritize research efforts on such timely topics as antibiotic use; Johne's disease; digital dermatitis; bovine leukosis virus (BLV); and potential foodborne pathogens, including *E. coli*, *Salmonella*, and *Campylobacter*.

Two major goals of the Dairy 2002 study were to describe management strategies that prevent and reduce Johne's disease and to determine management factors associated with *Mycoplasma* and *Listeria* in bulk-tank milk. The study also described levels of participation in quality assurance programs, the incidence of digital dermatitis, animal-waste handling systems used on U.S. dairy operations, and industry changes since the NDHEP in 1991 and the Dairy 1996 study.

The Dairy 2007 study provides valuable information to participants, stakeholders, and the industry as a whole. Dairy operations and cows in these States represented 79.5 percent of U.S. dairy operations and 82.5 percent of U.S. dairy cows. Results are presented in a variety of publications, including the following reports:

- Part 1: Reference of Dairy Cattle Health and Management Practices in the United States, 2007 (October 2007)—The first in a series of reports containing national information from the NAHMS Dairy 2007 study, this report contains data collected from 2,194 dairy operations.
- Part II: Changes in the U.S. Dairy Cattle Industry, 1991–2007 (March 2008)—This report presents trends in the dairy industry by providing national estimates of animal-health management practices for comparable populations from the NAHMS 1991–92 NDHEP, Dairy 1996, Dairy 2002, and Dairy 2007 studies.
- Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007 (September 2008)—This report presents national information from 582 operations with 30 or more dairy cows, a subset of the 2,194 operations described in Part I. State and Federal veterinary medical officers (VMOs) and animal health technicians (AHTs) conducted questionnaire interviews with producers and collected biological samples for analysis between February 26 and April 30, 2007.
- Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007 (February 2009)—This report presents national information from 519 operations with 30 or more dairy cows, a subset of the 582 operations described in Part III. State and Federal VMOs and AHTs conducted questionnaire interviews with producers and collected biological samples for analysis between May 1 and August 31, 2007.

This report, Part V: Changes in Dairy Cattle Health and Management Practices in the United States, 1996–2007 provides national estimates of dairy cattle health and management practices for comparable populations from the NAHMS Dairy 1996, Dairy 2002, and Dairy 2007 studies. For the 2002 and 2007 studies, data were collected via two VMO surveys. Due to ongoing educational efforts, producers' awareness and recognition of some diseases have increased and may be partially responsible for some changes observed in this report.

**States Participating in NAHMS 1996, 2002, and 2007 Dairy Studies**



## Terms Used in This Report

**Antibiotics:** Chemical substances produced by microorganisms that kill or inhibit the growth of other microorganisms. For the purpose of this report, antibiotics are synonymous with antimicrobials.

**Antimicrobial:** Any substance that kills or inhibits the growth of microorganisms.

**Cow:** Female dairy bovine that has calved at least once.

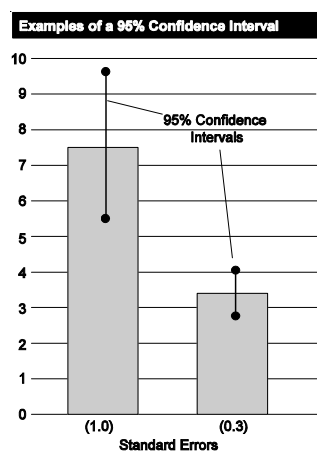
**Heifer:** Female dairy bovine that has not yet calved.

**Herd size:** Herd size is based on January 1 dairy cow inventory for each study year. Small herds are those with fewer than 100 head; medium herds are those with 100 to 499 head; and large herds are those with 500 or more head.

**Operation:** Premises with at least 30 dairy cows on January 1 of each study year.

**Operation average:** A single value for each operation is summed over all operations reporting divided by the number of operations reporting. For instance, operation average number of visits (p 72) is calculated by summing reported average number of visits over all operations divided by the number of operations.

**Population estimates:** The estimates in this report make inference to all of the operations with 30 or more dairy cows in the target population (see Methodology section, p 89). Data from the operations responding to the survey are weighted to reflect their probability of selection during sampling and to account for any survey nonresponse.



**Precision of population estimates:** Estimates in this report are provided with a measure of precision called the standard error. A 95-percent confidence interval can be created with bounds equal to the estimate plus or minus two standard errors. If the only error is sampling error, the confidence intervals created in this manner will contain the true population mean 95 out of 100 times. In the example to the left, an estimate of 7.5 with a standard error of 1.0 results in limits of 5.5 to 9.5 (two times the standard error above and below the estimate). The second estimate of 3.4 shows a standard error of 0.3 and results in limits of 2.8 and 4.0. Alternatively, the 90-percent confidence interval would be created by multiplying the standard error by 1.65 instead of 2. Most estimates in this report are rounded to the nearest tenth. If rounded to 0, the standard error was reported (0.0). If there were no reports of the event, no standard error was reported (—).

**Preweaned:** Prior to removal from a liquid ration. Previous studies used the term unweaned to mean preweaned.

**Sample profile:** Information that describes characteristics of the operations from which data were collected.

## Section I: Population Estimates

### A. Disease Familiarity and Biosecurity Practices

#### 1. Producer familiarity with disease

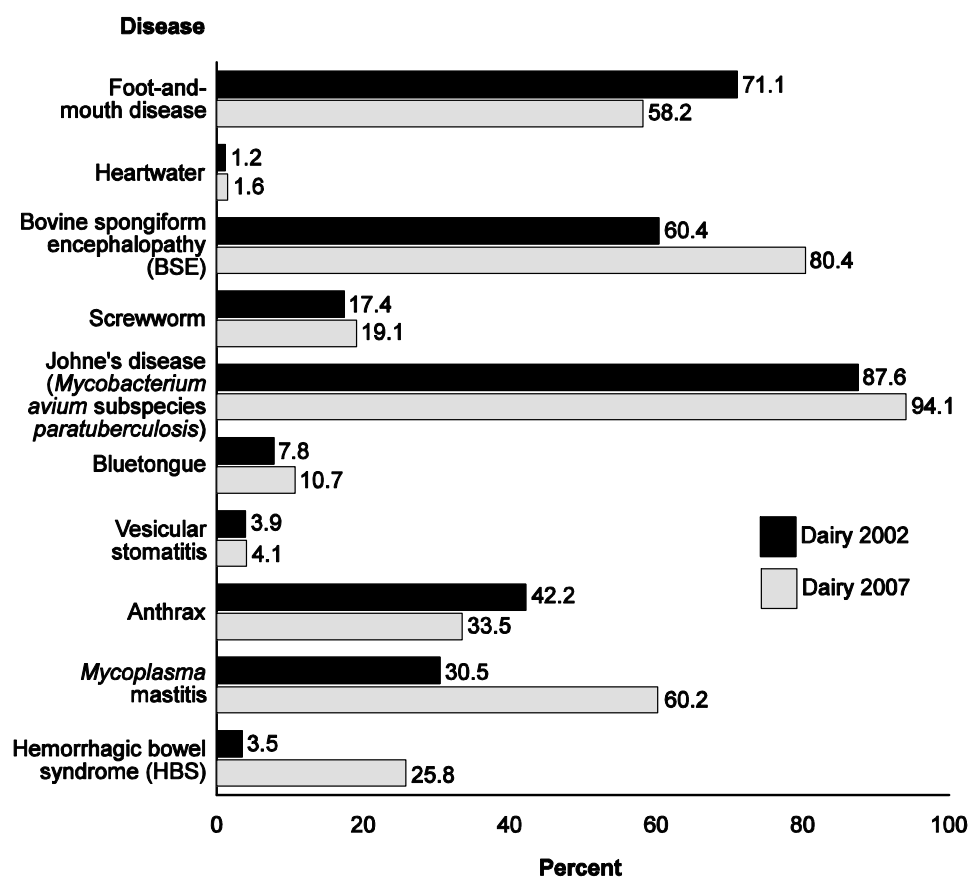
Familiarity with various diseases is an important part in developing an effective biosecurity plan. By being familiar with different diseases, producers are able to implement biosecurity practices specifically designed to prevent the introduction of a particular disease. Disease familiarity may also help limit the spread of a disease should it be introduced into the herd.

Producer familiarity with diseases varied by disease. Most producers at least knew some basics about foot-and-mouth disease, bovine spongiform encephalopathy (BSE), Johne's disease, and *Mycoplasma* mastitis; however, the majority of producers were unfamiliar with heartwater, screwworm, bluetongue, vesicular stomatitis, and hemorrhagic bowel syndrome (HBS). In 2002, nearly twice the percentage of operations were fairly knowledgeable about foot-and-mouth disease compared with operations in 2007 (16.5 and 8.9 percent, respectively). In contrast, the percentage of operations fairly knowledgeable about Johne's disease, *Mycoplasma* mastitis, and HBS increased from 2002 to 2007.

Percentage of operations by level of familiarity with specific cattle diseases:

	Percent Operations							
	Level of Familiarity							
	Fairly Knowledgeable		Knew Some Basics		Recognized the Name, Not Much Else		Had Not Heard of It Before	
	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007
Disease	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)
Foot-and-mouth disease	16.5 (1.5)	8.9 (1.2)	54.6 (2.1)	49.3 (2.9)	28.1 (1.9)	40.7 (2.9)	0.8 (0.3)	1.1 (0.7)
Heartwater	0.3 (0.2)	0.6 (0.3)	0.9 (0.3)	1.0 (0.4)	3.7 (0.7)	4.5 (1.0)	95.1 (0.8)	93.9 (1.1)
Bovine spongiform encephalopathy (BSE)	13.9 (1.5)	19.6 (2.0)	46.5 (2.2)	60.8 (2.7)	38.0 (2.1)	18.8 (2.2)	1.6 (0.5)	0.8 (0.6)
Screwworm	5.9 (1.0)	4.0 (0.8)	11.5 (1.2)	15.1 (1.9)	45.1 (2.2)	37.4 (2.6)	37.5 (2.2)	43.5 (2.7)
Johne's disease ( <i>Mycobacterium avium</i> subspecies <i>paratuberculosis</i> )	45.3 (2.1)	57.9 (2.9)	42.3 (2.1)	36.2 (2.8)	11.4 (1.4)	4.4 (1.2)	1.0 (0.3)	1.5 (0.6)
Bluetongue	2.6 (0.6)	2.2 (0.9)	5.2 (0.8)	8.5 (1.2)	40.7 (2.0)	41.0 (2.8)	51.5 (2.1)	48.3 (2.8)
Vesicular stomatitis	1.1 (0.3)	0.7 (0.3)	2.8 (0.5)	3.4 (0.8)	12.9 (1.3)	14.1 (1.7)	83.2 (1.4)	81.8 (1.9)
Anthrax	9.6 (1.2)	5.1 (1.2)	32.6 (2.0)	28.4 (2.6)	54.0 (2.2)	56.3 (2.8)	3.8 (0.8)	10.2 (1.8)
<i>Mycoplasma</i> mastitis	8.7 (1.0)	20.3 (1.8)	21.8 (1.7)	39.9 (2.8)	46.6 (2.2)	30.4 (2.8)	22.9 (2.0)	9.4 (1.8)
Hemorrhagic bowel syndrome (HBS)	1.0 (0.2)	8.2 (1.1)	2.5 (0.4)	17.6 (1.9)	8.7 (1.3)	22.6 (2.3)	87.8 (1.3)	51.6 (2.7)

**Percentage of Operations that were Fairly Knowledgeable or Knew Some Basics About Specific Cattle Diseases**



## 2. Information sources in case of a foreign animal disease outbreak

An outbreak of foreign animal disease in the United States could be catastrophic. Knowing where producers would turn for information in the event of a foreign animal disease outbreak is critical to planning for the control of the disease.

Most producers in 2002 and 2007 indicated they would contact their private veterinarian for disease information if a foreign animal disease outbreak occurred in the United States. Other information sources would also be used, but not to the extent of the private veterinarian. There were no changes in the percentage of operations that were very likely to use a specific information source between 2002 and 2007.

Percentage of operations by likelihood of using the following information sources if an outbreak of foreign animal disease occurred in the United States (e.g., foot-and-mouth disease):

	Percent Operations											
	Likelihood											
	Very Likely				Somewhat Likely				Not Likely			
	Dairy 2002		Dairy 2007		Dairy 2002		Dairy 2007		Dairy 2002		Dairy 2007	
Information Source	Std. Pct.	Error	Std. Pct.	Error	Std. Pct.	Error	Std. Pct.	Error	Std. Pct.	Error	Std. Pct.	Error
Other dairy producers	40.5	(2.1)	41.4	(2.8)	34.5	(2.0)	37.8	(2.7)	25.0	(1.9)	20.8	(2.3)
Private veterinarian	92.8	(1.1)	93.6	(1.3)	6.6	(1.1)	5.4	(1.3)	0.6	(0.3)	1.0	(0.5)
Extension agent	34.2	(2.0)	32.5	(2.7)	36.9	(2.1)	38.9	(2.9)	28.9	(2.0)	28.6	(2.5)
Dairy organization or cooperative	30.3	(1.9)	30.7	(2.6)	41.8	(2.1)	42.3	(2.8)	27.9	(1.9)	27.0	(2.6)
Magazines	41.8	(2.1)	39.0	(2.8)	44.7	(2.1)	49.4	(2.8)	13.5	(1.5)	11.6	(1.5)
Internet	19.0	(1.6)	23.1	(2.2)	27.4	(1.9)	28.8	(2.6)	53.6	(2.1)	48.1	(2.8)
State Veterinarian's office	34.7	(2.1)	26.7	(2.4)	31.3	(2.0)	37.4	(2.8)	34.0	(2.1)	35.9	(2.9)
U.S. Department of Agriculture	25.1	(1.8)	22.6	(2.4)	38.1	(2.2)	42.5	(2.8)	36.8	(2.1)	34.9	(2.7)
Television/newspapers	30.7	(2.1)	25.8	(2.5)	35.2	(2.0)	38.8	(2.8)	34.1	(2.0)	35.4	(2.6)
Other	3.7	(0.9)	4.7	(1.2)	0.8	(0.3)	2.4	(1.0)	95.5	(1.0)	92.9	(1.6)

### 3. Resource contacts

Almost all producers in 2002 and 2007 (97.9 and 98.6 percent, respectively) would contact their private veterinarian if they suspected that an animal on their operation had a foreign animal disease. Approximately 4 of 10 operations would use the State Veterinarian's office as a resource. These responses highlight the continuing need to educate veterinary practitioners on how to identify and handle suspected foreign animal diseases on livestock operations.

Percentage of operations that would contact the following resources if an animal on the operation was suspected of having foot-and-mouth disease or another foreign animal disease:

Resource	Percent Operations			
	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Extension agent/university	25.4	(1.8)	20.8	(2.3)
State Veterinarian's office	43.9	(2.2)	35.7	(2.6)
U.S. Department of Agriculture	25.5	(1.8)	21.8	(2.3)
Private veterinarian	97.9	(0.7)	98.6	(0.5)
Feed company or milk cooperative representative	28.0	(1.9)	25.7	(2.3)
Other	3.3	(0.7)	4.1	(1.3)

#### 4. Employees and visitors

Employees or visitors—especially those who have contact with animals off the operation—can introduce disease agents via their boots, clothing, vehicles, or other equipment. As people travel more frequently to parts of the world that have animal diseases not present in the United States, the risk of inadvertent or intentional introduction of disease agents onto U.S. livestock operations increases. Establishing written policies or guidelines pertaining to visitor and employee animal contacts and travel is an important step in reducing the risk of disease introduction.

The percentage of operations that had employees increased from 47.2 percent in 2002 to 75.7 percent in 2007. The percentage of small operations with employees doubled from 32.2 percent in 2002 to 65.6 percent in 2007.

a. Percentage of operations that had employees\*, by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
	<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All</b> <b>Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Dairy 2002	32.2	(2.5)	84.2	(2.4)	99.0	(0.6)	47.2	(2.0)
Dairy 2007	65.6	(4.1)	95.0	(2.0)	98.0	(1.9)	75.7	(2.8)

\*Question variation: 2007 estimates specifically exclude owners and family members.

The percentage of operations that placed restrictions on employee livestock ownership outside the operation, had guidelines regarding foreign travel by employees, and trained employees in performing biosecurity practices declined from 2002 to 2007. Alternatively, the percentage of operations that had written standard operating procedures (other than milking procedures) increased from 5.1 percent in 2002 to 12.2 percent in 2007.

b. For operations with employees, percentage of operations by biosecurity practices used:

Biosecurity Practice	Percent Operations			
	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Restrictions on employee livestock ownership outside this operation	27.7	(2.2)	18.1	(2.5)
Guidelines regarding foreign travel by employees	21.8	(2.3)	12.0	(2.0)
Written standard operating procedures (other than milking procedures)	5.1	(0.8)	12.2	(2.0)
Training for employees in performing biosecurity practices	42.1	(2.7)	21.9	(2.5)

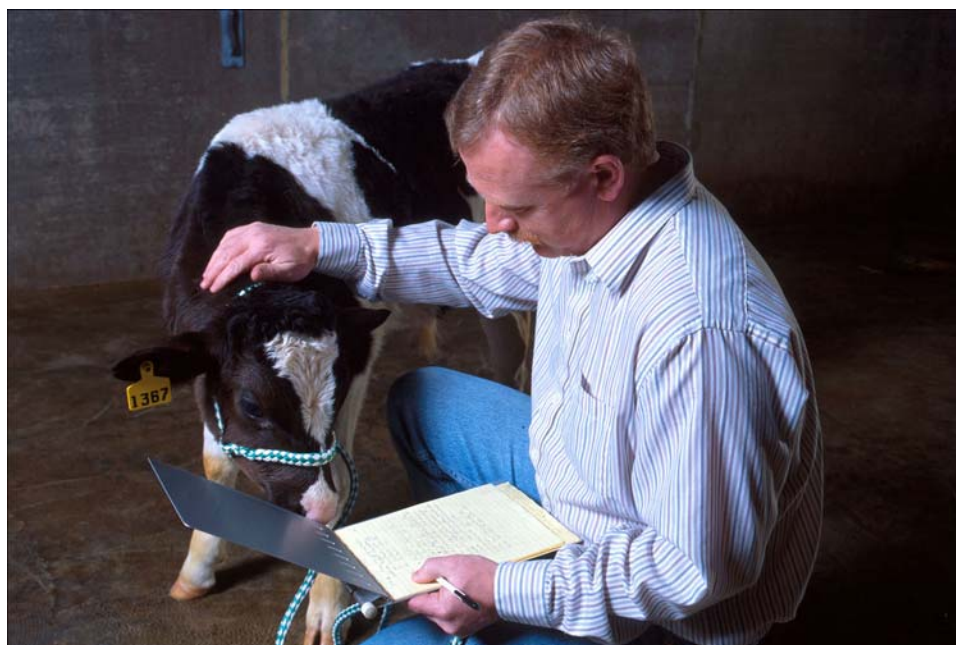
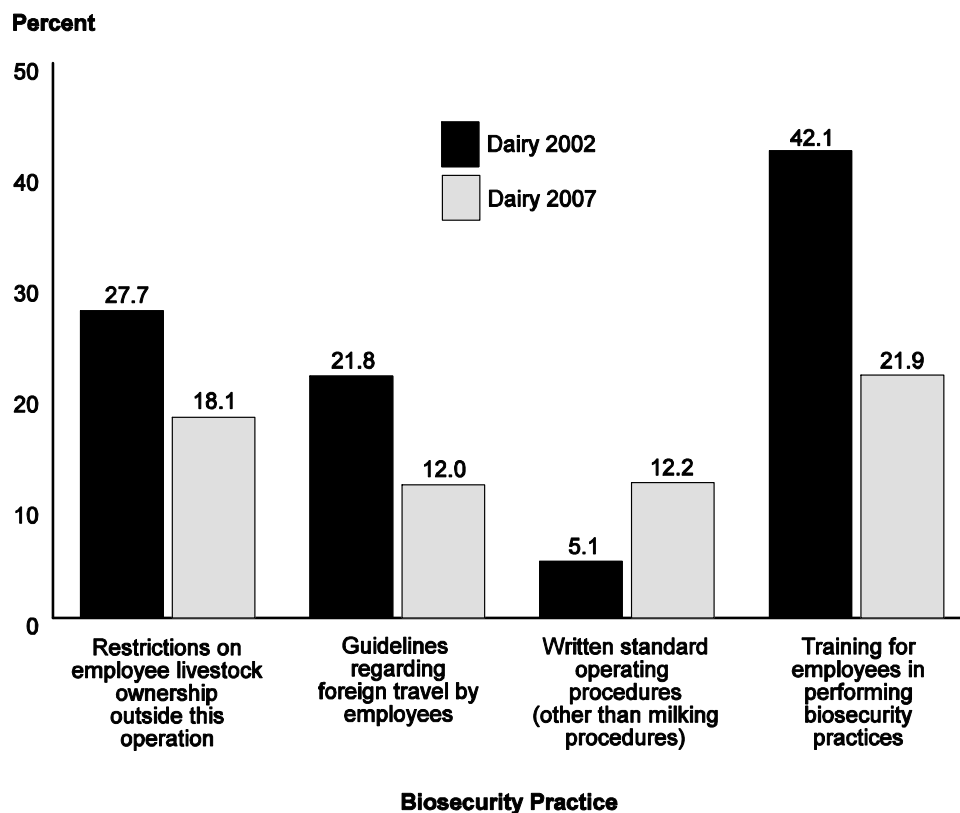


Photo courtesy of Chuck Greiner, Agricultural Research Service



### For Operations with Employees, Percentage of Operations by Biosecurity Practices Used



A higher percentage of small operations and all operations allowed visitors access to animal areas in 2007 compared with 2002. More than 8 of 10 operations, regardless of herd size, allowed visitors into animal areas during both study years.

c. Percentage of operations that allowed visitors in animal areas, by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
	<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Dairy 2002	84.6	(2.0)	91.7	(1.5)	89.2	(2.8)	86.5	(1.5)
Dairy 2007	98.6	(0.8)	95.9	(1.8)	97.9	(1.6)	97.9	(0.7)

Of the following biosecurity practices implemented specifically for visitors, a higher percentage of operations in 2007 than in 2002 required disposable or clean boots for visitors entering animal areas and had restrictions on vehicles entering animal areas. The percentages of operations that had guidelines regarding which visitors were allowed in animal areas or had footbaths for visitors entering animal areas remained unchanged from 2002 to 2007.

d. For operations that allowed visitors in the animal areas, percentage of operations by biosecurity practices used:

<b>Percent Operations</b>				
<b>Biosecurity Practice</b>	<b>Dairy 2002</b>		<b>Dairy 2007</b>	
	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Guidelines regarding which visitors are allowed in animal areas	38.6	(2.0)	30.4	(2.6)
Footbaths for visitors entering animal areas	6.3	(1.0)	6.9	(1.3)
Disposable or clean boots for visitors entering animal areas	18.9	(1.6)	28.3	(2.6)
Restrictions on vehicles entering animal areas	44.2	(2.1)	51.3	(2.9)

### 5. Specific biosecurity practices

Many diseases are initially introduced by an infected animal purchased as an addition to the herd. The majority of operations maintained a closed herd during 2002 and 2007. Over four-fifths of operations had insect and rodent control programs. Approximately one of three operations had a bird control program. Nearly one-half of all operations limited cattle contact with other livestock, elk, and deer, and controlled access to feed by other livestock and wildlife, or had a closed herd.

Percentage of operations that used the following biosecurity practices to prevent disease during the previous 12 months:

Biosecurity Practice	Percent Operations			
	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Insect control	92.5	(1.1)	87.4	(2.0)
Rodent control	94.7	(0.9)	94.4	(1.1)
Bird control	29.1	(1.9)	33.8	(2.7)
Limit cattle contact with other livestock, elk, and deer	41.4	(2.1)	48.5	(2.8)
Control access to cattle feed by other livestock and wildlife	53.7	(2.1)	49.9	(2.9)
Closed herd*	59.5	(2.1)	56.2	(2.9)

\*All replacements are from the operation; no contact with cattle from other operations.

## 6. Equipment handling for manure and feeding

Using the same equipment to remove manure and handle feed increases the risk of contaminating feed with disease-causing organisms, especially *Salmonella* and *M. paratuberculosis*. On some operations, it may not be feasible to have equipment dedicated solely to either feed handling or manure removal. In those cases, training employees to clean and disinfect equipment between uses will reduce the likelihood that feed will be contaminated with feces and pathogens.

There were no differences between 2002 and 2007 in the percentages of operations by frequency that the same equipment was used to handle manure and feed cattle.

a. Percentage of operations by frequency that the same equipment was ever used to handle manure and feed cattle:

Percent Operations				
Frequency	Dairy 2002*		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Routinely	58.8	(2.1)	32.2	(2.7)
Rarely			35.6	(2.7)
Never	41.2	(2.1)	32.2	(2.7)
Total	100.0		100.0	

\*In 2002, question was "Does this operation ever use the same equipment to handle manure and feed cattle."

The percentage of operations that used the same equipment to handle manure and feed cattle then washed the equipment with water or steam (54.2 and 61.0 percent of operations, respectively) remained unchanged from 2002 to 2007. The majority of operations that used “other” procedures in 2007 used separate loader buckets.

b. For operations that ever used the same equipment to handle manure and feed cattle, percentage of operations by procedure that best describes what is usually done with equipment after handling manure:

Percent Operations				
Procedure	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Wash equipment with water or steam only	54.2	(2.9)	61.0	(3.4)
Chemically disinfect only	0.0	(--)	0.1	(0.1)
Wash equipment and chemically disinfect	5.7	(1.5)	4.6	(1.5)
Other	24.9	(2.5)	23.2	(3.1)
No procedures	15.2	(2.2)	11.1	(2.3)
Total	100.0		100.0	

## 7. Equipment sharing with other livestock operations

Sharing heavy equipment with other operations increases the risk of introducing new disease-causing agents to an operation. If equipment is shared, it should be sanitized and disinfected prior to use. In 2002 and 2007, about one of three operations shared equipment with other livestock operations.

Percentage of operations that shared any heavy equipment (tractors, feeding equipment, manure spreaders, trailers, etc.) with other livestock operations during the previous 12 months:

Percent Operations								
Herd Size (Number of Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Dairy 2002	40.0	(2.7)	33.4	(2.8)	28.0	(3.7)	38.0	(2.1)
Dairy 2007	35.9	(3.7)	41.0	(4.1)	21.3	(4.3)	36.2	(2.8)

## 8. Johne's disease

A Johne's disease control program may include testing individual animals to identify those shedding *Mycobacterium avium* subspecies *paratuberculosis* and thereby presenting a risk to noninfected animals on the operation.

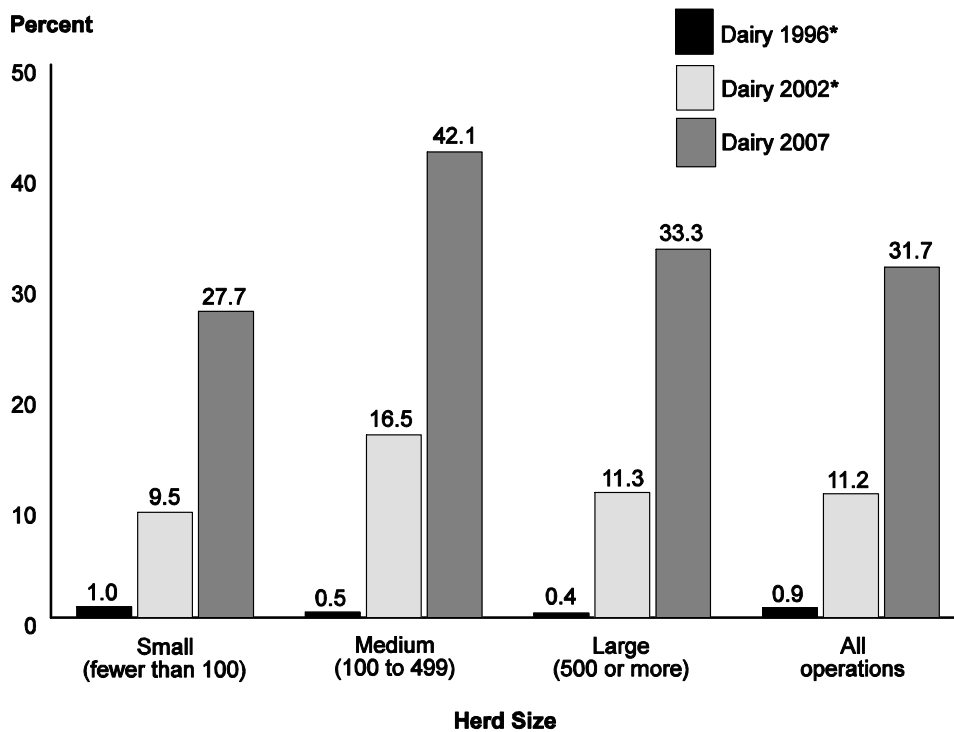
The percentage of operations participating in a Johne's disease control or certification program has increased for each herd size category and for all operations since 1996. Less than 1 percent of operations participated in a Johne's disease control or certification program in 1996 compared with 11.2 percent in 2002 and 31.7 percent in 2007.

a. Percentage of operations that participated in any Johne's disease control or certification program, by herd size:

Percent Operations								
Herd Size (Number of Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Dairy 1996*	1.0	(0.4)	0.5	(0.4)	0.4	(0.4)	0.9	(0.3)
Dairy 2002*	9.5	(1.7)	16.5	(2.3)	11.3	(2.3)	11.2	(1.4)
Dairy 2007	27.7	(3.3)	42.1	(4.1)	33.3	(4.5)	31.7	(2.5)

\*Question variation: In 1996, "Is this operation currently on a Johne's certification program."; In 2002, "Does operation participate in a Johne's disease herd status, control, or certification program."

#### Percentage of Operations that Participated in any Johne's Disease Control or Certification Program, by Herd Size



\*Question variation: In 1996, "Is this operation currently on a Johne's certification program."; in 2002, "Does operation participate in a Johne's disease herd status, control, or certification program."

The percentage of operations that tested for Johne's disease increased across herd sizes from 1996 to 2002 and for all operations from 1996 to 2007; 13.1 percent of operations tested for Johne's in 1996, 25.7 percent tested in 2002, and 35.3 percent tested in 2007. Based on the percentage of operations that participated in a Johne's disease control program (table 8a, p18), it appears that a substantial percentage of operations performed testing without being formally enrolled in a Johne's disease control or certification program.

b. Percentage of operations that performed any testing for Johne's disease, by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Dairy 1996*	10.5	(1.3)	22.0	(2.4)	19.9	(4.3)	13.1	(1.1)
Dairy 2002	20.4	(2.5)	39.5	(3.3)	38.3	(4.0)	25.7	(1.9)
Dairy 2007	30.7	(3.4)	47.6	(4.1)	37.5	(5.7)	35.3	(2.6)

\*Question variation: 1996 estimate was operations that tested in the last 24 months, while the 2002 and 2007 estimates are for testing performed during the previous 12 months.



Photo courtesy of Judy Rodriguez



### 9. Calving areas

Sick cows in the calving area are potential sources of disease for both dams and newborn calves. Although more than 50 percent of operations allowed sick cows in the calving area in 1996 and 2002, only 34.2 percent did so in 2007.

a. Percentage of operations that allowed sick cows in the calving area:

Percent Operations					
Dairy 1996		Dairy 2002		Dairy 2007*	
Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
54.9	(1.8)	54.1	(2.4)	34.2	(3.2)

\*Question variation: Estimate only for operations with a dedicated calving area.

Cows that test positive for Johne's disease can contaminate the calving area, resulting in transmission of disease to newborn calves. To prevent calving-area contamination, test-positive animals should not be allowed in the calving area or other areas where calves could be exposed and potentially infected.

There were no differences between 2002 and 2007 in the percentage of operations that allowed Johne's disease test-positive cows into the calving area.

b. For operations that tested for Johne's disease, percentage of operations that allowed Johne's test-positive cows in the calving area:

Percent Operations			
Dairy 2002		Dairy 2007*	
Percent	Std. Error	Percent	Std. Error
15.2	(1.8)	15.5	(3.2)

\*Question variation: Estimate only for operations with a dedicated calving area.

**B. General Management****1. Flooring type**

Flooring surfaces affect cow health and longevity. When given an option, cows select flooring that compresses and provides cushion, such as rubber mats, pasture, or dirt. Concrete flooring is associated with increased lameness, injuries, and decreased expression of estrus.

Overall, the percentage of operations that used concrete as the predominate flooring type for cattle decreased from 85.8 percent in 1996 to 51.1 percent in 2007. A higher percentage of operations used rubber mats over concrete in 2007 compared with 2002 (22.9 and 10.8 percent, respectively). In 2007, pasture was the predominant flooring for lactating cows on 10.1 percent of operations and for 5.1 percent of cows; dirt was the predominant flooring on 5.4 percent of operations and for 20.0 percent of cows, which probably reflects the use of drylots on large operations.

Percentage of operations (and percentage of cows on these operations) by predominant flooring type that lactating cows stood or walked on when not being milked:

Flooring Type	Percent Operations						Percent Cows					
	Dairy 1996		Dairy 2002		Dairy 2007		Dairy 1996		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Concrete—grooved	27.2	(1.4)	31.1	(1.7)	34.3	(2.4)	39.3	(1.7)	45.7	(1.9)	48.7	(3.5)
Concrete—textured	16.2	(1.4)	5.7	(1.0)			17.2	(1.7)	4.0	(0.7)		
Concrete—slat	0.8	(0.3)	1.0	(0.3)	1.3	(0.5)	1.6	(0.7)	1.7	(0.5)	1.1	(0.5)
Concrete—smooth	41.6	(1.8)	26.3	(2.0)	15.5	(2.3)	26.7	(1.4)	12.6	(1.0)	5.8	(0.8)
Rubber mats over concrete			10.8	(1.4)	22.9	(2.5)			6.9	(1.0)	13.9	(2.2)
Pasture	6.9	(1.0)	12.4	(1.3)	10.1	(1.7)	4.6	(0.6)	7.8	(0.8)	5.1	(0.9)
Dirt	5.8	(0.8)	7.1	(1.0)	5.4	(1.1)	9.6	(1.0)	18.0	(1.8)	20.0	(3.5)
Other	1.5	(0.4)	5.6	(1.0)	10.5	(1.8)	1.0	(0.3)	3.3	(0.7)	5.4	(1.1)
Total	100.0		100.0		100.0		100.0		100.0		100.0	

## 2. Surface moisture

Wet flooring can be detrimental to hoof health. Cows on wet surfaces have increased hoof-horn moisture and are more prone to infectious hoof diseases.

The ground or flooring surface for lactating cows in 2007 was usually dry on 60.3 percent of operations in summer and 49.5 percent in winter, down from 71.0 and 58.9 percent, respectively, in 1996. The percentage of operations in which flooring was almost always wet but no standing water was present in summer increased from 7.8 percent in 1996 to 16.3 percent in 2007. The percentage of operations in which flooring was almost always wet, but no standing water was present in winter increased from 16.9 percent in 1996 to 28.1 percent in 2007.

Percentage of operations by category that best describes the surface moisture of the ground or flooring that lactating cows stood on most of the time, and by season:

Percent Operations						
Season						
Summer			Winter			
	Dairy 1996	Dairy 2002	Dairy 2007	Dairy 1996	Dairy 2002	Dairy 2007
Surface Moisture	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error
Usually dry	71.0 (1.6)	63.3 (2.0)	60.3 (2.7)	58.9 (1.5)	49.7 (2.1)	49.5 (2.6)
Wet about half the time	20.9 (1.5)	22.2 (1.8)	22.8 (2.4)	22.9 (1.4)	26.0 (1.8)	21.8 (2.2)
Almost always wet, but no standing water	7.8 (0.8)	13.3 (1.2)	16.3 (1.7)	16.9 (1.0)	23.1 (1.5)	28.1 (2.1)
Usually standing water or slurry	0.3 (0.1)	1.2 (0.5)	0.6 (0.3)	1.3 (0.3)	1.2 (0.4)	0.6 (0.3)
Total	100.0	100.0	100.0	100.0	100.0	100.0

### 3. Bedding types

The ideal bedding for lactating cows is dry and clean, provides cushion, and does not support bacterial growth. Of the bedding types listed in the table below, only the use of straw and/or hay decreased from 1996 to 2007, on operations and for cows. The percentage of cows bedded on corn cobs and stalks decreased by about one-half from 1996 to 2007. The percentage of operations that used sand or mattresses increased, with mattresses showing the largest increase from 4.7 percent in 1996 to 23.7 percent in 2007. Composted manure use increased, as 9.0 percent of cows were bedded on composted manure in 1996 compared with 24.2 percent in 2007.

Percentage of operations (and percentage of cows on these operations) by type of bedding used for lactating cows during the previous 90 days:

Bedding Type	Percent Operations						Percent Cows					
	Dairy 1996		Dairy 2002		Dairy 2007		Dairy 1996		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Straw and/or hay	66.9	(1.5)	54.0	(2.0)	54.1	(2.7)	47.7	(1.5)	35.6	(1.5)	33.4	(2.8)
Sand	11.2	(1.0)	18.1	(1.5)	21.9	(2.0)	15.3	(1.3)	21.3	(1.6)	30.3	(2.6)
Sawdust/wood products	27.9	(1.5)	35.0	(1.9)	35.0	(2.6)	27.3	(1.3)	32.1	(1.5)	31.2	(2.8)
Composted/dried manure	2.4	(0.4)	2.3	(0.4)	3.9	(0.5)	9.0	(1.4)	12.7	(1.5)	24.2	(2.6)
Rubber mats	27.0	(1.6)	25.8	(2.0)	30.2	(2.7)	18.8	(1.2)	15.0	(1.2)	18.5	(2.1)
Rubber tires	1.0	(0.3)	1.3	(0.4)	1.6	(0.6)	1.6	(0.5)	1.7	(0.4)	1.1	(0.4)
Shredded newspaper	6.7	(0.9)	7.9	(1.2)	5.2	(1.2)	5.7	(0.7)	5.4	(0.7)	3.1	(0.7)
Mattresses	4.7	(0.6)	17.4	(1.5)	23.7	(2.4)	7.0	(0.8)	18.1	(1.2)	20.1	(1.9)
Corn cobs and stalks	12.8	(1.3)	10.5	(1.4)	11.0	(1.9)	10.1	(1.1)	6.6	(0.8)	5.7	(1.0)
Shells/hulls			1.8	(0.4)					5.9	(1.1)		
Waterbeds					1.7	(0.8)					2.3	(1.0)
Other	3.7	(0.8)	5.0	(1.0)	11.7	(1.9)	4.8	(1.0)	6.8	(1.1)	13.3	(2.5)
Any bedding	95.2	(0.5)	93.2	(0.8)	97.0	(0.8)	87.5	(1.3)	85.8	(1.6)	94.9	(1.9)

#### 4. Feedstuffs

The percentage of operations that fed alfalfa hay/haylage and/or corn silage to lactating cows increased from 1996 to 2007.

Percentage of operations by type of feedstuff fed to lactating cows during the previous 90 days:

Feedstuff	Percent Operations					
	Dairy 1996		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Alfalfa hay/haylage	72.3	(1.6)	93.8	(1.0)	92.3	(1.6)
Corn silage	77.4	(1.5)	81.6	(1.7)	87.6	(1.8)
Clover as forage or pasture	31.2	(1.7)	22.5	(1.9)	23.1	(2.4)
Whole cottonseed	28.7	(1.5)	37.8	(2.0)	33.0	(2.5)
Cottonseed meal or hulls	8.9	(0.9)	7.9	(1.0)	9.3	(1.5)
Whole soybeans or soybean meal	80.0	(1.3)	83.6	(1.5)	84.4	(2.1)
Bakery byproducts	6.4	(0.8)	5.5	(0.8)	6.6	(1.0)
Brewery byproducts	28.7	(1.6)	30.6	(1.9)	37.1	(2.7)
Corn			95.8	(0.7)	94.2	(1.4)
Barley			12.8	(1.2)	14.1	(1.9)
Wheat (not silage)			6.7	(1.0)	6.7	(1.1)
Oats (not silage)			22.3	(2.0)	17.5	(2.4)
Green chop			3.9	(1.0)	4.9	(1.4)
Feather/poultry meal			3.0	(0.7)	3.2	(0.7)
Fish meal			4.9	(0.7)	4.4	(0.9)
Fat/tallow	25.3	(1.5)	20.0	(1.6)	32.7	(2.5)
Porcine meat and bone meal	21.8*	(1.4)			8.3	(1.3)
Blood meal					13.2	(1.7)

\*Question variation 1996: "Meat and bone meal or blood meal."

## 5. Feeding practices

There were no differences in the percentages of operations by specific feeding practices for lactating cows. The majority of operations fed all lactating cows one ration in both study years.

a. Percentage of operations by feeding practices that best describe how lactating cows were fed:

Feeding Practice	Percent Operations			
	Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error
Feed all lactating cows the same ration	59.1	(2.2)	62.3	(2.7)
Feed individuals or groups based on production/stage of lactation	38.2	(2.2)	35.6	(2.7)
Feed individuals or groups based on lactation number			1.6	(0.6)
Feed individuals or groups based on criteria other than production/stage of lactation or lactation number	2.7	(0.4)	0.5	(0.3)
Total	100.0		100.0	

A similar percentage of operations fed anionic salts to close-up cows and/or springing heifers in 2002 and 2007.

b. Percentage of operations that fed anionic salts (e.g., BioChlor, SoyChlor, ammonium chloride, etc.) to prevent milk fever, by cattle class:

Cattle Class	Percent Operations			
	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Close-up cows <sup>1</sup>	19.1	(1.4)	22.9	(2.2)
Springing heifers <sup>2</sup>	14.3	(1.2)	15.7	(1.9)

<sup>1</sup>Cows 2 to 4 weeks prior to calving.

<sup>2</sup>Heifers 2 to 4 weeks prior to calving.

The percentage of operations that separated close-up cows from other dry cows did not change from 2002 to 2007.

c. Percentage of operations that separated close-up cows from other dry cows, by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
	<b>Small</b> (Fewer than 100)		<b>Medium</b> (100-499)		<b>Large</b> (500 or More)		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Dairy 2002	56.1	(2.8)	81.7	(2.3)	98.2	(1.2)	63.9	(1.9)
Dairy 2007	47.1	(3.9)	74.9	(3.7)	96.0	(2.1)	57.1	(2.9)

The use of any milk urea nitrogen (MUN) testing increased from 22.3 percent of operations in 2002 to 49.8 percent in 2007. The percentage of operations that routinely used MUN testing increased from 9.3 percent in 2002 to 30.9 percent in 2007.

d. Percentage of operations by use of milk urea nitrogen (MUN) testing to determine ration composition:

<b>Percent Operations</b>				
<b>Dairy 2002</b>			<b>Dairy 2007</b>	
<b>Frequency</b>	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Use routinely	9.3	(1.0)	30.9	(2.4)
Use only if have a problem	13.0	(1.3)	18.9	(2.2)
Never used	77.7	(1.6)	50.2	(2.7)
Total	100.0		100.0	

## 6. Water source

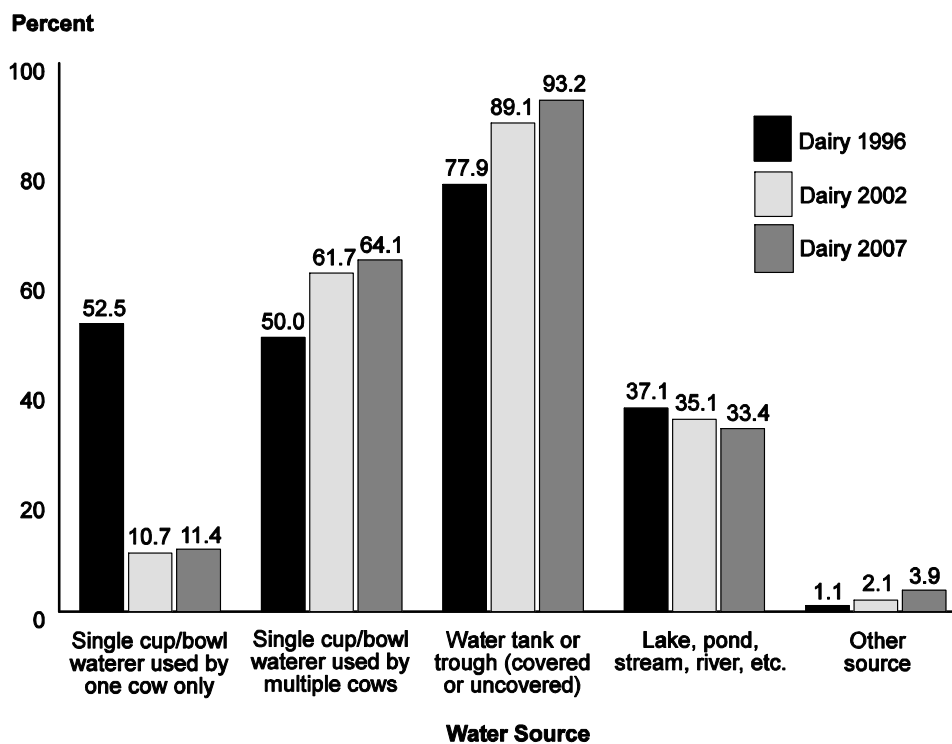
Water sources for cows have changed since 1996. The use of a single cup/bowl by only one cow decreased from 52.5 percent of operations in 1996 to 10.7 percent in 2002 and 11.4 percent in 2007. The percentage of operations that used a single cup/bowl for multiple cows increased from 50.0 percent of operations in 1996 to 64.1 percent in 2007. The percentage of operations that used a water tank or trough increased from 77.9 percent in 1996 to 93.2 percent in 2007. The changes in water sources reflect the changes in housing in which cows are in loose housing rather than restricted to a single stall and water source.

a. Percentage of operations by source of drinking water for any cows during the previous 12 months:

Water Source	Percent Operations					
	Dairy 1996		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Single cup/bowl waterer used by one cow only	52.5	(1.6)	10.7	(1.4)	11.4	(2.0)
Single cup/bowl waterer used by multiple cows	50.0	(1.8)	61.7	(1.8)	64.1	(2.4)
Water tank or trough (covered or uncovered)	77.9	(1.5)	89.1	(1.4)	93.2	(1.5)
Lake, pond, stream, river, etc.	37.1	(1.7)	35.1	(2.0)	33.4	(2.7)
Other source	1.1	(0.4)	2.1	(0.7)	3.9	(1.3)



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**Percentage of Operations by Source of Drinking Water for any Cows During the Previous 12 Months**


The frequency that water tanks/troughs were cleaned 13 or more times a year increased from 13.6 percent of operations in 1996 to 34.2 percent in 2007.

b. For operations with a water tank or trough, percentage of operations by average number of times per year water tank or trough was drained **and** cleaned:

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Percent Operations						
Number Times/Year	Dairy 1996		Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
0	8.4	(1.2)	6.2	(1.1)	4.6	(1.4)
1 to 4	51.8	(2.1)	46.5	(2.3)	37.1	(3.2)
5 to 12	26.2	(1.9)	22.3	(1.9)	24.1	(2.8)
13 or more	13.6	(1.4)	25.0	(1.9)	34.2	(2.8)
Total	100.0		100.0		100.0	

---

The percentage of operations that chlorinated drinking water for cows has not changed since 1996 and remains at approximately 9 percent. This percentage may not reflect water sources for cattle that are chlorinated prior to arriving at the operation, such as municipal water supplies.

c. Percentage of operations that usually chlorinated drinking water for cows:

Percent Operations					
Dairy 1996		Dairy 2002		Dairy 2007	
Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
10.7	(1.0)	9.8	(1.0)	8.7	(1.2)

## 7. Permanently removed cows

About one of four cows was permanently removed (excluding those that died) from operations in 2002 and 2007.

a. Percentage of cows permanently removed from the operation during the previous 12 months (excluding those that died):

Percent Cows*			
Dairy 2002		Dairy 2007	
Percent	Std. Error	Percent	Std. Error
24.9	(0.4)	25.8	(0.9)

\*As a percentage of cow inventory at the time of interview.

The majority of permanently removed cows were removed at 200 or more days in milk in 2002 and 2007. The percentage of permanently removed cows by days in milk did not change between 2002 and 2007.

b. Percentage of cows permanently removed during the previous 12 months, by days in milk:

	Percent Cows			
	Dairy 2002		Dairy 2007	
Days in Milk	Percent	Std. Error	Percent	Std. Error
Fewer than 50	15.6	(0.5)	16.2	(1.1)
50 to 199	24.1	(0.7)	22.6	(1.3)
200 or more	60.3	(0.9)	58.0	(1.8)
Dry cows			3.2	(0.4)
Total	100.0		100.0	



Photo courtesy of Judy Rodriguez

## C. Milk Quality and Milking Procedures

### 1. Bulk tank somatic cell count

Bulk tank somatic cell count (BTSCC) refers to the number of white blood cells (leukocytes) and secretory cells per milliliter of raw milk and is used as a measure of milk quality and udder health. Increased BTSCCs are generally associated with increased intramammary infection and decreased milk production. The current regulatory limit for BTSCCs in the United States is 750,000 cells/ml. Although the U.S. regulatory limit is 750,000 cells/ml, producers may lose quality premiums or receive less money for their milk if it does not meet the quality guidelines determined by the processor who purchases the milk.

The majority of operations had an average BTSCC between 100,000 and 299,000 cell/ml during each of the three study years.

Percentage of operations by average BTSCC for milk shipped during the previous 12 months:

BTSCC (cells/ml)	Percent Operations					
	Dairy 1996 <sup>1</sup>		Dairy 2002 <sup>2</sup>		Dairy 2007 <sup>3</sup>	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Less than 100,000	4.4	(0.7)	2.4	(0.6)	2.8	(1.0)
100,000 to 199,000	25.4	(1.6)	23.6	(1.9)	27.8	(2.6)
200,000 to 299,000	34.4	(1.7)	34.5	(2.1)	40.3	(2.8)
300,000 to 399,000	20.2	(1.5)	21.7	(1.7)	18.7	(2.0)
400,000 to 499,000	10.1	(1.2)	11.0	(1.4)	8.7	(1.9)
500,000 to 599,000	5.5	(0.9)	6.8	(1.1)	1.7	(1.0)
Total	100.0		100.0		100.0	

Question variation: <sup>1</sup>1996 question asked about previous 6 months. <sup>2</sup>2002 question asked about previous 90 days. <sup>3</sup>2007 question asked about previous 12 months.

2. Milking frequency

Milk production can be negatively affected by intramammary pressure. Frequent milking during peak production can shorten periods of increased intramammary pressure. Although increased milking frequency opens the teat canal more often, the risk for intramammary infection does not appear to be increased. Evidence suggests that increasing the times per day that fresh cows (cows less than 30 days in milk) are milked increases milk production during that period and persists throughout lactation.

More than 9 of 10 operations milked the majority of cows twice a day in 2002 and 2007.

Percentage of operations by number of times per day the majority of cows\* were milked:

Percent Operations				
Times per Day	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
1	0.5	(0.4)	0.5	(0.4)
2	93.6	(0.8)	92.5	(0.9)
3	5.8	(0.7)	7.0	(0.8)
More than 3	0.1	(0.1)	0.0	(--)
Total	100.0		100.0	

\*Question variation: other than fresh cows specified in 2007.

**3. Udder and teat preparation**

The percentage of operations that forestripped all cows increased from 44.5 percent in 2002 to 58.9 percent in 2007. The percentage of operations that did not forestrip any cows decreased from 13.1 percent in 2002 to 7.4 percent in 2007.

a. Percentage of operations by use of forestripping:

<b>Percent Operations</b>				
	<b>Dairy 2002</b>		<b>Dairy 2007</b>	
<b>Forestripping</b>	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
All cows	44.5	(2.1)	58.9	(2.9)
Some cows	42.4	(2.1)	33.7	(2.8)
No cows	13.1	(1.5)	7.4	(1.6)
Total	100.0		100.0	

Iodophor was the predominant predip compound used during summer and winter in 2002 and 2007. The use of primary predip compounds did not change from 2002 to 2007.

b. Percentage of operations by primary *predip* compounds used as disinfectants, by season:

Percent Operations								
Season								
Summer					Winter			
Predip Compound	Dairy 2002		Dairy 2007		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Iodophor (iodine containing)	64.7	(2.4)	59.6	(2.9)	65.1	(2.4)	59.7	(2.9)
Chlorhexidine	9.4	(1.6)	11.7	(2.1)	10.6	(1.7)	11.8	(2.1)
Fatty acid based	4.7	(1.1)	2.5	(0.7)	4.7	(1.1)	2.5	(0.7)
Quaternary ammonium	0.3	(0.3)	0.3	(0.2)	0.5	(0.4)	0.3	(0.2)
Phenols	0.3	(0.2)	0.1	(0.1)	0.3	(0.2)	0.1	(0.1)
Chlorine product	3.7	(0.8)	7.2	(1.5)	3.7	(0.8)	7.1	(1.5)
Other	7.1	(1.2)	7.9	(1.6)	6.9	(1.2)	8.0	(1.6)
None	9.8	(1.6)	10.7	(1.8)	8.2	(1.5)	10.5	(1.8)
Total	100.0		100.0		100.0		100.0	

Single-use paper towel was the most common drying method used in 2002 and 2007. In summer and winter, the percentage of operations that air dried teats prior to milking decreased from about 27 percent in 2002 to about 12 percent in 2007. The use of single-use cloth towels increased from 2002 (10.2 and 7.9 percent in summer and winter, respectively) to 2007 (21.5 and 21.6 percent in summer and winter, respectively).

c. Percentage of operations by the method used to dry teats *prior* to milking, and by season:

Percent Operations								
Season								
Summer					Winter			
Drying Method	Dairy 2002		Dairy 2007		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Air dry	27.0	(3.4)	12.4	(2.1)	27.4	(3.4)	12.3	(2.1)
Single-use cloth towel	10.2	(2.2)	21.5	(2.1)	7.9	(1.8)	21.6	(2.1)
Single-use paper towel	49.7	(3.9)	54.8	(2.8)	50.8	(3.8)	54.6	(2.8)
Multiple-use cloth towel	7.4	(1.6)	7.1	(1.3)	7.0	(1.5)	7.1	(1.3)
Multiple-use paper towel	4.2	(1.7)	0.6	(0.4)	5.4	(1.8)	0.6	(0.4)
Other	1.5	(1.0)	0.4	(0.3)	1.5	(1.0)	0.6	(0.3)
Not applicable—teats not wet prior to milking			3.2	(1.1)			3.2	(1.1)
Total	100.0		100.0		100.0		100.0	



#### 4. Postmilking procedures

As with predip compounds, iodophor was the predominant postdip compound used during summer and winter in 2002 and 2007. The use of primary postdip compounds in summer and winter at the operation level did not change from 2002 to 2007.

Percentage of operations by primary *postdip* compounds used as disinfectants, and by season:

Percent Operations								
Season								
Summer					Winter			
Predip Compound	Dairy 2002		Dairy 2007		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Iodophor (iodine containing)	71.1	(1.9)	69.8	(2.9)	69.7	(2.0)	67.8	(2.9)
Chlorhexidine	11.4	(1.4)	12.1	(2.1)	12.1	(1.4)	13.4	(2.2)
Fatty acid based	5.4	(0.8)	6.4	(1.4)	6.2	(0.9)	7.2	(1.5)
Quaternary ammonium	0.4	(0.3)	0.3	(0.2)	0.5	(0.3)	0.8	(0.5)
Phenols	0.4	(0.2)	0.0	(--)	0.4	(0.2)	0.0	(0.0)
Chlorine product	1.2	(0.4)	2.3	(1.1)	1.2	(0.4)	1.7	(0.8)
Other	3.8	(0.8)	3.9	(1.1)	3.7	(0.8)	3.8	(1.1)
None	6.3	(1.1)	5.2	(1.6)	6.2	(1.2)	5.3	(1.6)
Total	100.0		100.0		100.0		100.0	

### 5. Milking practices

The percentage of operations in which milkers wore gloves to milk all cows increased from 32.9 percent in 2002 to 55.2 percent in 2007. The percentage of cows on operations in which milkers wore gloves increased from 48.7 in 2002 to 76.8 percent in 2007.

Percentage of operations (and percentage of cows on these operations) in which milkers wore gloves to milk all cows:

Percent Operations				Percent Cows			
Dairy 2002		Dairy 2007*		Dairy 2002		Dairy 2007*	
Percent	Std. Error	Percent	Std. Error	Percent	Std. Error	Percent	Std. Error
32.9	(1.9)	55.2	(2.8)	48.7	(1.9)	76.8	(2.5)

\*Question variation: Specified latex or nitrile gloves in 2007.

### 6. Milking equipment

Less than 7.0 percent of operations used a backflush system in 2002 and 2007. There were no differences across herd sizes between 2002 and 2007 in the use of a backflush system.

a. Percentage of operations that used a backflush system in milking units, by herd size:

Percent Operations								
Herd Size (Number of Dairy Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Dairy 2002	4.9	(1.1)	9.8	(1.7)	20.7	(3.1)	6.7	(0.9)
Dairy 2007	5.9	(1.8)	8.6	(2.1)	9.3	(2.6)	6.8	(1.3)

Although there were no changes by herd size from 2002 to 2007 in the percentage of operations that used automatic takeoffs, the percentage of all operations increased from 36.0 percent in 2002 to 45.4 percent in 2007.

b. Percentage of operations that used automatic takeoffs, by herd size:

Percent Operations								
Herd Size (Number of Dairy Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Dairy 2002	21.3	(2.1)	71.0	(2.8)	93.3	(1.5)	36.0	(1.8)
Dairy 2007	30.2	(3.3)	76.9	(3.8)	89.5	(3.4)	45.4	(2.6)

## 7. Vaccination

There were no changes from 2002 to 2007 in the percentage of operations that administered coliform mastitis and *Salmonella* vaccines. As reported in both 2002 and 2007, about 4 of 10 operations vaccinated for coliform mastitis and about 1 of 10 vaccinated for *Salmonella*. *Salmonella* vaccine might also help prevent coliform mastitis.

a. Percentage of operations by type of vaccination used during the previous 12 months:

Percent Operations				
Vaccination Type	Dairy 2002 <sup>1</sup>		Dairy 2007 <sup>2</sup>	
	Pct.	Std. Error	Pct.	Std. Error
Coliform mastitis	36.0	(2.0)	37.6	(2.6)
<i>Salmonella</i>	10.7	(1.3)	13.4	(1.6)

<sup>1</sup>Question variation: Majority of cows.

<sup>2</sup>Question variation: All or some cows.

**8. Dry-off procedures/antibiotic treatment**

There were no differences between 2002 and 2007 in the percentage of operations by percentage of cows treated with dry-cow intramammary antibiotics at dry-off during the previous 12 months. More than 8 of 10 cows in 2002 and 2007 were on operations that dry treated 100.0 percent of cows.

a. Percentage of operations (and percentage of cows on these operations) by percentage of cows treated with dry-cow intramammary antibiotics at dry-off during the previous 12 months:

	Percent Operations				Percent Cows			
	Dairy 2002		Dairy 2007		Dairy 2002		Dairy 2007	
Percent Dry Cows Treated	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
0.0	5.9	(1.0)	9.9	(1.7)	4.3	(0.8)	5.9	(1.5)
1.0 to 33.0	7.1	(1.2)	5.6	(1.4)	3.7	(0.6)	2.7	(0.9)
33.1 to 66.0	2.9	(0.7)	3.0	(0.8)	2.0	(0.6)	2.4	(0.8)
66.1 to 99.9	8.9	(1.2)	9.2	(1.8)	6.6	(0.9)	7.3	(1.3)
100.0	75.2	(1.9)	72.3	(2.7)	83.4	(1.4)	81.7	(2.3)
Total	100.0		100.0		100.0		100.0	

The percentage of cows treated with cephalixin decreased from 42.1 percent in 2002 to 31.0 percent in 2007, while the use of penicillin G (procaine)/novobiocin increased from 5.8 to 13.2 percent. Ceftiofur hydrochloride was used to treat 7.0 percent of cows in 2007 and was not approved for use in 2002.

b. For cows treated with dry cow intramammary antibiotics during the previous 12 months, percentage of cows treated, by type of antibiotic:

Antibiotic	Percent Dry Cows <sup>1</sup> Treated			
	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Ceftiofur hydrochloride <sup>2</sup>			7.0	(2.0)
Cephalexin (benzathine)	42.1	(1.8)	31.0	(2.3)
Cloxacillin (benzathine)	12.8	(1.4)	7.9	(1.8)
Erythromycin	0.8	(0.3)	0.3	(0.1)
Novobiocin	5.7	(1.1)	2.5	(1.9)
Penicillin G (procaine)	1.3	(0.4)	1.7	(0.5)
Penicillin G (procaine)/dihydrostreptomycin	31.7	(2.0)	36.9	(3.2)
Penicillin G (procaine)/novobiocin	5.8	(1.0)	13.2	(2.4)
Other	0.2	(0.1)	0.0	(--)

<sup>1</sup>As a percentage of cows dry treated during the previous 12 months. Some cows were treated with more than one antibiotic.

<sup>2</sup>Approved for use in dry cows in 2005.

**D. Antibiotic Use**

**NOTE: In this section, the terms antibiotic and antimicrobial are used synonymously (See Terms Used in This Report, p 4).**

**1. Preweaned heifers**

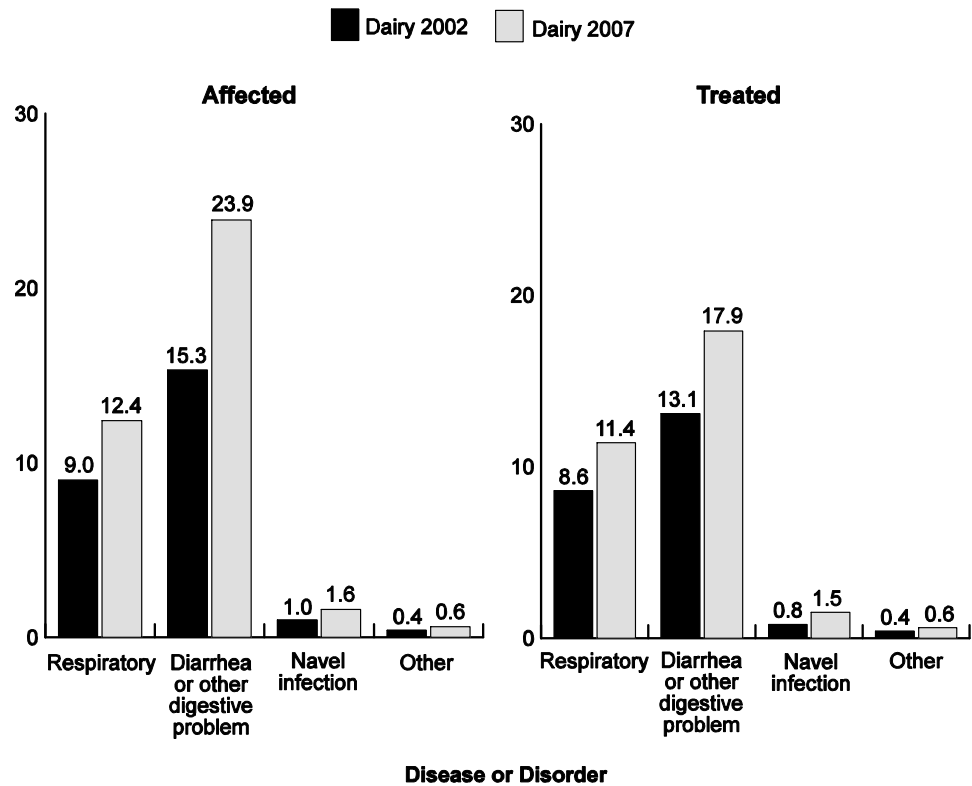
Diarrhea or other digestive problem was the single most common disease or disorder affecting preweaned heifer calves in 2002 and 2007, and a higher percentage of preweaned heifers were affected in 2007 (23.9 percent) compared with 2002 (15.3 percent). There were no differences between 2002 and 2007 in the percentages of preweaned heifers affected or treated for respiratory disease. Nor was there a difference in the percentage of heifers treated with antibiotics for diarrhea or other digestive problem between 2002 and 2007. The percentage of preweaned heifers treated for navel infection in 2007 was slightly higher than in 2002 (1.5 and 0.8 percent, respectively).

a. Percentage of preweaned heifers affected with the following diseases or disorders during the previous 12 months and percentage treated with antibiotics:

<b>Percent Preweaned Heifers*</b>								
<b>Disease or Disorder</b>	<b>Affected</b>				<b>Treated</b>			
	<b>Dairy 2002</b>		<b>Dairy 2007</b>		<b>Dairy 2002</b>		<b>Dairy 2007</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Respiratory	9.0	(0.5)	12.4	(1.3)	8.6	(0.5)	11.4	(1.3)
Diarrhea or other digestive problem	15.3	(0.9)	23.9	(1.9)	13.1	(0.8)	17.9	(1.7)
Navel infection	1.0	(0.1)	1.6	(0.2)	0.8	(0.1)	1.5	(0.2)
Other	0.4	(0.1)	0.6	(0.2)	0.4	(0.1)	0.6	(0.2)

\*As a percentage of dairy heifer calves born alive.

**Percentage of Preweaned Heifers Affected with the Following Diseases or Disorders During the Previous 12 Months and Percentage Treated with Antibiotics**



The percentage of preweaned heifers affected with a specific disease or disorder and treated with an antibiotic did not change between 2002 and 2007.

b. Of preweaned heifers affected with the following diseases or disorders during the previous 12 months, percentage treated with an antibiotic:

Percent Affected Preweaned Heifers Treated				
Disease or Disorder	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Respiratory	95.6	(1.1)	93.4	(2.3)
Diarrhea or other digestive problem	85.7	(2.0)	74.5	(4.8)
Navel infection	82.8	(4.9)	92.3	(2.4)
Other	96.9	(2.0)	97.2	(1.9)

In 2002 and 2007, florfenicol and noncephalosporin beta-lactam were the primary antibiotics used for preweaned heifers with respiratory disease on more than 10 percent of operations. Although the primary antibiotic used on operations for diarrhea or other digestive problem did not change, a higher percentage of operations had heifers affected with diarrhea in 2007 than in 2002 (79.5 and 66.2 percent, respectively). A lower percentage of operations that had heifers with diarrhea or other digestive problem did not treat affected heifers in 2007 compared with 2002 (17.4 and 7.0 percent, respectively). The use of noncephalosporin beta-lactam as the primary antibiotic used for navel infection increased from 11.4 percent of operations in 2002 to 21.2 percent in 2007. Additionally, in 2007 a higher percentage of operations had preweaned heifers with navel infections than in 2002 (31.2 and 17.0 percent, respectively), and a higher percentage of operations used any antibiotic to treat navel infections in 2007 than in 2002 (28.7 and 15.2 percent, respectively).



c. Percentage of operations (including those not reporting diseases or disorders) by primary antibiotic used to treat preweaned heifers during the previous 12 months, and by disease or disorder treated:

Percent Operations								
Disease/Disorder								
Primary Antibiotic Used	Respiratory		Diarrhea/ Other Digestive Problem		Navel Infection		Other	
	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007
	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)
Aminocyclitol*		0.0 (0.0)		1.7 (0.7)		0.0 (--)		0.0 (--)
Aminoglycoside	1.1 (0.4)	0.6 (0.4)	6.0 (1.0)	4.0 (1.1)	0.3 (0.2)	0.0 (0.0)	0.3 (0.3)	0.4 (0.4)
Noncephalosporin beta-lactam	13.9 (1.7)	11.6 (2.0)	12.4 (1.6)	9.4 (1.8)	11.4 (1.3)	21.2 (2.5)	1.1 (0.4)	1.4 (0.7)
Cephalosporin	6.9 (1.0)	8.2 (1.5)	4.7 (0.8)	5.6 (1.1)	1.1 (0.4)	2.2 (0.6)	0.1 (0.0)	0.5 (0.4)
Florfenicol	11.8 (1.4)	18.3 (2.2)	2.3 (0.6)	4.0 (1.1)	0.6 (0.4)	1.1 (0.5)	0.2 (0.1)	0.0 (0.0)
Macrolide	9.6 (1.3)	15.2 (2.1)	3.4 (0.9)	1.5 (0.5)	0.3 (0.3)	0.8 (0.4)	0.1 (0.1)	0.3 (0.2)
Sulfonamide	2.8 (0.8)	1.9 (0.7)	13.8 (1.6)	9.2 (1.5)	0.1 (0.1)	0.9 (0.9)	0.0 (--)	0.2 (0.1)
Tetracycline	9.7 (1.2)	8.9 (1.7)	12.8 (1.4)	16.2 (2.3)	1.4 (0.4)	1.4 (0.4)	0.6 (0.3)	1.0 (0.6)
Other/unknown	1.9 (0.5)	2.0 (0.7)	3.8 (0.8)	10.5 (1.8)	0.0 (0.0)	1.1 (0.6)	0.0 (--)	0.7 (0.5)
Any antibiotic	57.7 (2.3)	66.7 (2.8)	59.2 (2.2)	62.1 (2.8)	15.2 (1.5)	28.7 (2.6)	2.4 (0.6)	4.5 (1.1)
No treatment but disease	0.5 (0.3)	1.4 (0.6)	7.0 (1.2)	17.4 (2.2)	1.8 (0.6)	2.5 (0.7)	0.3 (0.2)	0.2 (0.2)
No disease or disorder	41.8 (2.3)	31.9 (2.8)	33.8 (2.1)	20.5 (2.4)	83.0 (1.6)	68.8 (2.7)	97.3 (0.6)	95.3 (1.2)
Total	100.0		100.0		100.0		100.0	

\*Included in "other" in 2002.

In 2007, 11.4 percent of preweaned heifers were treated for respiratory disease; 17.9 percent were treated for diarrhea or other digestive problem; and 1.5 percent were treated for navel infection (see table 1a). Table d. on the following page presents the primary antibiotic used to treat these preweaned heifers.

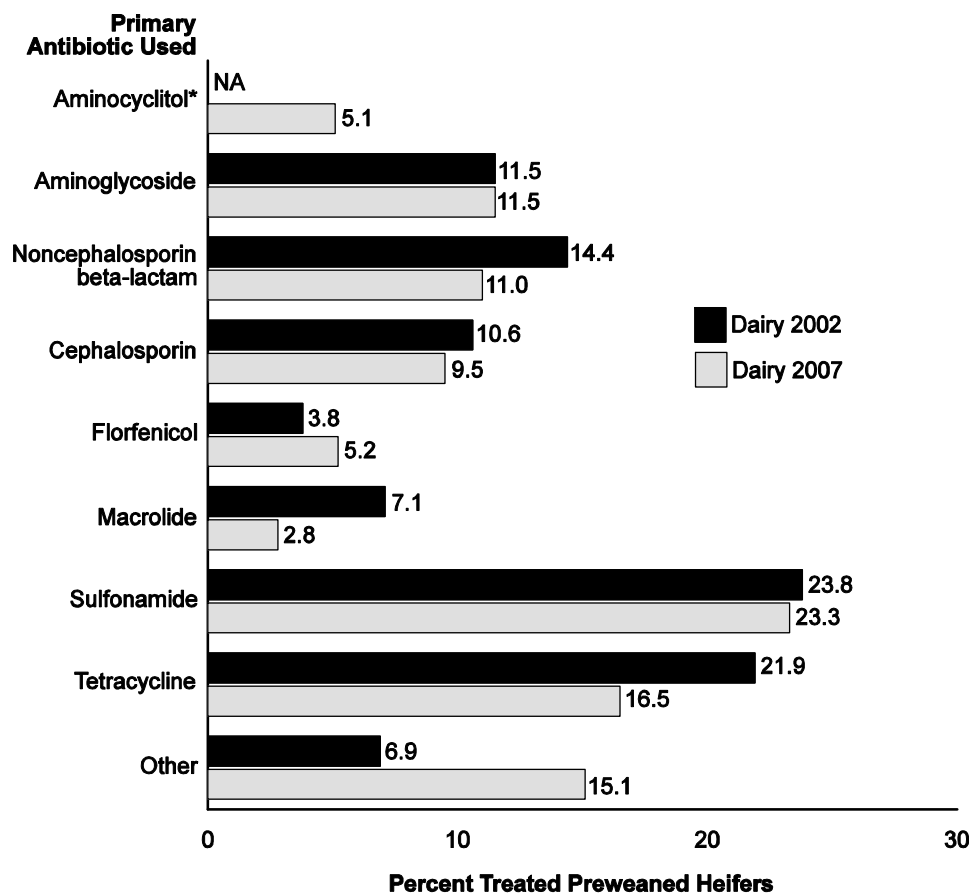
The percentage of preweaned heifers by primary antibiotic used to treat a disease or disorder did not change between 2002 to 2007. For both study periods, more than 14 percent of heifers treated for respiratory disease were on operations that primarily used cephalosporin, florfenicol, or macrolide to treat respiratory disease. In 2002 and 2007, sulfonamide and tetracycline were the primary antibiotics used to treat more than 15.0 percent of heifers with diarrhea or other digestive problem. The majority of preweaned heifers treated for navel infection were on operations that primarily used noncephalosporin beta-lactam antibiotics to treat navel infections.

d. Of preweaned heifers treated with antibiotics for the following diseases or disorders during the previous 12 months (see table 1a, p 41), percentage of preweaned heifers by primary antibiotic used to treat disease or disorder:

Percent Treated Preweaned Heifers								
	Disease/Disorder							
	Respiratory		Diarrhea/ digestive		Navel Infection		Other	
	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007
Primary Antibiotic Used	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)
Aminocyclitol*		0.1 (0.1)		5.1 (2.0)		0.0 (--)		0.0 (--)
Aminoglycoside	1.8 (0.7)	2.4 (1.7)	11.5 (2.5)	11.5 (3.9)	0.5 (0.5)	0.3 (0.2)	12.7 (8.5)	0.9 (0.9)
Noncephalosporin beta-lactam	14.5 (2.0)	7.9 (2.1)	14.4 (2.3)	11.0 (2.8)	80.5 (4.2)	69.6 (7.9)	28.5 (9.9)	12.9 (6.4)
Cephalosporin	14.6 (2.0)	24.6 (8.5)	10.6 (2.0)	9.5 (2.3)	4.8 (2.1)	5.0 (1.7)	0.8 (0.8)	4.0 (3.4)
Florfenicol	29.3 (3.3)	25.4 (5.5)	3.8 (1.1)	5.2 (1.8)	3.9 (2.6)	3.7 (2.0)	19.1 (13.1)	0.2 (0.2)
Macrolide	16.1 (2.2)	19.8 (3.7)	7.1 (1.8)	2.8 (1.6)	1.2 (1.1)	11.6 (8.9)	0.9 (0.8)	15.2 (10.3)
Sulfonamide	3.9 (1.4)	3.3 (1.8)	23.8 (2.7)	23.3 (6.2)	0.4 (0.3)	1.8 (1.8)	0.0 (--)	10.2 (9.1)
Tetracycline	17.9 (2.7)	13.2 (3.3)	21.9 (3.2)	16.5 (2.9)	8.7 (2.8)	6.7 (3.2)	38.0 (13.5)	24.8 (16.5)
Other	1.9 (0.6)	3.3 (1.5)	6.9 (1.5)	15.1 (3.0)	0.0 (--)	1.3 (0.6)	0.0 (--)	31.8 (18.6)
Total	100.0		100.0		100.0		100.0	

\*Included in "other" in 2002.

**Of Preweaned Heifers Treated with Antibiotics for Diarrhea or Other Digestive Problem During the Previous 12 Months, Percentage of Preweaned Heifers by Primary Antibiotic Used to Treat Diarrhea or Other Digestive Problem**



\*Included in "other" in 2002.

## 2. Weaned heifers

Ionophores have not consistently been considered antibiotics, but according to Food and Drug Administration (FDA) guidelines ionophores are a type of antibiotic. Excluding ionophores, antibiotic use in weaned heifer rations remained the same between 2002 and 2007. However, when including ionophores as antibiotics, 50.9 percent of operations used antibiotics in weaned heifer rations to prevent disease or promote growth in 2007 compared with 17.5 percent in 2002.

a. Percentage of operations by use of antibiotics in weaned heifer rations to prevent disease or promote growth during the previous 12 months:

Antibiotic Usage	Percent Operations			
	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Antibiotics in heifer ration	17.5	(1.5)	18.2	(2.0)
Ionophores only in heifer ration*			32.7	(2.6)
Did not know if antibiotics were in heifer ration	2.0	(0.6)	2.3	(0.9)
No antibiotics in heifer ration	76.6	(1.7)	44.2	(2.8)
No weaned heifers on operation	3.9	(0.7)	2.6	(0.8)
Total	100.0		100.0	

\*Ionophores have not consistently been considered antibiotics, but according to FDA guidelines ionophores are a type of antibiotic.

Of operations that used antibiotics in weaned heifer rations, a lower percentage used chlortetracycline or sulfamethazine in 2007 than in 2002. In 2007, no operations used bacitracin methylene disalicylate or tylosin phosphate in weaned heifer rations.

b. For operations that used antibiotics in weaned heifer rations during the previous 12 months, percentage of operations by antibiotic used:

Antibiotic Used	Percent Operations			
	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Bacitracin methylene disalicylate	3.7	(1.8)	0.0	(--)
Bambermycin	0.9	(0.5)	0.5	(0.5)
Chlortetracycline compounds	62.4	(4.5)	14.4	(2.3)
Neomycin sulfate	4.6	(1.7)	4.1	(1.8)
Ionophores			84.9	(2.8)
Neomycin-oxytetracycline	14.5	(3.2)	5.4	(1.9)
Oxytetracycline compounds	21.5	(3.6)	10.9	(2.2)
Sulfamethazine	27.2	(4.1)	5.7	(1.5)
Tylosin phosphate	0.0	(0.0)	0.0	(--)
Virginiamycin	0.0	(--)	0.2	(0.2)
Other antibiotics	2.3	(2.1)	2.0	(1.4)

Respiratory disease was the most common disease or disorder affecting weaned heifers; however, the percentage of weaned heifers affected was less than 6 percent during 2002 and 2007. There were no differences between 2002 and 2007 in the percentages of weaned heifers affected or treated with antibiotics for a specific disease or disorder.

c. Percentage of weaned heifers affected with the following diseases or disorders during the previous 12 months and percentage treated with antibiotics:

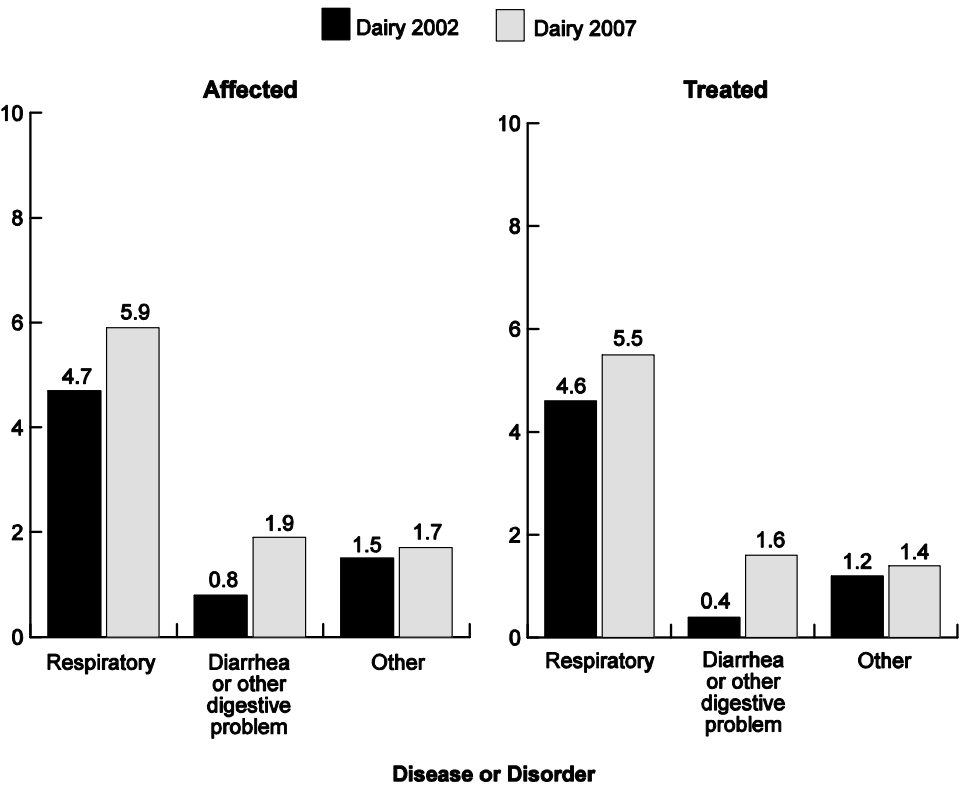
<b>Percent Weaned Heifers*</b>								
<b>Disease or Disorder</b>	<b>Affected</b>				<b>Treated</b>			
	<b>Dairy 2002</b>		<b>Dairy 2007</b>		<b>Dairy 2002</b>		<b>Dairy 2007</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Respiratory	4.7	(0.3)	5.9	(0.5)	4.6	(0.3)	5.5	(0.5)
Diarrhea or other digestive problem	0.8	(0.2)	1.9	(0.7)	0.4	(0.2)	1.6	(0.7)
Other	1.5	(0.2)	1.7	(0.6)	1.2	(0.2)	1.4	(0.6)

\*As a percentage of weaned heifer inventory on January 1.



Photo courtesy Dr. Jason Lombard

**Percentage of Weaned Heifers Affected with the Following Diseases or Disorders During the Previous 12 Months and Percentage Treated with Antibiotics**



The percentage of weaned heifers affected with a specific disease or disorder and treated with antibiotics did not differ between 2002 and 2007. Although the percentage of heifers affected and treated for diarrhea or other digestive problem appeared much lower in 2002 compared with 2007 (50.7 and 85.4 percent, respectively), the large standard errors associated with the estimates preclude identifying a change.

d. Of weaned heifers affected with the following diseases or disorders during the previous 12 months, percentage treated with an antibiotic:

Percent Affected Weaned Heifers Treated				
Disease or Disorder	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Respiratory	97.5	(0.9)	93.3	(1.8)
Diarrhea or other digestive problem	50.7	(12.6)	85.4	(7.8)
Other	86.3	(4.3)	81.3	(8.9)

The percentage of operations that had weaned heifers with respiratory disease increased from 41.9 percent in 2002 to 54.3 percent in 2007. However, the percentage of operations that used any antibiotic to treat respiratory disease in weaned heifers was similar in 2002 and 2007. A lower percentage of operations in 2002 than in 2007 reported respiratory disease but did not treat it (0.5 and 5.1 percent, respectively). A lower percentage of operations in 2002 than in 2007 used any antibiotic to treat diarrhea or other digestive problem in weaned heifers (3.5 and 7.4, respectively). “Other” diseases or disorders were treated with an antibiotic on 14.8 percent of operations in 2002 and 6.2 percent in 2007. There was also an increase in the percentage of operations reporting “other” diseases that did not treat with an antibiotic (0.7 percent in 2002 and 4.7 percent in 2007).

e. Percentage of operations (including those not reporting diseases or disorders) by primary antibiotic used to treat weaned heifers during the previous 12 months, and by disease/disorder:

	Percent Operations					
	Disease/Disorder					
	Respiratory		Diarrhea/Other Digestive Problem		Other	
	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007
Primary Antibiotic Used	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error
Aminocyclitol*		0.4 (0.2)		0.0 (--)		0.0 (--)
Aminoglycoside	0.0 (0.0)	0.0 (--)	0.3 (0.1)	0.2 (0.1)	0.3 (0.2)	0.0 (--)
Noncephalosporin beta-lactam	7.2 (1.1)	7.8 (1.6)	1.0 (0.4)	1.6 (0.8)	7.1 (1.0)	3.3 (1.1)
Cephalosporin	4.6 (0.8)	4.5 (1.3)	0.5 (0.1)	0.7 (0.2)	0.6 (0.3)	0.2 (0.2)
Florfenicol	8.0 (1.1)	12.4 (1.7)	0.0 (--)	0.4 (0.2)	0.0 (--)	0.0 (--)
Macrolide	6.5 (1.0)	8.0 (1.2)	0.0 (--)	0.2 (0.2)	0.8 (0.4)	0.2 (0.2)
Sulfonamide	2.2 (0.7)	1.5 (0.5)	0.8 (0.2)	0.4 (0.1)	0.4 (0.2)	0.2 (0.1)
Tetracycline	11.6 (1.3)	11.0 (1.7)	0.8 (0.3)	1.4 (0.5)	5.1 (0.8)	1.9 (0.6)
Other	1.3 (0.5)	3.6 (1.1)	0.1 (0.1)	2.5 (0.7)	0.5 (0.3)	0.4 (0.2)
Any antibiotic	41.4 (2.1)	49.2 (2.9)	3.5 (0.6)	7.4 (1.3)	14.8 (1.4)	6.2 (1.3)
No treatment but disease	0.5 (0.3)	5.1 (1.4)	3.1 (0.8)	4.2 (1.1)	0.7 (0.4)	4.7 (1.5)
No disease or disorder	58.1 (2.1)	45.7 (2.9)	93.4 (1.0)	88.4 (1.6)	84.5 (1.5)	89.1 (1.9)
Total	100.0	100.0	100.0	100.0	100.0	100.0

\*Included in “other” category in 2002.



In 2007, 5.5 percent of weaned heifers were treated for respiratory disease; 1.6 percent were treated for diarrhea or other digestive problem; and 1.4 percent were treated for “other” diseases or disorders (see table 2c, p 49). The following table presents the primary antibiotic used to treat these weaned heifers.

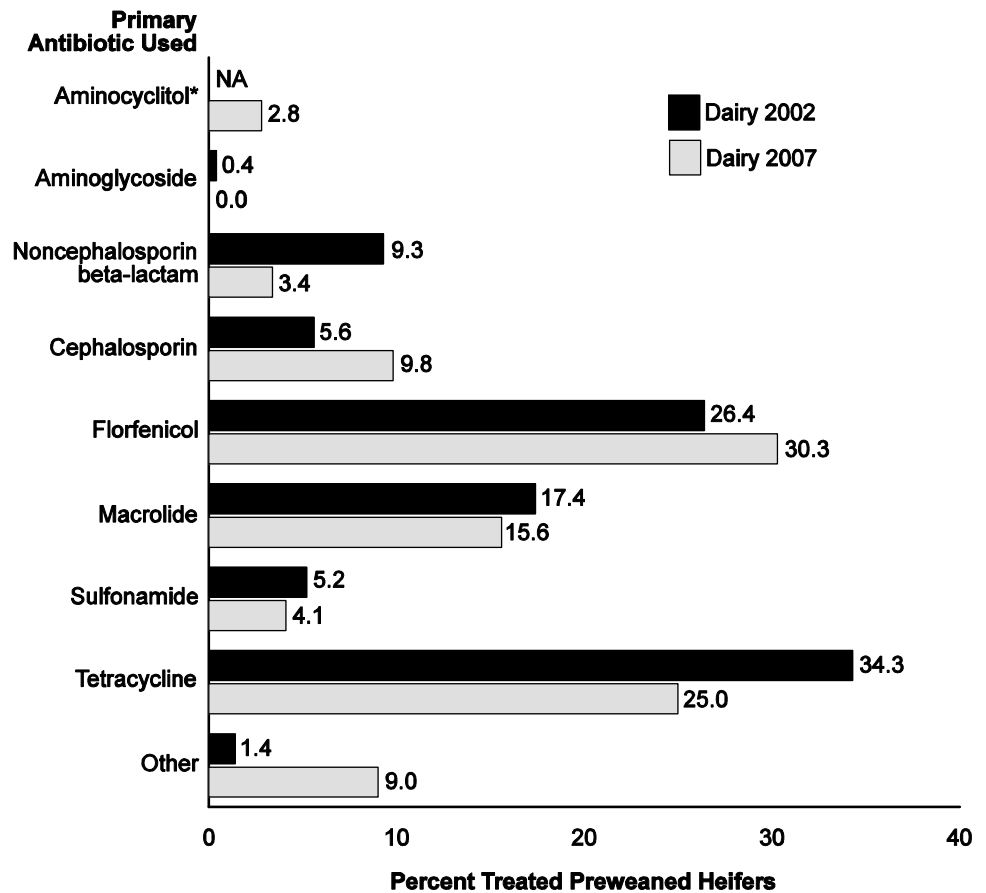
In 2002 and 2007, florfenicol, macrolide, and tetracycline were the primary antibiotics used to treat respiratory disease in more than 15 percent of weaned heifers. The percentage of treated weaned heifers on operations that primarily used noncephalosporin beta-lactam antibiotics decreased from 9.3 percent in 2002 to 3.4 percent in 2007.

f. Of weaned heifers treated with antibiotics during the previous 12 months (see table 2c, p 49), percentage of weaned heifers by primary antibiotic used for the following diseases/disorders:

Percent Treated Weaned Heifers						
Primary Antibiotic Used	Disease/Disorder					
	Respiratory		Diarrhea/Digestive		Other	
	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007
	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error
Aminocyclitol*		2.8 (2.5)		0.0 (--)		0.0 (--)
Aminoglycoside	0.4 (0.4)	0.0 (--)	9.2 (7.8)	0.0 (--)	1.3 (1.3)	0.0 (--)
Noncephalosporin beta-lactam	9.3 (1.5)	3.4 (0.8)	12.6 (7.2)	3.9 (2.8)	41.3 (7.2)	24.1 (14.2)
Cephalosporin	5.6 (1.2)	9.8 (2.8)	54.3 (20.0)	3.2 (2.3)	3.7 (2.3)	0.9 (0.9)
Florfenicol	26.4 (3.8)	30.3 (4.9)	0.0 (--)	10.0 (8.3)	0.0 (--)	0.0 (--)
Macrolide	17.4 (3.4)	15.6 (3.2)	0.0 (--)	0.2 (0.2)	2.3 (1.2)	0.5 (0.4)
Sulfonamide	5.2 (1.8)	4.1 (1.7)	11.0 (5.7)	2.0 (1.2)	3.0 (1.6)	1.7 (1.4)
Tetracycline	34.3 (3.9)	25.0 (4.7)	11.8 (6.7)	55.1(22.2)	46.2 (6.8)	67.0 (16.2)
Other	1.4 (0.7)	9.0 (3.5)	1.1 (1.2)	25.6(15.1)	2.2 (1.3)	5.8 (4.1)
Total	100.0	100.0	100.0	100.0	100.0	100.0

\*Included in “other” category in 2002.

**Of Weaned Heifers Treated with Antibiotics for Respiratory Disease During the Previous 12 Months, Percentage of Weaned Heifers by Primary Antibiotic Used to Treat Respiratory Disease**



\*Included in "other" in 2002.

### 3. Cows

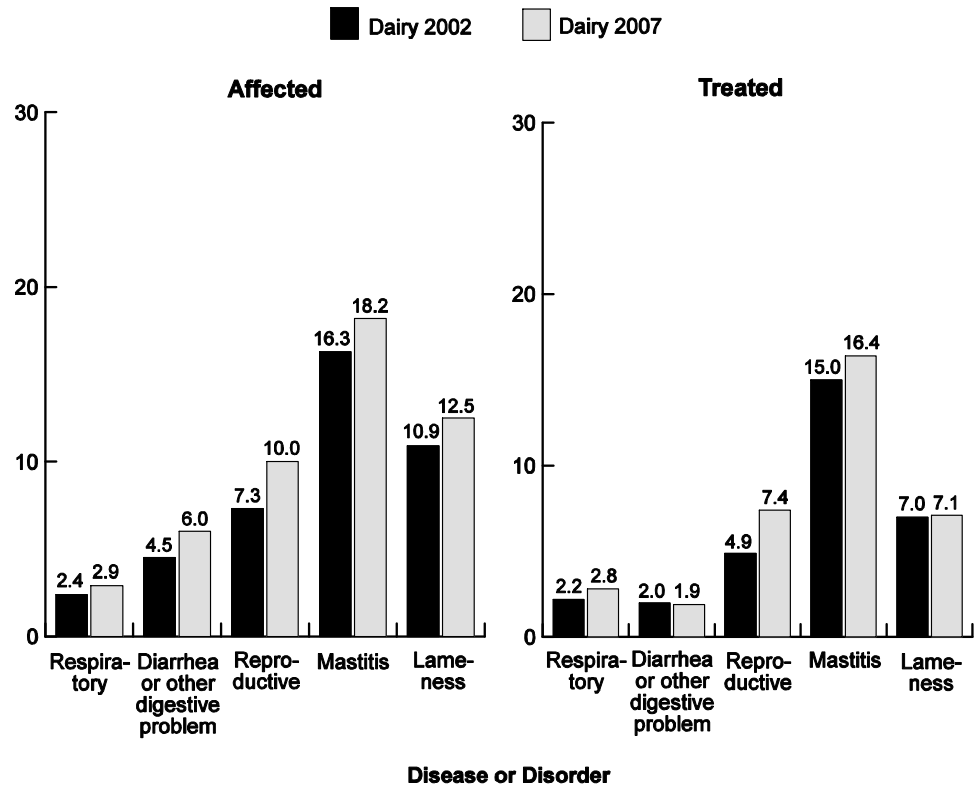
The percentage of cows with reproductive disease increased from 7.3 percent in 2002 to 10.0 percent in 2007, and the percentage treated for reproductive disease increased from 4.9 percent in 2002 to 7.4 percent in 2007.

a. Percentage of cows affected with the following diseases or disorders during the previous 12 months and percentage treated with antibiotics:

Percent Cows*								
Disease or Disorder	Affected				Treated			
	Dairy 2002		Dairy 2007		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Respiratory	2.4	(0.2)	2.9	(0.2)	2.2	(0.1)	2.8	(0.2)
Diarrhea or other digestive problem	4.5	(0.3)	6.0	(0.6)	2.0	(0.2)	1.9	(0.2)
Reproductive	7.3	(0.4)	10.0	(0.7)	4.9	(0.3)	7.4	(0.7)
Mastitis	16.3	(0.7)	18.2	(0.9)	15.0	(0.7)	16.4	(0.8)
Lameness	10.9	(0.7)	12.5	(0.9)	7.0	(0.6)	7.1	(0.7)
Other	0.6	(0.1)	0.7	(0.2)	0.2	(0.1)	0.5	(0.1)

\*As a percentage of cow inventory on January 1.

**Percentage of Cows Affected with the Following Diseases or Disorders During the Previous 12 Months and Percentage Treated with Antibiotics**



The percentage of cows affected with a specific disease and treated with antibiotics did not change between 2002 and 2007.

b. Of cows affected with the following diseases or disorders during the previous 12 months, percentage treated with an antibiotic:

Percent Affected Cows Treated				
Disease or Disorder	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Respiratory	92.6	(4.0)	96.4	(1.2)
Diarrhea or other digestive problem	44.7	(3.7)	32.3	(4.0)
Reproductive	66.9	(3.1)	74.7	(3.1)
Mastitis	91.9	(1.2)	89.9	(1.3)
Lameness	64.9	(3.3)	56.5	(4.1)
Other	41.4	(11.0)	66.2	(12.7)

In 2002, 52.5 percent of operations had cows with reproductive disease compared with 74.7 percent of operations in 2007. The percentage of operations that used cephalosporin as the primary antibiotic to treat reproductive disease in cows increased from 7.3 percent in 2002 to 17.2 percent in 2007. The percentage of operations that treated reproductive disease with antibiotics increased from 42.1 percent in 2002 to 52.9 percent in 2007. In addition, the percentage of operations that had cows with reproductive disease and did not treat them with an antibiotic increased from 2002 to 2007 (10.4 and 21.8 percent, respectively).

For mastitis treatment, the percentage of operations that used cephalosporin increased from 2002 to 2007 (33.3 and 44.5 percent, respectively), while the use of noncephalosporin beta-lactam and macrolide antibiotics to treat mastitis decreased from 2002 to 2007. The percentage of operations with lame cows increased from 60.2 percent in 2002 to 75.8 percent in 2007. The overall percentage of operations that used antibiotics for lameness remained the same between 2002 and 2007; however, the percentage of operations that had cows with lameness but did not treat them with antibiotics increased between 2002 and 2007 (8.6 and 17.2 percent, respectively).

c. Percentage of operations (including those not reporting diseases or disorders) by primary antibiotic used to treat cows during the previous 12 months, and by disease/disorder:

Percent Operations						
Disease/Disorder						
Primary Antibiotic Used	Reproductive		Mastitis		Lameness	
	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007
	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error
Aminocyclitol*		0.6 (0.6)		1.1 (0.6)		0.0 (--)
Aminoglycoside	0.1 (0.1)	0.0 (--)	0.9 (0.4)	0.5 (0.4)	0.1 (0.1)	0.0 (--)
Noncephalosporin beta-lactam	15.9 (1.7)	13.5 (2.0)	29.0 (2.1)	16.9 (2.0)	14.7 (1.6)	13.6 (2.1)
Cephalosporin	7.3 (1.0)	17.2 (2.0)	33.3 (2.2)	44.5 (2.9)	18.3 (1.6)	23.0 (2.2)
Florfenicol	0.0 (--)	0.2 (0.2)	0.1 (0.1)	0.0 (--)	0.0 (--)	0.3 (0.2)
Lincosamide			11.9 (1.5)	15.8 (2.1)		
Macrolide	0.3 (0.3)	0.0 (--)	2.7 (0.8)	0.3 (0.2)	0.5 (0.3)	0.2 (0.1)
Sulfonamide	1.8 (0.8)	0.1 (0.1)	1.0 (0.4)	1.8 (0.9)	1.8 (0.5)	1.4 (0.4)
Tetracycline	16.7 (1.7)	17.7 (2.1)	4.4 (0.9)	2.5 (0.7)	13.9 (1.6)	18.6 (2.2)
Other	0.0 (0.0)	3.6 (1.3)	1.0 (0.5)	2.0 (1.0)	2.3 (0.7)	1.5 (0.6)
Any antibiotic	42.1 (2.3)	52.9 (2.8)	84.3 (1.7)	85.4 (2.2)	51.6 (2.3)	58.6 (2.9)
No treatment but disease	10.4 (1.4)	21.8 (2.5)	1.0 (0.5)	7.7 (1.5)	8.6 (1.5)	17.2 (2.4)
No disease	47.5 (2.3)	25.3 (2.5)	14.7 (1.7)	6.9 (1.7)	39.8 (2.3)	24.2 (2.6)
Total	100.0	100.0	100.0	100.0	100.0	100.0

\*Included in "other" category in 2002.

In 2007, respiratory disease was reported on about 6 of 10 operations (59.3 percent). The highest percentage of operations (33.0 percent) that had cows with respiratory disease used cephalosporin as the primary antibiotic to treat the disease. The percentage of operations that had cows with diarrhea or other digestive problem increased from 43.1 percent in 2002 to 56.6 percent in 2007. A two-fold increase was observed between 2002 and 2007 in the percentage of operations that had cows with digestive disease but did not treat with antibiotics (15.2 and 31.6 of operations, respectively). No change occurred between 2002 and 2007 in the percentage of operations that treated cows with antibiotics for digestive disease. Less than 7.0 percent of operations treated “other” diseases with antibiotics in 2002 and 2007.

d. Percentage of operations (including those not reporting diseases or disorders) by primary antibiotic used to treat cows during the previous 12 months, and by disease/disorder:

	Percent Operations					
	Disease/Disorder					
	Respiratory		Diarrhea/Other Digestive Problem		Other	
	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007
Primary Antibiotic Used	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error
Aminocyclitol*		1.0 (0.5)		0.0 (--)		0.0 (--)
Aminoglycoside	0.5 (0.4)	0.3 (0.3)	1.0 (0.5)	0.6 (0.3)	0.0 (--)	0.0 (--)
Noncephalosporin beta-lactam	9.0 (1.4)	10.5 (1.8)	11.4 (1.4)	8.8 (1.6)	3.1 (0.9)	3.0 (1.1)
Cephalosporin	27.6 (2.0)	33.0 (2.7)	10.1 (1.3)	11.3 (1.8)	0.9 (0.5)	1.8 (0.7)
Florfenicol	1.3 (0.4)	2.4 (0.9)	0.2 (0.1)	0.3 (0.2)	0.0 (0.0)	0.0 (--)
Macrolide	1.9 (0.8)	1.2 (0.6)	0.3 (0.3)	0.6 (0.4)	0.0 (--)	0.0 (--)
Sulfonamide	1.9 (0.7)	1.7 (0.8)	2.8 (0.6)	1.3 (0.4)	0.0 (0.0)	0.0 (--)
Tetracycline	6.2 (1.0)	4.7 (1.0)	2.1 (0.6)	1.1 (0.4)	0.8 (0.5)	0.6 (0.4)
Other	0.6 (0.3)	1.0 (0.5)	0.0 (0.0)	1.1 (0.6)	0.0 (--)	1.5 (0.8)
Any antibiotic	49.0 (2.3)	55.8 (2.9)	27.9 (2.0)	25.0 (2.4)	4.8 (1.1)	6.9 (1.5)
No treatment but disease	1.5 (0.5)	3.5 (1.2)	15.2 (1.7)	31.6 (2.7)	3.3 (0.9)	3.5 (1.2)
No disease	49.5 (2.3)	40.7 (2.9)	56.9 (2.2)	43.4 (2.9)	91.9 (1.4)	89.6 (1.8)
Total	100.0	100.0	100.0	100.0	100.0	100.0

\*Included in “other” category in 2002.

In 2007, 7.4 percent of cows were treated for reproductive disease; 16.4 percent were treated for mastitis; and 7.1 percent were treated for lameness (see table 3a, p 54). Table e. on the following page presents the primary antibiotic used to treat these cows.

No changes occurred between 2002 and 2007 in the percentage of treated cows by primary antibiotic used for reproductive disease. Tetracycline, cephalosporin, and noncephalosporin beta-lactam remained the primary antibiotics used to treat cows with reproductive disease.

The percentage of cows treated for mastitis with noncephalosporin beta-lactam and macrolide antibiotics decreased from 2002 to 2007, while the use of cephalosporin increased.

The majority of cows were on operations that primarily used tetracycline, cephalosporin, or noncephalosporin beta-lactam antibiotics to treat lameness.

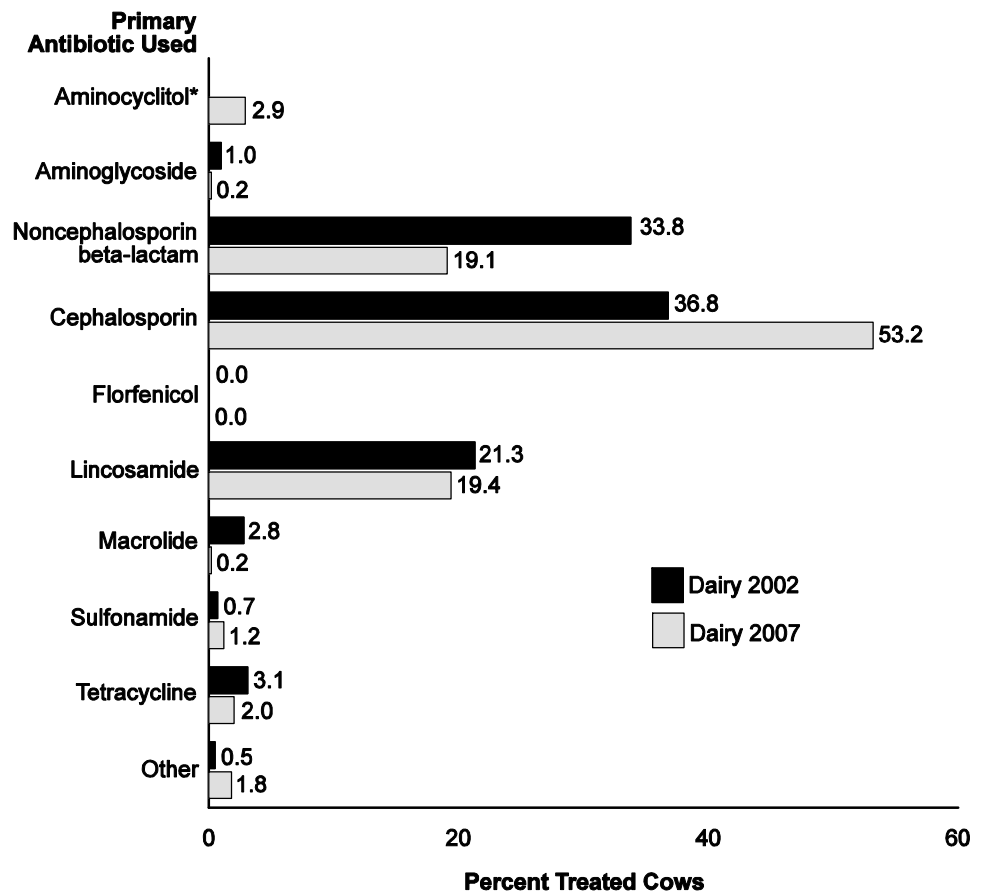


e. Of cows treated with antibiotics for the following diseases or disorders during the previous 12 months (see table 3a, p 54), percentage of cows by primary antibiotic used to treat disease or disorder:

Percent Treated Cows						
Disease/Disorder						
Primary Antibiotic Used	Reproductive		Mastitis		Lameness	
	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007
	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error
Aminocyclitol*		0.2 (0.2)		2.9 (2.0)		0.0 (--)
Aminoglycoside	0.1 (0.1)	0.0 (--)	1.0 (0.5)	0.2 (0.2)	0.1 (0.1)	0.0 (--)
Noncephalosporin beta-lactam	31.1 (3.4)	19.7 (3.8)	33.8 (2.9)	19.1 (3.0)	17.3 (3.3)	19.5 (5.4)
Cephalosporin	23.2 (3.0)	27.9 (4.7)	36.8 (3.1)	53.2 (4.1)	29.8 (4.4)	27.2 (3.8)
Florfenicol	0.0 (--)	0.2 (0.2)	0.0 (0.0)	0.0 (--)	0.0 (--)	0.5 (0.3)
Lincosamide			21.3 (3.2)	19.4 (3.1)		
Macrolide	0.1 (0.1)	0.0 (--)	2.8 (1.0)	0.2 (0.2)	0.2 (0.1)	0.5 (0.3)
Sulfonamide	4.2 (2.2)	0.2 (0.2)	0.7 (0.3)	1.2 (0.5)	4.4 (1.1)	4.2 (1.4)
Tetracycline	41.2 (4.1)	44.4 (6.0)	3.1 (0.8)	2.0 (0.7)	42.4 (5.1)	42.1 (5.4)
Other	0.1 (0.1)	7.4 (4.5)	0.5 (0.2)	1.8 (0.9)	5.8 (1.8)	6.0 (3.0)
Total	100.0	100.0	100.0	100.0	100.0	100.0

\*Included in "other" category in 2002.

**Of Cows Treated with Antibiotics for Mastitis During the Previous 12 months,  
Percentage of Cows by Primary Antibiotic Used to Treat Mastitis**



\*Included in "other" category in 2002.

In 2007, 2.8 percent of cows were treated for respiratory disease; 1.9 percent were treated for diarrhea or other digestive problem; and 0.5 percent were treated for "other" disease or disorder (see table 3a). Table f. on the following page presents the primary antibiotic used to treat these cows.

For respiratory disease and diarrhea or other digestive problem, the percentages of treated cows by primary antibiotic used did not change from 2002 to 2007. As opposed to the treatment of reproductive disease and lameness in the previous table, tetracycline was not used on a high percentage of cows treated for respiratory or digestive disease between 2002 and 2007. Cephalosporin was the

primary antibiotic used to treat the majority of cows with respiratory disease in 2002 and 2007 (67.3 and 70.5 percent of treated cows, respectively). About 7 of 10 cows treated for digestive disease were on operations that used noncephalosporin beta-lactam or cephalosporin as primary antibiotics for diarrhea or other digestive problem.

f. Of cows treated with antibiotics for the following diseases or disorders during the previous 12 months, percentage of cows by primary antibiotic used on the operation to treat a disease or disorder:

Percent Treated Cows						
Primary Antibiotic Used	Respiratory		Disease/Disorder Diarrhea/Other Digestive Problem		Other	
	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007	Dairy 2002	Dairy 2007
	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error
Aminocyclitol*		3.3 (1.6)		0.0 (--)		0.0 (--)
Aminoglycoside	0.4 (0.4)	0.6 (0.5)	3.2 (1.7)	6.4 (4.4)	0.0 (--)	0.0 (--)
Noncephalosporin beta-lactam	13.0 (1.9)	11.0 (2.5)	41.2 (4.3)	30.3 (5.7)	61.4 (15.1)	29.9 (11.6)
Cephalosporin	67.3 (3.1)	70.5 (3.9)	37.9 (4.3)	36.0 (5.9)	16.1 (8.0)	23.6 (11.5)
Florfenicol	2.1 (0.8)	1.9 (0.7)	0.4 (0.3)	0.4 (0.4)	0.1 (0.1)	0.0 (--)
Macrolide	1.3 (0.5)	1.1 (0.5)	0.7 (0.7)	1.1 (0.8)	0.0 (--)	0.0 (--)
Sulfonamide	3.1 (1.0)	2.8 (1.4)	11.9 (2.4)	15.6 (6.6)	7.1 (6.9)	0.0 (--)
Tetracycline	11.6 (2.0)	6.4 (1.6)	4.6 (1.7)	7.0 (2.9)	15.3 (9.8)	2.6 (1.9)
Other	1.2 (0.5)	2.4 (1.3)	0.1 (0.1)	3.2 (2.2)	0.0 (--)	43.9 (16.6)
Total	100.0	100.0	100.0	100.0	100.0	100.0

\*Included in "other" category in 2002.

**E. Surgical Procedures****1. Dehorning**

Between 1996 and 2007, the percentage of operations that dehorned heifer calves while on the operation decreased on large operations and on all operations. In 2007, 94.0 percent of operations still dehorned calves. The percentage of large operations that dehorned calves decreased from 88.9 percent in 1996 to 64.3 percent in 2007, which might be due to the increase in operations that have calves raised off-site.

a. Percentage of operations that routinely dehorned heifer calves while on the operation, by herd size:

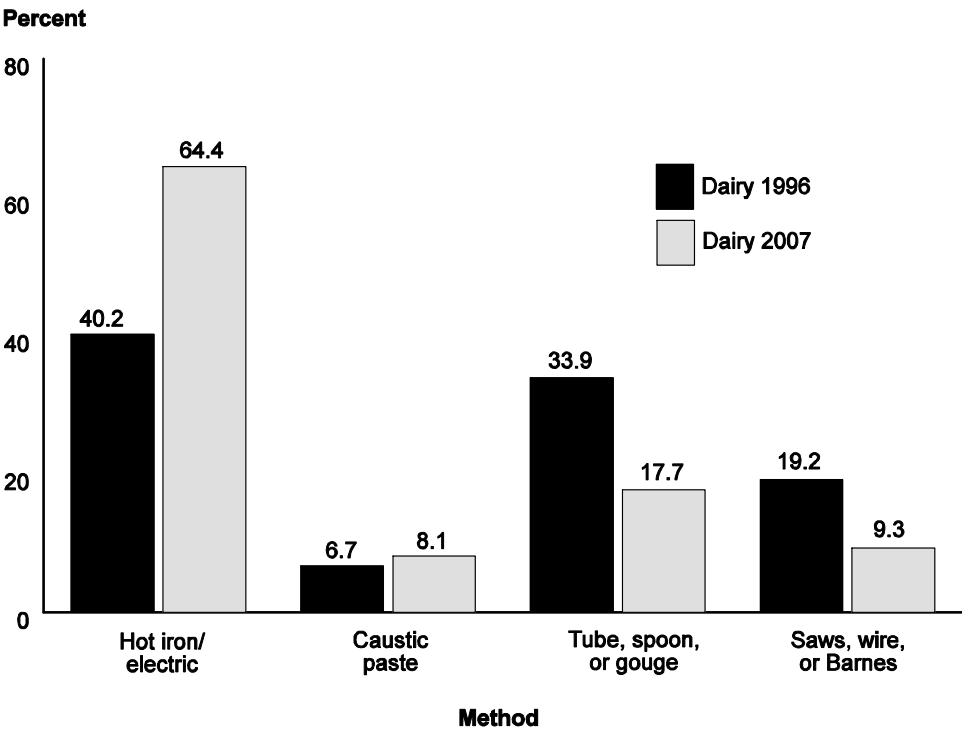
<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Study</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Dairy 1996	98.6	(0.5)	98.9	(0.4)	88.9	(4.1)	98.4	(0.4)
Dairy 2007	97.3	(1.6)	92.6	(2.8)	64.3	(6.3)	94.0	(1.4)

The use of hot iron/electric dehorner increased from 40.2 percent of operations in 1996 to 64.4 percent in 2007. In contrast, the use of tube, spoon, or gouge, and saws, wire, or Barnes dehorner decreased by about one-half in the same period.

b. For operations that routinely dehorned heifer calves, percentage of operations by primary method used to dehorn heifer calves:

Percent Operations				
Primary Method	Dairy 1996		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Hot iron/electric	40.2	(1.7)	64.4	(3.0)
Caustic paste	6.7	(1.0)	8.1	(1.8)
Tube, spoon, or gouge	33.9	(1.8)	17.7	(2.4)
Saws, wire, or Barnes	19.2	(1.5)	9.3	(1.6)
Other			0.5	(0.3)
Total	100.0		100.0	

**For Operations that Routinely Dehorned Heifer Calves, Percentage of Operations by Primary Method used to Dehorn Heifer Calves**



Approximately 4 of 10 operations that used a method to dehorn calves that caused bleeding disinfected the equipment between each animal.

c. For operations that routinely dehorned heifer calves with surgical dehorning equipment that causes bleeding, percentage of operations that chemically disinfected equipment between each animal:

Percent Operations			
Dairy 1996		Dairy 2007	
Percent	Std. Error	Percent	Std. Error
38.3	(2.6)	46.4	(4.9)

## 2. Tail docking

About one-half of operations tail-docked cows in each study period.

a. Percentage of operations by percentage of tail-docked cows:

Percent Operations				
Dairy 2002			Dairy 2007	
Percent Cows	Percent	Std. Error	Percent	Std. Error
0	49.5	(2.1)	51.4	(2.9)
1.0 to 24.9	17.5	(1.6)	10.8	(1.9)
25.0 to 75.9	9.1	(1.3)	8.9	(1.6)
76.0 to 99.9	8.0	(1.1)	14.3	(2.2)
100.0	15.9	(1.5)	14.6	(2.0)
Total	100.0		100.0	

Overall, 38.8 percent of cows had their tail docked in 2007 compared with 32.9 percent in 2002. A higher percentage of cows had their tail docked on medium operations than on small or large operations in 2002 and 2007.

b. Percentage of cows with docked tail, by herd size:

Percent Cows*								
Herd Size (Number of Cows)								
Study	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Dairy 2002	27.3	(2.3)	44.3	(2.6)	27.0	(2.7)	32.9	(1.5)
Dairy 2007	27.1	(3.2)	55.5	(3.6)	34.5	(4.3)	38.8	(2.4)

## F. Hoof Health

### 1. Lameness

The percentage of operations with cases of lameness in bred heifers increased from 36.5 percent in 2002 to 58.7 percent in 2007. The highest percentage of operations that had lameness in bred heifers reported that between 1.0 and 24.9 percent of bred heifers were affected.

From 1996 to 2007, almost all operations had at least 1.0 percent of cows affected by lameness during the previous 12 months. The percentage of operations that had 1.0 to 24.9 percent of cows affected by lameness decreased from 75.4 percent in 1996 to 63.9 percent in 2007. However, the percentage of operations that had 50.0 percent or more cows affected with lameness increased from 5.0 percent in 1996 to 12.0 percent in 2007.

a. Percentage of operations by percentage of lameness cases in bred heifers and cows during the previous 12 months:

Percent Operations						
Cattle Class						
Percent Lameness Cases	Bred Heifers			Cows		
	Dairy 1996 <sup>1 2</sup>	Dairy 2002 <sup>3</sup>	Dairy 2007 <sup>4</sup>	Dairy 1996 <sup>1 5</sup>	Dairy 2002 <sup>6</sup>	Dairy 2007 <sup>7</sup>
	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error	Std. Pct. Error
0	63.5 (1.7)	61.1 (2.1)	41.3 (3.1)	4.9 (0.8)	4.7 (1.0)	3.6 (1.1)
1.0 to 24.9	29.8 (1.6)	32.0 (1.9)	49.6 (3.0)	75.4 (1.6)	68.5 (2.0)	63.9 (2.7)
25.0 to 49.9	5.0 (0.8)	4.8 (0.9)	6.3 (1.7)	14.7 (1.3)	16.6 (1.5)	20.5 (2.3)
50.0 or more	1.7 (0.6)	2.1 (0.6)	2.8 (1.0)	5.0 (0.8)	10.2 (1.3)	12.0 (1.8)
Total	100.0	100.0	100.0	100.0	100.0	100.0

Question variation:

<sup>1</sup> 1996 question variation: asked number of animals that showed clinical signs of lameness.

<sup>2</sup> Cows in first lactation were used as a proxy for total bred heifers during the previous 12 months.

<sup>3</sup> As a percentage of home-raised replacements entering milking string in 2001.

<sup>4</sup> As a percentage of dairy-cow replacements entering milking string in 2006.

<sup>5</sup> As a percentage of milk cows on the operation January 1, 1996.

<sup>6</sup> As a percentage of milk cows on the operation at time of interview (February through April, 2002).

<sup>7</sup> As a percentage of milk cows on the operation at time of interview (February through August, 2007).



Digital dermatitis remained the primary cause of lameness in bred heifers, accounting for more than 50 percent of all lameness cases. In cows, digital dermatitis as a percentage of all lameness cases decreased from 63.4 percent in 1996 to 49.1 percent in 2007.

b. Percentage of lameness cases in bred heifers and cows due to digital dermatitis (hairy-heel warts), by cattle class:

Percent Lameness Cases											
Cattle Class											
Bred Heifers						Cows					
Dairy 1996		Dairy 2002		Dairy 2007		Dairy 1996		Dairy 2002		Dairy 2007	
Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
54.9	(3.3)	61.8	(2.8)	61.8	(5.5)	63.4	(2.5)	53.9	(2.0)	49.1	(2.8)

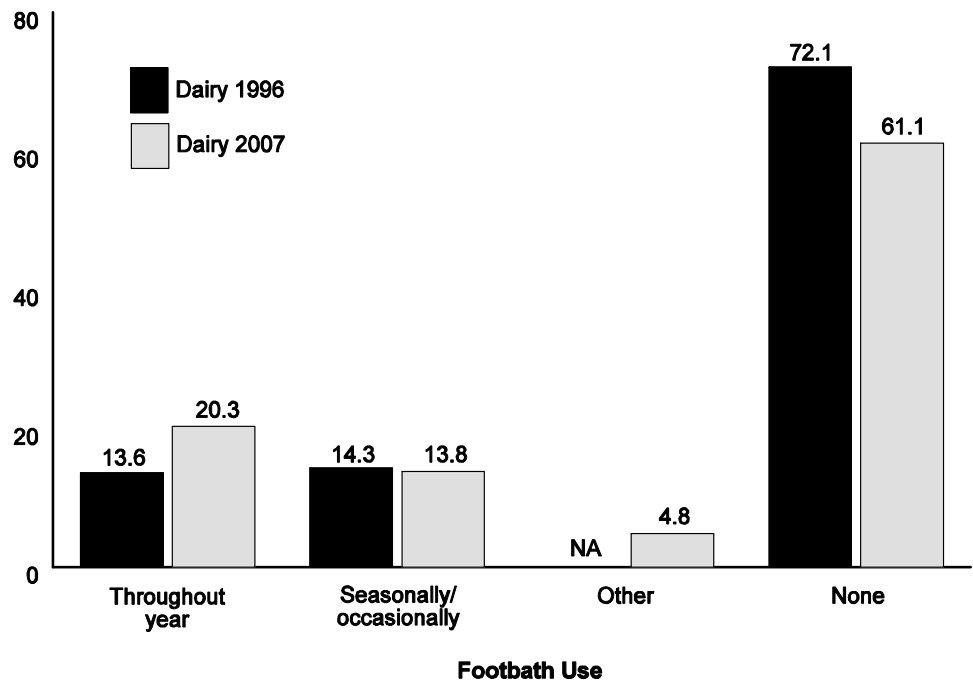
## 2. Footbath

Between 1996 and 2007, the percentage of operations that used footbaths for cows throughout the year increased from 13.6 percent in 1996 to 20.3 percent in 2007. Footbath use throughout the year increased as herd size increased.

Percentage of operations by use of a footbath for cows during the previous 12 months, and by herd size:

Percent Operations								
Herd Size (Number Dairy Cows)								
	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Dairy 1996	Dairy 2007	Dairy 1996	Dairy 2007	Dairy 1996	Dairy 2007	Dairy 1996	Dairy 2007
Footbath Use	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)	Pct. (SE)
Throughout year	6.4 (1.0)	5.2 (1.5)	34.9 (2.7)	46.3 (4.2)	66.3 (6.2)	80.8 (5.1)	13.6 (1.0)	20.3 (1.7)
Seasonally/ occasionally	12.2 (1.4)	12.9 (2.5)	22.8 (2.4)	18.6 (3.7)	9.2 (3.7)	5.5 (2.4)	14.3 (1.2)	13.8 (1.9)
Other		4.9 (2.1)		4.8 (2.1)		2.6 (2.2)		4.8 (1.5)
None	81.4 (1.7)	77.0 (3.3)	42.3 (2.7)	30.3 (3.9)	24.5 (5.5)	11.1 (4.2)	72.1 (1.5)	61.1 (2.6)
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

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**Percentage of Operations by Use of a Footbath for Cows During the Previous 12 Months****Percent**

### 3. Hoof trimming

Hoof trimming increased from 75.9 percent of operations in 1996 to 84.8 percent in 2007. A substantial increase occurred between 1996 and 2007 in the percentage of operations that trimmed 90 to 100 percent of cows during the previous 12 months (13.0 and 46.4 percent, respectively).

a. Percentage of operations by percentage of cows that had their hooves trimmed at least once during the previous 12 months:

Percent Operations				
Percent Cows	Dairy 1996		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
0	24.1	(1.6)	15.2	(2.4)
1 to 9	24.0	(1.6)	5.4	(1.5)
10 to 39	20.0	(1.5)	13.1	(2.1)
40 to 59	8.8	(1.0)	9.0	(1.6)
60 to 89	10.1	(0.9)	10.9	(1.9)
90 to 100	13.0	(1.0)	46.4	(3.0)
Total	100.0		100.0	

Professional hoof trimmers trimmed the majority of hooves on 50.8 percent of operations in 1996 and on 76.7 percent of operations in 2007. The percentages of operations in which a veterinarian or owner or operation personnel trimmed the majority of hooves decreased from 1996 to 2007. Between 1996 and 2007, the percentage of cows that had hooves trimmed by a professional hoof trimmer increased from 68.0 percent in 1996 to 80.1 percent in 2007.

b. For operations that had cows' hooves trimmed during the previous 12 months, percentage of operations (and percentage of cows on these operations) by the person who trimmed the **majority** of hooves:

	Percent Operations				Percent Cows			
	Dairy 1996		Dairy 2007		Dairy 1996		Dairy 2007	
Hoof Trimmer	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Professional hoof trimmer (not the operation's personnel)	50.8	(2.0)	76.7	(2.8)	68.0	(1.8)	80.1	(3.2)
Veterinarian (not the operation's personnel)	20.2	(1.8)	5.5	(1.8)	11.5	(1.0)	1.4	(0.4)
Owner or the operation's personnel	28.9	(1.9)	17.2	(2.4)	20.2	(1.7)	17.6	(3.1)
Other	0.1	(0.1)	0.6	(0.4)	0.3	(0.2)	0.9	(0.5)
Total	100.0		100.0		100.0		100.0	

The operation average number of visits made by a professional hoof trimmer or either a professional hoof trimmer or veterinarian during the previous 12 months increased in each herd size from 1996 to 2007. On medium operations, the average number of visits by a veterinarian to trim hooves decreased during the same period. For all operations, the operation average number of visits for professional hoof trimmers increased from 2.6 in 1996 to 7.1 in 2007.

c. For operations in which a professional hoof trimmer or veterinarian visited to trim hooves or to evaluate lame cows (as part of a routine trimming program), operation average number of visits made by professional hoof trimmer, veterinarian, or either during the previous 12 months, by herd size:

<b>Operation Average Number Visits</b>								
<b>Herd Size (Number of Cows)</b>								
	<b>Small</b>		<b>Medium</b>		<b>Large</b>		<b>All</b>	
	<b>(Fewer than 100)</b>		<b>(100-499)</b>		<b>(500 or More)</b>		<b>Operations</b>	
	<b>Dairy</b>	<b>Dairy</b>	<b>Dairy</b>	<b>Dairy</b>	<b>Dairy</b>	<b>Dairy</b>	<b>Dairy</b>	<b>Dairy</b>
	<b>1996</b>	<b>2007</b>	<b>1996</b>	<b>2007</b>	<b>1996</b>	<b>2007</b>	<b>1996</b>	<b>2007</b>
<b>Professional</b>	<b>Pct.</b>	<b>Pct.</b>	<b>Pct.</b>	<b>Pct.</b>	<b>Pct.</b>	<b>Pct.</b>	<b>Pct.</b>	<b>Pct.</b>
	<b>(SE)</b>	<b>(SE)</b>	<b>(SE)</b>	<b>(SE)</b>	<b>(SE)</b>	<b>(SE)</b>	<b>(SE)</b>	<b>(SE)</b>
Hoof trimmer	1.1 (0.1)	2.0 (0.2)	4.4 (0.3)	9.0 (0.5)	17.8 (1.7)	44.5 (4.0)	2.6 (0.1)	7.1 (0.5)
Veterinarian	2.3 (0.3)	1.3 (0.3)	2.0 (0.3)	0.7 (0.2)	0.4 (0.3)	0.2 (0.2)	2.2 (0.2)	1.1 (0.2)
Either	3.4 (0.3)	3.3 (0.3)	6.4 (0.4)	9.7 (0.6)	18.2 (1.7)	44.7 (4.0)	4.8 (0.2)	8.2 (0.5)

## G. Hemorrhagic Bowel Syndrome (HBS)

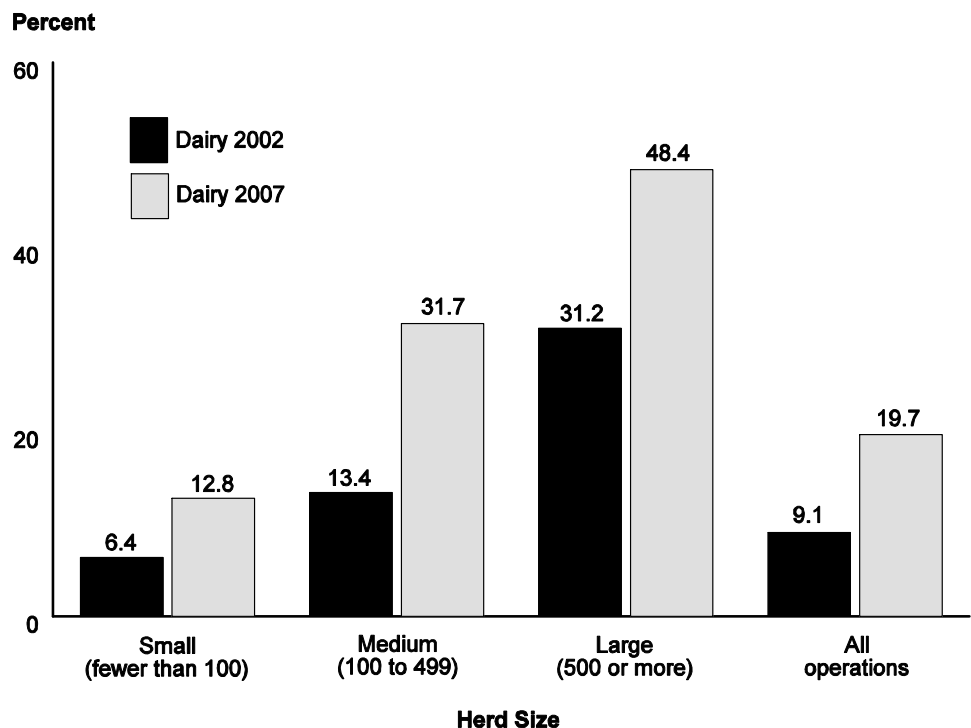
### 1. Clinical signs

Clinical signs consistent with HBS were observed in at least one cow on a lower percentage of medium operations in 2002 than in 2007 (13.4 and 31.7 percent, respectively). The percentage of operations in which at least one cow showed clinical signs consistent with HBS increased from 9.1 percent in 2002 to 19.7 percent in 2007.

Percentage of operations in which at least one cow showed clinical signs consistent with HBS during the previous 5 years, by herd size:

Percent Operations								
Herd Size (Number of Cows)								
Study	Small (Fewer than 100)		Medium (100-499)		Large (500 or More)		All Operations	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Dairy 2002	6.4	(1.3)	13.4	(1.9)	31.2	(3.8)	9.1	(1.1)
Dairy 2007	12.8	(2.6)	31.7	(4.1)	48.4	(6.2)	19.7	(2.1)

### Percentage of Operations in which at Least One Cow Showed Clinical Signs Consistent with HBS During the Previous 5 Years, by Herd Size



## H. Nutrient Management

### 1. Manure-handling methods

The percentage of operations that left manure on pasture as a manure-handling method increased for weaned-heifer and cow housing areas between 2002 and 2007. Similarly, the use of scrapers on drylots as a manure-handling method increased for both housing areas from 2002 to 2007. When comparing manure handling methods in weaned heifer and cow housing areas, a higher percentage of operations used gutter cleaners in cow housing areas, while bedded packs were used by a higher percentage of operations in weaned-heifer housing.

a. Percentage of operations by manure handling methods used in weaned-heifer and cow housing areas:

Percent Operations										
Housing Area										
Weaned-heifer*					Cow					
Manure-handling Method	Dairy 2002		Dairy 2007		Dairy 1996		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Manure left on pasture	73.8	(1.8)	88.5	(1.9)			72.4	(1.8)	85.3	(2.3)
Drylot scraped	50.3	(2.2)	75.3	(3.1)			57.0	(2.1)	82.5	(2.5)
Gutter cleaner	18.1	(1.8)	23.6	(2.8)	63.2	(1.3)	52.6	(1.9)	58.0	(2.5)
Alley scraper (mechanical or tractor)	42.7	(2.1)	47.3	(3.1)	57.7	(1.7)	51.4	(2.0)	54.9	(2.9)
Alley flush with fresh water	0.9	(0.3)	1.0	(0.4)	2.8	(0.3)	2.5	(0.5)	1.5	(0.4)
Alley flush with recycled water	2.3	(0.5)	3.5	(0.7)			4.4	(0.6)	5.0	(0.8)
Slotted floor	2.9	(0.7)	4.9	(1.2)			3.9	(0.6)	6.2	(1.2)
Bedded pack (manure pack)	62.1	(2.1)	60.6	(3.0)			31.6	(2.0)	40.0	(2.9)
Manure vacuum			0.6	(0.2)					1.5	(0.8)
Other method	4.8	(1.0)	6.5	(1.7)	1.1	(0.4)	3.9	(0.8)	5.3	(1.5)

\*For operations that housed weaned heifers.

There were no changes between 2002 and 2007 in methods used to handle the majority of manure in weaned-heifer housing or cow housing areas. In weaned-heifer housing, more than 9 percent of operations left manure on pasture, scraped the drylot, used a gutter cleaner, alley scraper, or bedded pack to handle the majority of manure. In cow-housing areas, gutter cleaners or alley scrapers were used by more than 30 percent of operations as the method of handling the majority of manure.

b. Percentage of operations by method used to handle the **majority** of manure in weaned-heifer and cow housing areas:

Percent Operations								
Housing Area								
Manure-handling Method	Weaned-heifer*				Cow			
	Dairy 2002		Dairy 2007		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Manure left on pasture	18.1	(1.7)	15.4	(2.1)	8.6	(1.2)	5.7	(1.3)
Drylot scraped	14.0	(1.5)	17.5	(2.3)	7.5	(1.0)	10.1	(1.5)
Gutter cleaner	9.1	(1.4)	14.6	(2.5)	43.4	(2.0)	42.8	(3.0)
Alley scraper (mechanical or tractor)	26.7	(1.9)	23.5	(2.5)	34.2	(1.9)	30.1	(2.4)
Alley flush with fresh water	0.3	(0.2)	0.0	(--)	0.6	(0.3)	0.2	(0.1)
Alley flush with recycled water	0.9	(0.2)	0.9	(0.3)	2.1	(0.3)	2.5	(0.5)
Slotted floor	1.3	(0.5)	1.5	(0.6)	1.1	(0.4)	1.4	(0.6)
Bedded pack (manure pack)	27.1	(2.0)	22.6	(2.6)	1.1	(0.5)	3.2	(1.2)
Manure vacuum			0.0	(0.0)			1.9	(1.1)
Other	2.5	(0.7)	4.0	(1.4)	1.4	(0.6)	2.1	(0.8)
Total	100.0		100.0		100.0		100.0	

\*For operations that housed weaned heifers.



## 2. Waste-storage and treatment systems

The only change in the use of waste-storage or treatment systems between 2002 and 2007 was the increase in the percentage of operations that used compost (4.3 and 11.1 percent, respectively). However, from 1996 to 2002 increases were seen in the percentages of operations that stored slurry in a tank, stored untreated slurry or liquid manure in an earthen basin, or used a manure pack.

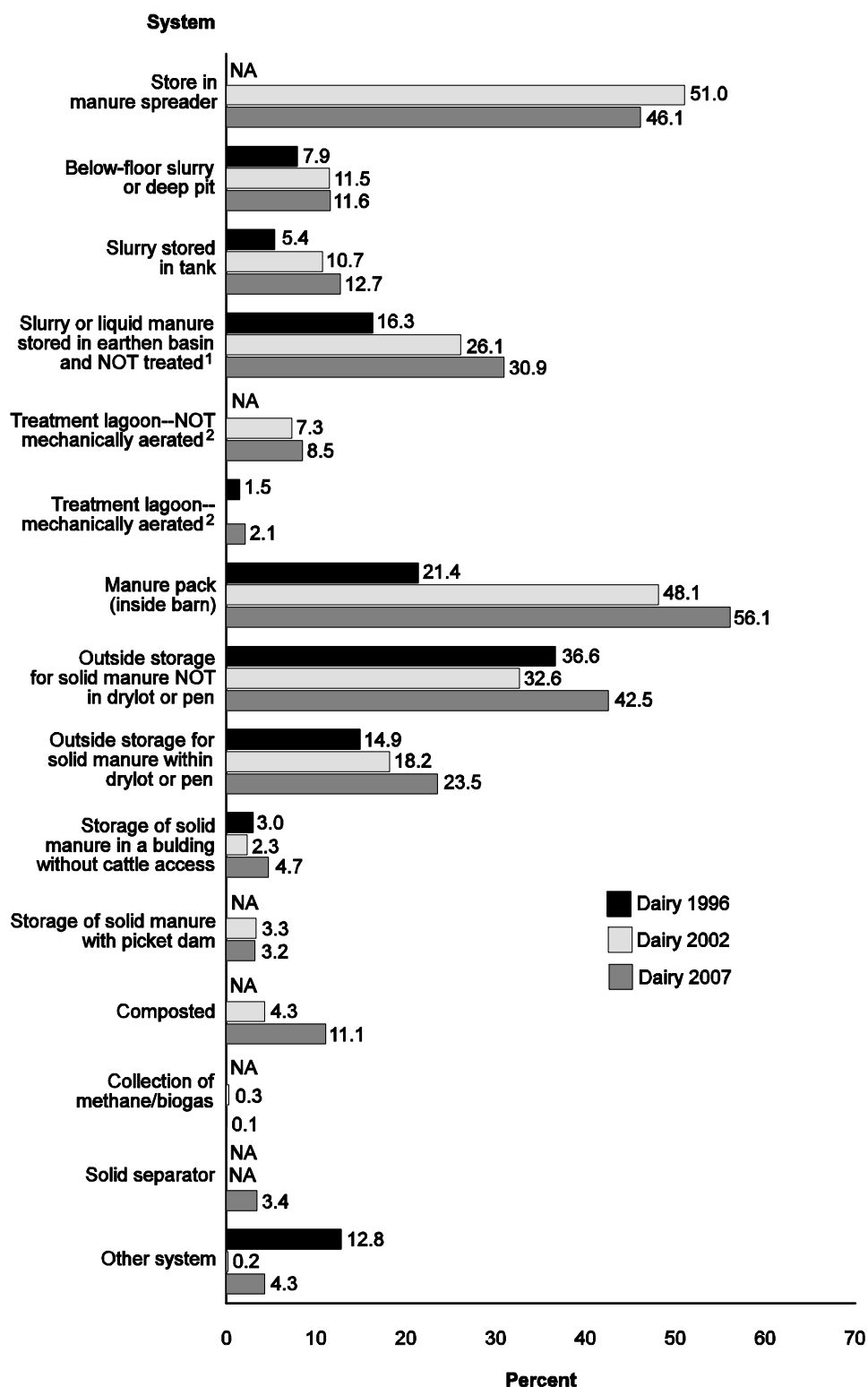
a. Percentage of operations by waste-storage and/or treatment system used:

Treatment System	Percent Operations					
	Dairy 1996		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Store in manure spreader			51.0	(2.0)	46.1	(2.9)
Below-floor slurry or deep pit	7.9	(0.8)	11.5	(1.2)	11.6	(1.6)
Slurry stored in tank	5.4	(0.7)	10.7	(1.2)	12.7	(1.8)
Slurry or liquid manure stored in earthen basin and NOT treated <sup>1</sup>	16.3	(1.2)	26.1	(1.8)	30.9	(2.6)
Treatment lagoon—NOT mechanically aerated <sup>2</sup>			7.3	(0.8)	8.5	(1.1)
Treatment lagoon—mechanically aerated <sup>2</sup>	1.5	(0.3)			2.1	(0.5)
Manure pack (inside barn)	21.4	(1.5)	48.1	(2.1)	56.1	(2.9)
Outside storage for solid manure NOT in drylot or pen	36.6	(1.8)	32.6	(2.0)	42.5	(3.0)
Outside storage for solid manure within drylot or pen	14.9	(1.4)	18.2	(1.6)	23.5	(2.5)
Storage of solid manure in a building without cattle access	3.0	(0.6)	2.3	(0.6)	4.7	(1.0)
Storage of solid manure with picket dam			3.3	(0.7)	3.2	(0.9)
Composted			4.3	(0.9)	11.1	(2.0)
Collection of methane/biogas			0.3	(0.2)	0.1	(0.0)
Solid separator					3.4	(0.5)
Other system	12.8	(0.9)	0.2	(0.1)	4.3	(1.2)

<sup>1</sup> Question variation: In 1996 only asked about slurry storage in earthen basin.

<sup>2</sup> These two categories were combined in Dairy 2002.

### Percentage of Operations by Waste-storage and/or Treatment System Used



<sup>1</sup>Question variation: In 1996 only asked about slurry storage in earthen basin.

<sup>2</sup>These two categories were combined in Dairy 2002.

### 3. Maximum manure storage capacity

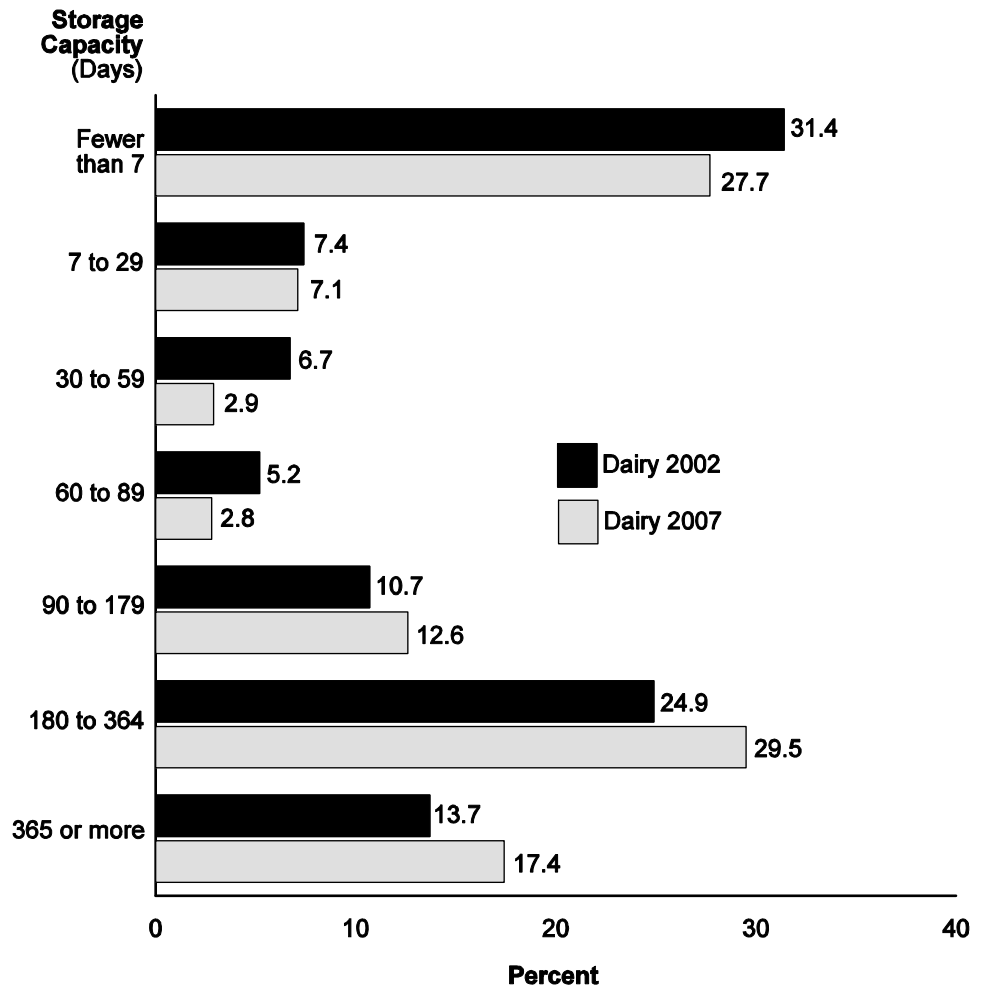
Producers were asked the following: “Assuming your facility was completely emptied of manure, and it was operating at full animal capacity, how many days could you operate and store manure before manure had to be removed from the storage facility?”

Overall, the days of storage capacity remained unchanged between 2002 to 2007.

Percentage of operations by maximum manure storage capacity:

	Percent Operations			
	Dairy 2002		Dairy 2007	
<b>Storage Capacity (Days)</b>	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Fewer than 7	31.4	(2.1)	27.7	(2.7)
7 to 29	7.4	(1.1)	7.1	(1.7)
30 to 59	6.7	(1.2)	2.9	(0.7)
60 to 89	5.2	(1.0)	2.8	(0.9)
90 to 179	10.7	(1.2)	12.6	(1.7)
180 to 364	24.9	(1.7)	29.5	(2.6)
365 or more	13.7	(1.4)	17.4	(2.2)
Total	100.0		100.0	

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**Percentage of Operations by Maximum Manure Storage Capacity**

#### 4. Manure use

Almost all operations applied manure to owned or rented land in all three study years. Between 1996 and 2007, the percentages of operations that sold manure or received other compensation or gave manure away increased.

Percentage of operations by method of manure use:

Method	Percent Operations					
	Dairy 1996		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Applied manure to land either owned or rented	98.9	(0.3)	98.3	(0.4)	99.1	(0.4)
Sold manure or received other compensation	2.3	(0.3)	4.8	(0.7)	7.1	(1.3)
Gave manure away	6.8	(0.8)	16.2	(1.5)	16.8	(2.0)
Used composted manure as bedding	4.7*	(0.7)	1.8	(0.3)	5.1	(1.4)
Other			0.1	(0.1)	0.9	(0.4)

\*Question variation: In 1996 inquired about composting manure, not using it as bedding.

#### 5. Manure application

Between 1996 and 2007, approximately 9 of 10 operations used a broadcast/solid spreader to apply manure to land. The percentage of operations that used surface application of liquid manure increased each study year. The percentage of operations that used subsurface application of liquid manure increased from 4.3 percent in 1996 to 8.8 percent in 2007.

a. For operations that applied manure to land, percentage of operations by manure application method used:

Percent Operations						
Method	Dairy 1996		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Broadcast/solid spreader	88.7	(1.1)	90.0	(1.2)	91.5	(1.7)
Surface application	22.7	(1.4)	30.1	(1.8)	40.7	(2.8)
Subsurface application	4.3	(0.7)	6.1	(0.8)	8.8	(1.5)
Irrigation/sprinkler	7.0	(0.6)	7.6	(0.7)	7.3	(0.8)
Other	0.1	(0.1)	0.3	(0.2)	1.3	(0.7)

The percentage of operations that never incorporated manure into the soil within 24 hours of application decreased from 82.1 percent in 1996 to 36.0 percent in 2007. The percentage of operations that always or almost always incorporated manure in the soil within 24 hours after application increased from 13.9 percent of operations in 2002 to 22.0 percent in 2007.

b. For operations that applied manure to land, percentage of operations by frequency that manure was incorporated into soil within 24 hours after application, including subsurface injection:

Percent Operations						
Frequency	Dairy 1996*		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Always or almost always	17.9	(1.3)	13.9	(1.4)	22.0	(2.2)
Sometimes			42.6	(2.2)	42.0	(3.0)
Never	82.1	(1.3)	43.5	(2.2)	36.0	(2.9)
Total	100.0		100.0		100.0	

\*1996 question variation: yes/no question.

The percentage of operations that analyzed the nutrient content of manure increased from 14.0 percent in 1996 to about 26 percent in 2007.

c. For operations that applied manure to land, percentage of operations that analyzed manure during the previous 12 months, by nutrient:

Percent Operations						
Nutrient	Dairy 1996*		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Nitrogen	14.0	(1.2)	20.9	(1.6)	26.9	(2.4)
Phosphorus			20.4	(1.6)	26.4	(2.3)
Potassium			20.3	(1.6)	26.4	(2.3)

\*1996 question variation: asked if analyzed content of manure such as nitrogen.

Crop nitrogen and phosphorus requirements used as criteria to determine frequency of applying manure to land increased from 44.8 and 38.5 percent, respectively, in 2002 to 56.3 and 49.2 percent, respectively, in 2007.

d. For operations that applied manure to land, percentage of operations by criteria used to determine how much or how frequently manure is applied to the land:

Percent Operations						
Criteria	Dairy 1996*		Dairy 2002		Dairy 2007	
	Pct.	Std. Error	Pct.	Std. Error	Pct.	Std. Error
Crop nitrogen requirement	43.2	(1.8)	44.8	(2.1)	56.3	(3.0)
Crop phosphorus requirement			38.5	(2.1)	49.2	(3.1)
Manure volume/acreage available			68.3	(2.1)	70.3	(2.8)
Soil quality improvement					70.7	(2.8)
Other criteria			6.5	(1.0)	6.2	(1.5)

\*1996 question variation: asked if manure application rate was established based on manure nutrients and/or crop needs.

There were no differences from 2002 to 2007 in the percentage of operations by distance between where manure was applied and surface water. Almost one of four operations applied manure 100 feet or less from surface water. About one of three operations applied manure 1,000 feet or more away from surface water.

e. For operations that applied manure to land, percentage of operations by minimum distance (in feet) between location of manure application and surface water, such as a lake, pond, stream, or river:

<b>Percent Operations</b>				
<b>Minimum Distance (Feet)</b>	<b>Dairy 2002</b>		<b>Dairy 2007</b>	
	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Less than 100	24.3	(1.8)	24.4	(2.5)
100 to 199	14.9	(1.6)	16.7	(2.2)
200 to 499	16.3	(1.6)	20.3	(2.5)
500 to 999	7.2	(1.1)	7.8	(1.7)
1,000 or more	37.3	(2.1)	30.8	(2.9)
Total	100.0		100.0	



There were no changes between 2002 and 2007 in the percentage of operations that applied manure to crops. More than one-half of operations applied manure to actively growing pasture or hay. Almost one of three operations applied manure to forage to be ensiled during 2002 and 2007.

f. Percentage of operations that applied manure to actively growing plants, by crop type:

<b>Percent Operations</b>				
<b>Crop Type</b>	<b>Dairy 2002</b>		<b>Dairy 2007</b>	
	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Pasture or hay	55.6	(2.2)	52.2	(2.9)
Forage to be ensiled	30.6	(2.0)	28.0	(2.5)
Other forage	9.0	(1.1)	13.4	(1.9)
Grain or oilseed	9.2	(1.2)	10.7	(1.7)
Other	0.4	(0.2)	3.9	(1.4)
Any	63.9	(2.1)	64.4	(2.9)

**6. Written nutrient management plan**

A higher percentage of operations in 2007 than in 2002 had a written nutrient management plan (43.6 and 30.6 percent, respectively).

a. Percentage of operations that had a written nutrient management plan addressing topics such as land treatment practices or manure storage structures, by herd size:

<b>Percent Operations</b>								
<b>Herd Size (Number of Cows)</b>								
<b>Study</b>	<b>Small (Fewer than 100)</b>		<b>Medium (100-499)</b>		<b>Large (500 or More)</b>		<b>All Operations</b>	
	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>	<b>Pct.</b>	<b>Std. Error</b>
Dairy 2002	23.3	(2.3)	48.4	(3.0)	55.8	(4.1)	30.6	(1.8)
Dairy 2007	35.1	(3.8)	62.1	(4.4)	62.7	(5.9)	43.6	(2.9)

For operations that had a written nutrient management plan, the percentage of operations that participated in a USDA voluntary cost share program increased from 45.9 percent in 2002 to 64.5 percent in 2007.

b. For operations that had a written nutrient management plan, percentage of operations that developed or implemented the plan in cooperation with Federal, State, or local agencies or requirements:

<b>Percent Operations</b>				
<b>Plan was...</b>	<b>Dairy 2002</b>		<b>Dairy 2007</b>	
	<b>Percent</b>	<b>Std. Error</b>	<b>Percent</b>	<b>Std. Error</b>
Developed in cooperation with the USDA Natural Resource Conservation Service or a local conservation district	81.0	(2.6)	89.2	(2.2)
Implemented to help satisfy a State or local regulatory requirement	54.9	(3.8)	62.9	(4.2)
Part of USDA voluntary cost share program	45.9	(3.5)	64.5	(3.6)

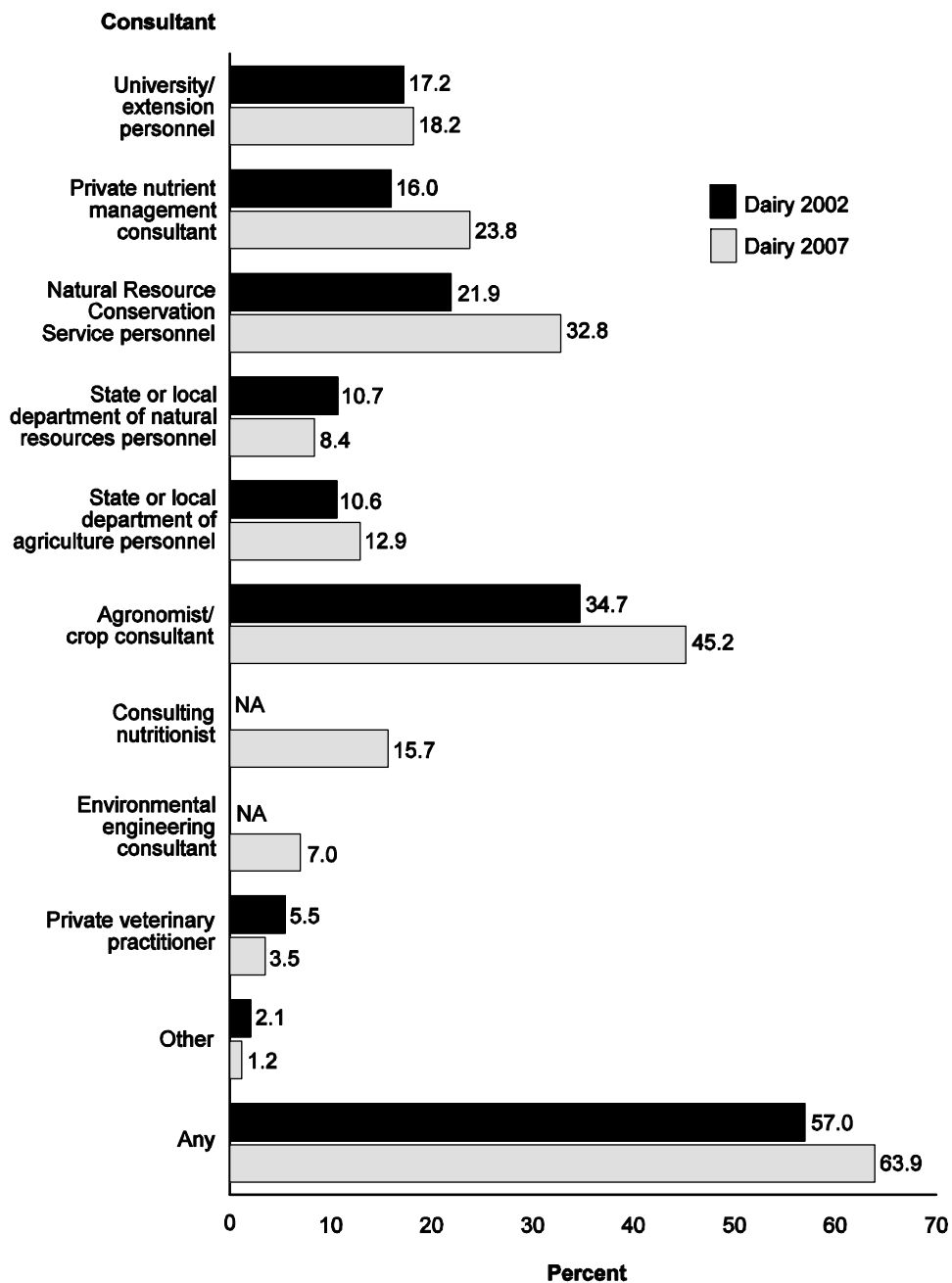
### 7. Waste-management consultant

The percentage of operations that used a private nutrient management consultant, Natural Resource Conservation Service personnel, or agronomist/crop consultant for waste management consultation increased between 2002 and 2007. However, the use of any consultant was similar in both studies.

Percentage of operations that consulted with the following people about waste management for their operation during the previous 12 months:

	Percent Operations			
	Dairy 2002		Dairy 2007	
Consultant	Percent	Std. Error	Percent	Std. Error
University/extension personnel	17.2	(1.6)	18.2	(2.2)
Private nutrient management consultant	16.0	(1.4)	23.8	(2.4)
Natural Resource Conservation Service personnel	21.9	(1.6)	32.8	(2.6)
State or local department of natural resources personnel	10.7	(1.3)	8.4	(1.2)
State or local department of agriculture personnel	10.6	(1.3)	12.9	(1.7)
Agronomist/crop consultant	34.7	(2.0)	45.2	(2.9)
Consulting nutritionist			15.7	(2.0)
Environmental engineering consultant			7.0	(1.3)
Private veterinary practitioner	5.5	(1.0)	3.5	(0.8)
Other	2.1	(0.5)	1.2	(0.7)
Any	57.0	(2.2)	63.9	(2.8)

**Percentage of Operations that Consulted with the Following People About Waste Management for Their Operation During the Previous 12 Months**



### 8. Knowledge of concentrated animal feeding operation (CAFO) classification

There were no differences between 2002 and 2007 in the percentage of operations by actual or perceived CAFO classification of the operation.

Percentage of operations by actual or perceived classification\* under current Federal EPA guidelines regarding CAFOs:

Classification Category	Percent Operations			
	Dairy 2002		Dairy 2007	
	Percent	Std. Error	Percent	Std. Error
Never heard of CAFO	38.1	(2.1)	31.2	(2.8)
Have heard of CAFO, but unsure how my operations is or will be classified	20.5	(1.8)	20.8	(2.7)
My operation is not or will likely not be classified as a CAFO	33.3	(2.0)	37.2	(2.8)
My operation is or will likely be classified as a CAFO	8.1	(0.9)	10.8	(1.3)
Total	100.0		100.0	

\*Regulations of the CAFO rule became effective December 22, 2008.

## Appendix I: Methodology\*

NAHMS Dairy Studies			
	1996	2002	2007
Data collection dates	2/20-5/24	2/25-4/30	2/26-8/31
Minimum number of dairy cattle	30	30	30
Number of States	20	21	17
Data collectors	State and Federal VMOs and AHTs		
Participating States as a percentage of U.S. population coverage			
Operations	85.6	86.6	84.7
Cows	82.7	85.5	82.5
Respondent Sample profile (herd size)			
Small (fewer than 100 cows)	630	400	233
Medium (100-499 cows)	502	392	215
Large (500 or more cows)	87	221	134
Response category			
Survey complete	1,219	1,013	582
Percent of total	76.0	70.4	54.0
Refused	340	335	380
Did not contact	16	76	111
Ineligible	29	14	4
Total	1,604	1,438	1,077

\*For more detailed information about the methodology for each study, see methodology section of each descriptive report at: <http://nahms.aphis.usda.gov>

## Appendix II: Study Objectives and Related Outputs

1. Describe trends in dairy cattle health and management practices
  - Part II: Changes in the U.S. Dairy Cattle Industry, 1991-2007, March 2008
  - **Part V: Changes in Dairy Cattle Health and Management in the United States, 1996-2007, June 2009**
2. Evaluate management factors related to cow comfort and removal rates
  - Part VI: Dairy Facilities and Cow Comfort on U.S. Dairy Operations, 2007, Interpretive Report, expected fall 2009
3. Describe dairy calf health and nutrition from birth to weaning and evaluate heifer disease prevention practices
  - Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, October 2007
  - Off-Site Heifer Raising on U.S. Dairy Operations, 2007, info sheet, November 2007
  - Colostrum Feeding and Management on U.S. dairy Operations, 1991-2007, info sheet, March 2008
  - Part IV: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, February 2009
  - Calving Management on U.S. Dairy Operations, 2007, info sheet, February 2009
  - Calf Health and Management Practices on U.S. Dairy Operations, 2007, Interpretive Report, expected summer 2009
  - Failure of Passive Transfer in Dairy Heifer Calves, 200, info sheet, expected fall 2009
4. Estimate the prevalence of herds infected with bovine viral diarrhea virus (BVDV)
  - Bovine Viral Diarrhea (BVD) Detection in Bulk Tank Milk and BVD Management Practices in the United States, 1996-2007, info sheet, October 2008
5. Describe current milking procedures and estimate the prevalence of contagious mastitis pathogens
  - Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, September 2008
  - Milking Procedures on U.S. Dairy Operations, 2007, info sheet, September 2008

6. Estimate the herd-level prevalence and associated costs of *Mycobacterium avium* subspecies *paratuberculosis*

- Johne's Disease on U.S. Dairies, 1991-2007 info sheet, April 2008

7. Describe current biosecurity practices and determine producer motivation for implementing or not implementing biosecurity practices

- Part I: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, October 2007
- Part III: Reference of Dairy Cattle Health and Management Practices in the United States, 2007, September 2008
- Biosecurity Practices on U.S. Dairy operations, 2002-07, Interpretive Report, expected summer 2009

8. Determine the prevalence of specific food-safety pathogens and describe antimicrobial resistance patterns

- Antibiotic Use on U.S. Dairy Operations, 2002-07, info sheet, September 2008
- *Listeria* and *Salmonella* in Bulk Tank Milk on U.S. Dairy Operations, 2002-07, info sheet, June 2009
- *Salmonella* and *Campylobacter* on U.S. Dairy Operations, 2002-07, info sheet, June 2009
- Food Safety Pathogens Isolated from U.S. Dairy Operations, 2007, Interpretive Report, expected winter 2009

Additional information sheets

- Dairy Cattle Identification Practices in the United States, 2007, info sheet, November 2007
- Bovine Leukosis Virus (BLV) on U.S. Dairy Operations, 2007, info sheet, September 2008
- Reproduction Practices on U.S. Dairy Operations, 2007, info sheet, February 2009
- Dairy Cattle Injection Practices in the United States, 2007, info sheet, February 2009
- Methicillin-Resistant *Staphylococcus aureus* (MRSA) Isolation from Bulk Tank Milk in the United States, 2007, info sheet, expected spring 2009



