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Dairy Heifer Raiser, 2011

An overview of operations that specialize in raising dairy heifers

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Items of Note

The majority of operations that specialize in raising dairy heifers have been in business for less than 10 years; less than 10 percent have been in business for 21 or more years. The number of clients (dairies or individuals) these operations raise heifers for varies. Generally, the larger the heifer-raising operation the more clients it serves. When heifers from multiple clients are allowed contact with one another on these operations, the potential for disease transmission increases.

Most heifers sent to heifer-raising operations are returned to their dairy of origin; however, about 20 percent of heifers are not returned and are sold through auction markets, dealers, or directly to another dairy.

Similar to all livestock enterprises, heifer-raising operations face an array of challenges. The majority of producers that raise heifers reported that heifer health, client relations, payments from producers, and feed cost/availability were very important challenges. The availability of labor was not a very important challenge to the majority of producers.

Heifer calves are sent to heifer-raising operations at various ages. Some dairies send calves within a day or so after birth; some send them after weaning; and others send pregnant heifers. The majority of heifer-raising operations received weaned calves and sent them back as pregnant heifers. In addition to dairy heifers, some heifer-raising operations housed dairy bulls, dairy steers (primarily Holstein), and beef cows. Approximately one-third of operations had dairy bulls intended for breeding during 2010, while less than one-fifth had other types of cattle.

Individual animal identification (ID) is important to heifer-raising operations for multiple reasons, including general inventory practices, production and treatment information, and, in the case of retained ownership, ensuring that the heifers are returned to the dairy of origin. In addition, applying and maintaining individual animal ID is important in disease-outbreak situations in which determining the source and movement of affected or exposed cattle is vital. Almost all operations had some form of individual animal ID, and the majority used nonelectronic ear tags inserted prior to arrival at the operation. Electronic or radio frequency ID (RFID) ear tags were used on about one-third of operations. Branding is one method of permanent herd identification and in some instances, when numbers instead of characters are used, can be used as individual animal ID. About 20 percent of operations raised heifers that were branded.

Keeping high-quality, usable records is important to any livestock operation. Keeping records is even more important to heifer-raising operations that house cattle from multiple sources, because heifers on these operations are often managed together and information such as breedings and treatments is reported to the dairies of origin and/or buyers. Records that include information on the use of antibiotics in individual animals are

essential to ensure that heifers treated at the heifer-raising operation are not marketed by the dairy of origin or the seller before the proper milk or slaughter withdrawal period. About 70 percent of operations recorded individual treatments administered to sick dairy heifers and kept written or computerized records of dairy-heifer growth and/or health information.

Housing systems for preweaned heifers have traditionally focused on individual hutches or pens, which minimize direct contact among calves. Current research suggests that housing preweaned heifers as a group reduces labor costs associated with feeding because grouping the animals allows for the use of automatic or free-choice feeding systems. When housed in groups, preweaned calves are socialized earlier in life, experience group learning, and their growth is equivalent to calves in individual-housing systems. Weaned and pregnant heifers have traditionally been housed in groups of similar age, rather than individually. The majority of heifer-raising operations housed preweaned heifers in an outside hutch/pen or individual inside pen in a cold calf barn. Housing for weaned heifers included pasture, freestall, dry lot/multiple-animal area, bedded pack/open shed, and multiple-animal inside area/barn/shed. Pregnant heifers were housed in facilities similar to that of weaned heifers, but more operations used freestalls for pregnant heifers.

Vaccination remains a key component of disease control and prevention on most livestock operations. About 40 percent of heifer-raising operations raised heifers that were vaccinated against brucellosis, even though vaccinating dairy heifers against brucellosis is no longer mandatory in many States. All 50 States were considered free from brucellosis as of February 2012. More than 8 of 10 operations vaccinated cattle against any disease during 2010, and more than three of four operations vaccinated against bovine viral diarrhea (BVD), infectious bovine rhinotracheitis (IBR), or parainfluenza type 3 (PI3). Vaccines for these three diseases are commonly administered together in a single dose.

Testing individual heifers for transmissible diseases such as BVD and brucellosis before or when they arrive at a heifer-raising operation is recommended. If heifers test positive, then mitigation steps can be taken to reduce the risk of disease transmission to the rest of the herd. Since the majority of operations raised heifers owned by the dairies of origin, testing also provided an indication of the status of the source herd. Depending on which States heifers travel to, regulations might require testing for brucellosis and/or tuberculosis (TB). Heifers shipped out of the United States are required to undergo some disease testing performed prior to shipment. Half of operations tested heifers for at least one disease during 2010; BVD and TB tests were the two most common tests performed.

Cattle movement on and off heifer-raising operations is generally dependent on the age of the heifers. Operations with preweaned heifers might receive new heifers on a daily

basis, while those that raise weaned heifers might receive heifers every 2 to 4 weeks. Heifer-raising operations received an average of 43.2 shipments during 2010, and the average shipment size was 9.9 heifers. The average number of shipments leaving heifer-raising operations was 19.4, and the average number of heifers per shipment was 24.9. The number of shipments for both incoming and outgoing heifers was higher for large operations compared with small operations, and the number of heifers per shipment increased as herd size increased. More than one-fourth of incoming and outgoing shipments traveled 100 miles or more, and one-third of all shipments crossed State lines. Overall, 12.2 percent of operations sent heifers to another country, with Turkey, Mexico, and Russia being the top three destinations for heifers sent out of the United States.

Administering colostrum to newborn calves is necessary for the absorption of immunoglobulins. Calves should receive colostrum within 2 to 3 hours of birth to increase the potential for passive transfer of immunity. Since heifers are not routinely moved to heifer-raising operations within 2 to 3 hours, colostrum should be fed at the dairy of origin, before shipment to the heifer-raising operation. All operations that raised preweaned heifers reported that colostrum was administered at the dairy of origin.

Milk replacer was fed on the majority of heifer-raising operations (85.9 percent), with one-third of operations feeding nonmedicated replacer and two-thirds feeding medicated replacer. Under regulations imposed in 2009, medications used to control or treat diarrhea can only be fed for 14 days in milk replacer. Although producers could continue to feed medications to improve weight gain and feed efficiency, the lower dose of medication might not be cost effective. The most commonly fed medication in milk replacer was oxytetracycline in combination with neomycin (NT). Prior to new regulations in 2009, NT was two parts neomycin and one part tetracycline. The 2009 regulations now require the two medications be mixed in a ratio of 1:1. Decoquinate and lasalocid were each fed by one of five operations (19.7 and 19.6 percent, respectively). Nonsaleable or waste milk was fed on one-third of operations. Waste milk was fed on a higher percentage of operations in the West region than in the East region (78.6 and 21.9 percent, respectively). The majority of heifers were fed 2 to 3 quarts twice daily, resulting in a total volume of 4 to 5 quarts per day. The average age at weaning was 7.1 weeks.

The use of antibiotics in livestock feed is under scrutiny due to concerns about antibiotic-resistant strains of bacteria that could impact human health. There are three general types of medications used in feed for heifers: ionophores, coccidiostats, and antibiotics. Ionophores alter the rumen bacterial population, change the production of certain volatile fatty acids, act as growth promotants, and prevent coccidiosis. Although ionophores are antibiotics, they are not used in human medicine and are not under scrutiny. Common ionophores are lasalocid (Bovatec®) and monensin (Rumensin®). Coccidoistats, such

as Deccox® (decoquinate), are also used to prevent coccidiosis. Antibiotics, such as chlortetracycline and neomycin, are labeled for the prevention or treatment of respiratory disease or scours. Some antibiotics are also labeled for increasing rate of gain and improving feed efficiency. More than three-fourths of operations fed some antibiotics to heifers, and more than 8 of 10 weaned and pregnant heifers were fed ionophores in feed during 2010.

Ideally, heifer-raising operations would either raise heifers from a single source or not allow contact or commingling among heifers from different dairies. Commingling or allowing contact among heifers from different dairies can result in the transmission of many important dairy cattle diseases, including TB, brucellosis, salmonellosis, BVD, and hairy heel warts. In addition, disease can be transmitted if heifers have contact and/or commingle with adult dairy cattle, beef cattle, or feeder cattle. Of particular concern is the risk of transmitting TB when any breeding stock, particularly dairy heifers, are commingled with cattle of Mexican origin. No operations in the study reported housing cattle of Mexican origin. Dairy heifers were commingled with heifers from other operations on 60.3 percent of operations. On 20.9 percent of operations, heifers were housed separately but allowed nose-to-nose contact with heifers from other dairies. The majority of heifer-raising operations also had dogs or cats on the operation. Between 20 and 30 percent of operations had beef cattle, chickens or other poultry, or horses, donkeys, or mules.

Wild animals may carry diseases that can be transmitted to cattle. For example, deer and coyotes in parts of Michigan can be reservoirs for TB. BVD virus can also infect deer and potentially be transmitted to cattle. Elk and feral swine can be infected with brucellosis and potentially transmit the disease to cattle. Raccoons, although primarily recognized as potential sources of rabies, can also carry *Salmonella* and other pathogens. Foxes can harbor leptospirosis and *Neospora,* which are recognized cattle diseases. Coyotes, foxes, or raccoons were observed on 9 of 10 heifer-raising operations during 2010. Deer or signs of deer were observed on about 4 of 10 operations in the West region and on about 9 of 10 operations in the East region. In heifer-calf housing areas, deer were observed at least monthly on 21.1 percent of operations, less than monthly on 24.1 percent, and never observed on 54.8 percent of operations.

Vehicles used to transport heifers—especially preweaned heifers—should be washed and rinsed out between every shipment. Transport vehicles used to haul cattle from multiple operations in multiple shipments without being cleaned could pose a disease risk (e.g., *Salmonella*) to heifers. Transport vehicles were washed or rinsed out after every shipment on 26.1 percent of operations, and a disinfectant was used to wash out vehicles on 24.4 percent of operations.

Consultants are very important to the success of heifer-raising operations, but they can also be a source of disease introduction or spread. For example, consultants who do not disinfect footwear after visiting an operation could spread disease to the next operation visited. Veterinarians were used weekly or monthly by more than three-fourths of operations. More than 6 of 10 operations (63.9 percent) used a nutritionist weekly or monthly, and almost half of operations used an artificial insemination (AI) technician during 2010. Federal or State animal health officials or university/extension personnel were consulted by 20 to 25 percent of operations. About 9 of 10 operations had veterinarians and AI technicians use a footbath, disposable boots, or clean coverall/boots as a biosecurity practice.

Breeding practices can result in disease transmission between animals. Bovine leukemia virus (BLV) can be transmitted during breeding or pregnancy exams via blood on palpation sleeves. Natural breeding can also result in transmission of trichomoniasis or other diseases. Dairy heifers were bred on 75.3 percent of operations. Of these operations, 18.5 percent used only natural breeding (bulls), 31.5 percent used only AI, and 50.0 percent used a combination of natural breeding and AI. Bull management practices related to health, such as breeding soundness exams and disease testing, were performed by about 15 to 37 percent of operations that used breeding bulls.

Digestive problems and pneumonia were the most common diseases or disorders affecting preweaned heifers, and 18.2 and 16.4 percent of preweaned heifers, respectively, were treated with antibiotics during 2010 for these two disorders. Antibiotics were used to treat diarrhea in preweaned heifers on 85.7 percent of operations. Respiratory disease was the most common disorder affecting weaned heifers (11.2 percent of heifers). Antibiotics were used on 82.1 percent of operations to treat respiratory disease in weaned heifers. Pregnant heifers were infrequently affected or treated for disease. As expected, respiratory and digestive diseases were the primary causes of death for heifers. Half of operations performed any necropsies to determine the cause of death in heifers. Rendering, burying, and composting were the most common methods to dispose of dead heifers.

Table of Contents

Acknowledgments

This study was a cooperative effort between the Animal and Plant Health Inspection Service (APHIS), participating States, and the Dairy Calf and Heifer Association (DCHA).

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Thanks also goes to the State and Federal veterinary medical officers (VMOs), and animal health technicians (AHTs) who were tasked with developing a list of operations that specialize in raising dairy heifers in their respective States. In addition, the VMOs and AHTs visited the operations and collected the data for the study. Their hard work and dedication were invaluable. The roles of the producers, area veterinarians in charge (AVICs), NAHMS coordinators, VMOs, and AHTs were critical in providing quality data. Recognition also goes to the personnel at the Centers for Epidemiology and Animal Health for their efforts in generating and distributing valuable information related to dairy-heifer-raising operations.

All participants are to be commended, particularly the producers whose voluntary efforts made the Dairy Heifer Raiser 2011 study possible.

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Feedback
Feedback ,comments, and suggestions regarding the Dairy Heifer Raiser report are welcomed. You may submit feedback via online survey at http://nahms.aphis.usda.gov (Click on “FEEDBACK on NAHMS reports.“)

Introduction

In the 1990s, a survey conducted by “Dairy Herd Management” magazine reported that 4,000 of their subscribers classified their primary agricultural function as growing dairy heifers. A more recent estimate of the number of heifer-raiser operations is not available, and since the capital costs associated with these types of operations does not necessarily have to be large, these operations can likely go in and out of business in a short period of time, making enumeration difficult.

The advantages of growing heifers at an off-site location include freeing up space on the dairy operation for more lactating cows and, in the case of heifer-raising operations, enabling management personnel to focus exclusively on the health and growth of heifers, rather than on a lactating herd. In addition, separating growing heifers from older animals reduces or eliminates disease transmission that might occur between these animals. One of the major disadvantages of heifer-raising operations is that in some cases heifers are commingled with heifers from different operations, which could lead to the spread of disease. The probability that *Salmonella,* BVD, hairy heel warts, and other infectious diseases will be transmitted increases as the number of heifer sources and the number of heifers present on the operation increase. Commingling dairy heifers with Mexican cattle is of particular concern because cattle of Mexican origin have been associated with TB and, therefore, present a risk of transmitting the disease.

Many of the dairy operations involved in recent TB outbreaks used heifer-raising facilities, although these facilities were not confirmed as the disease source. The potential risks for disease transmission that heifer-raising operations present have been recognized for years, and in 2004 the U.S. Animal Health Association TB Strategic Planning Committee recommended that a descriptive analysis of the dairy-heifer-raising industry be conducted:

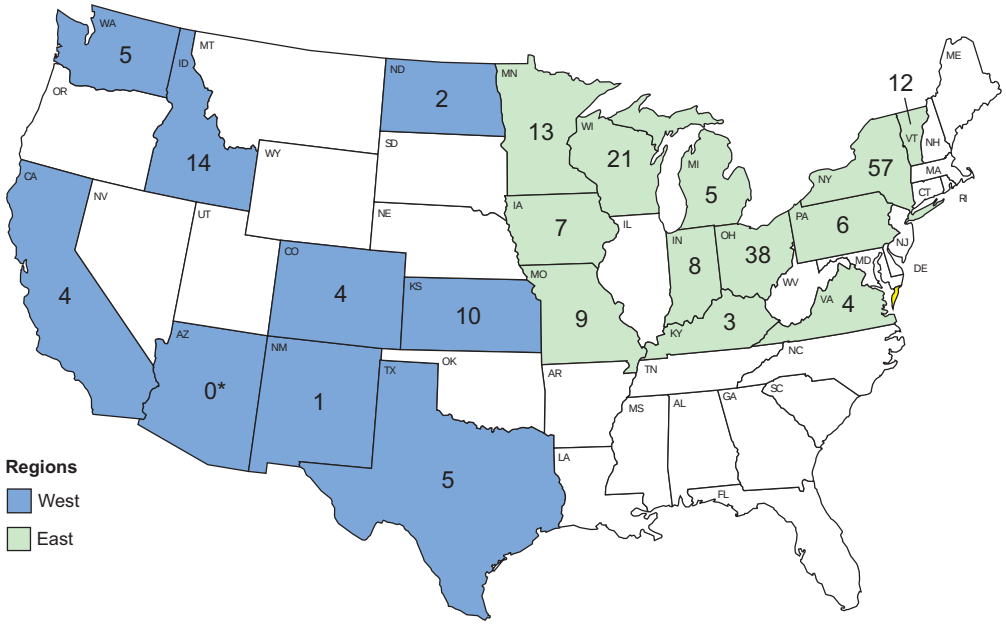
> “This information is critical if education efforts regarding risk factors and practices that promote spread of bovine tuberculosis and other disease are to be focused toward this segment of the industry.” *U.S. Animal Health Association TB Strategic Planning Committee*

Off-site heifer-raising operations were used by about 1 of 10 dairy operations in 2006 (NAHMS Dairy 2007). Almost half of operations with 500 or more cows raised at least some heifers off-site. Although the NAHMS Dairy 2007 study asked producers about off-site heifer raising, NAHMS did not obtain information about the operations themselves.

Three primary objectives of the NAHMS Dairy Heifer Raiser 2011 study are:

1. Provide the first comprehensive information on animal health and management practices for heifer-raising operations,
2. Evaluate the biosecurity risks associated with heifer-raising operations (e.g., commingling cattle from multiple operations, and exposing young cattle to Mexican cattle).
3. Assist in the development of a biosecurity assessment that can be used to evaluate the risk of disease transmission.

Dairy Heifer Raiser 2011 participating States and number of respondents per State



*Operations contacted in Arizona were ineligible or declined to participate.

Information on the methods used and the number of respondents in the study can be found in Section II: Methodology (p 145).

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.

Client: Dairies or individuals that buy heifers from the heifer-raising operation or that have heifers returned to them after the designated growing period.

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

Dairy beef: Generally refers to Holstein steers being fed for the slaughter market.

Heifer: Female dairy bovine that has not yet calved.

Heifer-raising operation: An operation that raised at least 20 dairy heifer calves for at least 1 operation other than its own during 2010. These operations are commonly known as custom raisers, calf ranches, or calf nurseries. During the course of the study, operations that raised heifers from multiple dairies all owned by the same entity were identified. Since these operations commingled cattle from multiple operations, they were included in the analysis and in this report.

Herd size: Herd size is based on the cumulative number of dairy heifers raised on the operation during 2010.

- **Small:** 20 to 99 head
- **Medium:** 100 to 999 head
- **Large:** 1,000 or more head.

Ionophore: An antibiotic administered in feed that promotes the efficient use of feedstuffs by altering fermentation in the rumen.

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 percentage of dairy heifers raised under a particular ownership arrangement during 2010 (p 10) is calculated by summing reported average percentage of heifers raised for each operation divided by the number of operations.

Private sales: Sales not associated with a dairy operation, such as cattle dealers and brokers.

Precision of sample 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. 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). 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 (—). References to estimates being higher or lower than other estimates are based on the 95-percent confidence intervals not overlapping. Note: Due to the relatively small sample size in this study, the resulting standard errors are large (i.e., lack of precision). Even though many point estimates across herd size or region appear to be different, when the 95-percent confidence intervals are evaluated, many interval estimates overlap; these estimates are not considered to be different.

Regions:

West: Arizona, California, Colorado, Idaho, Kansas, New Mexico, North Dakota, Texas, and Washington
East: Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, New York, Ohio, Pennsylvania, Vermont, Virginia, and Wisconsin.

Sample estimates: The estimates in this report make inference to heifer-raising operations that raised 20 or more heifers for at least one other operation during 2010 (target population) [Methodology section, p 145].

Sample profile: Information that describes characteristics of the operations from which Dairy Heifer Raiser 2011 study data were collected (Appendix I, p 148).

Source: Dairies, markets, or individuals that provide heifers to the heifer-raising operation.

Section I: Population Estimates

Note: Where appropriate, column totals are shown as 100.0 to aid in interpretation; however, some estimates may not sum to 100.0 due to rounding.

A. General Operation Information

1. Years in business

Although operations that specialize in raising dairy heifers have been around for more than 25 years, less than 10 percent of operations in this study had been in business for 21 years or more. A similar percentage of all operations had been in business 1 to 5, 6 to 10, and 11 to 20 years. There were no differences across herd sizes in the percentage of operations by number of years that operations had specialized in raising heifers.

A.1. Percentage of operations by number of years operation had been a heifer-raising operation, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Number years	**Pct.**	**Std error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1–5	35.1	(6.3)	23.1	(4.1)	14.9	(4.4)	23.7	(2.8)
6–10	31.6	(6.2)	33.7	(4.6)	31.3	(5.7)	32.5	(3.1)
11–20	24.6	(5.7)	37.5	(4.8)	38.8	(6.0)	34.6	(3.2)
21 or more	8.8	(3.8)	5.8	(2.3)	14.9	(4.4)	9.2	(1.9)
Total	100.0		100.0		100.0		100.0	

2. Number of clients

For this report, clients are dairies or individuals that buy heifers from the heifer-raising operation or that have heifers returned to them after the designated growing period. Sources are dairies, markets, or individuals that provide heifers to heifer-raising operations. On heifer-raising operations in which the dairy of origin retains ownership of heifers, the number of clients and sources may be equal.

Almost one-third of operations (32.9 percent) raised heifers for only one client. Alternatively, 7.0 percent of operations raised or sold heifers for 10 or more clients. The majority of small and medium operations had two or fewer clients, while the majority of large operations had five or more clients.

A.2.a. Percentage of operations by number of clients and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Number clients	**Pct.**	**Std error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1	50.0	(6.9)	35.4	(4.9)	15.4	(4.5)	32.9	(3.2)
2	36.5	(6.7)	26.0	(4.5)	13.8	(4.3)	24.9	(3.0)
3–4	7.7	(3.7)	26.0	(4.5)	12.3	(4.1)	17.4	(2.6)
5–9	5.8	(3.2)	10.4	(3.1)	38.5	(6.0)	17.8	(2.6)
10 or more	0.0	(—)	2.1	(1.5)	20.0	(5.0)	7.0	(1.8)
Total	100.0		100.0		100.0		100.0	

A higher percentage of operations in the West region than in the East region had five or more clients. Conversely, a higher percentage of operations in the East region than in the West region had just one client (37.9 and 13.6 percent, respectively). Differences between the West and East regions are mainly due to the differences in herd size between the two regions. Almost 80 percent of operations in the West region were large operations and more than 80 percent of operations in the East region were small or medium operations (Appendix I, p 148).

A.2.b. Percentage of operations by number of clients and by region:

	Percent Operations			
	Region			
	West		East	
Number clients	**Percent**	**Std. error**	**Percent**	**Std. error**
1	13.6	(5.2)	37.9	(3.7)
2	18.2	(5.8)	26.6	(3.4)
3–4	15.9	(5.5)	17.8	(2.9)
5–9	34.1	(7.2)	13.6	(2.6)
10 or more	18.2	(5.8)	4.1	(1.5)
Total	100.0		100.0	

3. Ownership arrangement

There are usually three types of ownership arrangements made between heifer sources and heifer-raising operations:

1. The source dairy retains ownership of its cattle.
2. The heifer-raiser operation buys the heifers from the source and sells the same heifers back to the dairy of origin.
3. The heifer-raising operation buys heifers from various sources without selling back to the source.

Most dairies retain ownership or buy back their heifers to ensure the genetic progress of their herd. More than three-fourths of all heifer-raising operations (78.0 percent) raised cattle that were owned by the dairy of origin. A lower percentage of small operations (52.6 percent) raised cattle owned by the dairy of origin compared with medium or large operations (87.5 and 84.8 percent, respectively). The majority of “other” ownership arrangements were operations that raised heifers for dealers, cattle brokers, or for multiple dairies under single ownership (i.e., the dairies and heifer-raising operation were all part of the same operation). Although these operations did not technically fit the definition of a heifer-raising operation necessary for inclusion in this study, they were included in this analysis because heifers from multiple operations were commingled.

Photograph courtesy of Dr. Jason Lombard

A.3.a. Percentage of operations by type of ownership arrangement for heifers raised in 2010, and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Ownership/ arrangement type	**Pct.**	**Std error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Originated from this operation	31.6	(6.2)	16.3	(3.6)	10.6	(3.8)	18.5	(2.6)
Owned by dairy of origin—not the operation (retained ownership)	52.6	(6.6)	87.5	(3.3)	84.8	(4.4)	78.0	(2.8)
Bought by the operation and then same heifers sold back to the dairy of origin	17.5	(5.0)	12.5	(3.3)	9.1	(3.5)	12.8	(2.2)
Bought by the operation and not sold back to the dairy of origin	28.1	(6.0)	12.5	(3.3)	19.7	(4.9)	18.5	(2.6)
Purchased from auction market/sale barn	24.6	(5.7)	10.6	(3.0)	10.6	(3.8)	14.1	(2.3)
Other	14.0	(4.6)	9.6	(2.9)	12.1	(4.0)	11.5	(2.1)

Approximately two-thirds of all heifers (66.7 percent) on heifer-raising operations were owned by the dairy of origin. A slightly higher percentage of heifers on small operations were purchased from auction markets/sale barns (11.0 percent) compared with large operations (1.8 percent).

A.3.b. Operation average percentage of dairy heifers raised during 2010, by type of ownership/arrangement and by herd size:

	Operation Average Percent Heifers							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Ownership/ arrangement type	**Pct.**	**Std error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Originated from this operation	10.5	(3.0)	3.8	(1.3)	2.7	(1.7)	5.2	(1.1)
Owned by dairy of origin—not the operation (retained ownership)	40.9	(5.8)	74.1	(3.7)	77.3	(4.6)	66.7	(2.8)
Bought by the operation and then same heifers sold back to the dairy of origin	9.1	(3.5)	7.7	(2.3)	3.3	(1.6)	6.8	(1.5)
Bought by the operation and not sold back to the dairy of origin	19.5	(4.7)	3.9	(1.7)	7.3	(2.6)	8.8	(1.7)
Purchased from auction market/ sale barn	11.0	(3.5)	2.8	(1.2)	1.8	(1.0)	4.6	(1.1)
Other	9.1	(3.4)	7.6	(2.5)	7.6	(3.0)	8.0	(1.7)
Total	100.0		100.0		100.0		100.0	

4. Operation challenges

Heifer health, client relations, payments from producers, and feed cost/availability were very important challenges for more than 70 percent of operations. Labor availability was a very important challenge on 24.1 percent of operations.

A.4. Percentage of operations by level of importance of the following challenges to the operation:

	Percent Operations						
	Level of Importance						
	Very		Somewhat		Not		
Challenge	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Total
Heifer health—sickness and death	92.5	(1.7)	4.8	(1.4)	2.6	(1.1)	100.0
Feed cost/ availability	72.4	(3.0)	22.4	(2.8)	5.3	(1.5)	100.0
Labor cost	33.8	(3.1)	40.4	(3.3)	25.9	(2.9)	100.0
Labor availability	24.1	(2.8)	40.4	(3.3)	35.5	(3.2)	100.0
Labor communication	36.0	(3.2)	29.4	(3.0)	34.6	(3.2)	100.0
Source of calves	50.9	(3.3)	28.3	(3.0)	20.8	(2.7)	100.0
Client relations	79.8	(2.7)	10.5	(2.0)	9.7	(2.0)	100.0
Environmental regulations	45.6	(3.3)	37.7	(3.2)	16.7	(2.5)	100.0
Payments from producers	72.7	(3.0)	13.7	(2.3)	13.7	(2.3)	100.0
Other	8.0	(1.8)	0.9	(0.6)	91.1	(1.9)	100.0

5. Dairy Calf and Heifer Association membership

The Dairy Calf and Heifer Association (DCHA) is the only national association dedicated to serving the dairy calf and heifer industry. DCHA strives to provide information, education, and access to leading research and technology to help its members be more profitable.

Approximately 2 of 10 operations (18.9 percent) were DCHA members. The percentage of operations that were DCHA members increased as herd size increased.

A.5. Percentage of operations that were DCHA members at the time of the study, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0.0	(—)	15.2	(3.6)	40.3	(6.0)	18.9	(2.6)

B. General Herd Information

1. Cattle type and Inventory

Exposing dairy heifers to older cattle—either dairy or beef—increases the chance of disease transmission. The percentages of operations that brought on the following cattle types were similar across herd sizes, with the exception of dairy bulls 1 year old and older that were intended for breeding. A higher percentage of large operations (46.9 percent) brought on dairy bulls 1 year old or older intended for breeding compared with 21.8 percent of small operations.

B.1.a. Percentage of operations by cattle type brought on during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Cattle type	**Pct.**	**Std error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Dairy heifers and cows								
Preweaned dairy heifers	36.8	(6.4)	26.9	(4.4)	43.3	(6.1)	34.2	(3.1)
Weaned but not pregnant dairy heifers (dairy replacements)	68.4	(6.2)	79.8	(3.9)	71.6	(5.5)	74.6	(2.9)
Pregnant dairy heifers	33.3	(6.3)	27.9	(4.4)	35.8	(5.9)	31.6	(3.1)
Lactating and dry dairy cows	8.8	(3.8)	9.6	(2.9)	1.5	(1.5)	7.0	(1.7)
Dairy bulls, dairy-beef, and beef cattle								
Preweaned dairy bulls (intended for breeding)	3.6	(2.5)	7.9	(2.7)	12.5	(4.1)	8.2	(1.9)
Weaned dairy bulls up to 1 year old (intended for breeding)	14.5	(4.8)	11.9	(3.2)	21.9	(5.2)	15.5	(2.4)
Dairy bulls 1 year old and older intended for breeding	21.8	(5.6)	28.7	(4.5)	46.9	(6.3)	32.3	(3.2)
Preweaned beef and dairy-beef calves (including heifers, steers, and bulls)	14.5	(4.8)	15.8	(3.6)	18.8	(4.9)	16.4	(2.5)
Weaned beef and dairy-beef calves up to 1 year old (including heifers, steers, and bulls)	9.1	(3.9)	11.9	(3.2)	26.6	(5.5)	15.5	(2.4)
Beef and dairy-beef cattle 1 year old and older	16.4	(5.0)	10.9	(3.1)	14.1	(4.4)	13.2	(2.3)

A higher percentage of operations in the West region brought on dairy bulls 1 year old and older intended for breeding or weaned beef and dairy-beef calves up to 1 year old (50.0 and 31.8 percent, respectively) compared with operations in the East region (27.8 and 11.4 percent, respectively).

B.1.b. Percentage of operations by cattle type brought on during 2010, and by region:

	Percent Operations			
	Region			
	West		East	
Cattle type	**Percent**	**Std. error**	**Percent**	**Std. error**
Dairy heifers and cows				
Preweaned dairy heifers	31.1	(6.9)	35.0	(3.5)
Weaned but not pregnant dairy heifers (dairy replacements)	77.8	(6.2)	73.8	(3.3)
Pregnant dairy heifers	24.4	(6.4)	33.3	(3.5)
Lactating and dry dairy cows	2.2	(2.2)	8.2	(2.0)
Dairy bulls, dairy-beef, and beef cattle				
Preweaned dairy bulls (intended for breeding)	11.4	(4.8)	7.4	(2.0)
Weaned dairy bulls up to 1 year old (intended for breeding)	25.0	(6.5)	13.1	(2.5)
Dairy bulls 1 year old and older intended for breeding	50.0	(7.6)	27.8	(3.4)
Preweaned beef and dairy-beef calves (including heifers, steers, and bulls)	20.5	(6.1)	15.3	(2.7)
Weaned beef and dairy-beef calves up to 1 year old (including heifers, steers, and bulls)	31.8	(7.0)	11.4	(2.4)
Beef and dairy-beef cattle 1 year old and older	13.6	(5.2)	13.1	(2.5)

2. Heifer class and age at arrival and departure

The majority of heifer-raising operations (53.9 percent) obtained weaned heifers and dispersed pregnant heifers. A higher percentage of operations in the East region (21.9 percent) obtained preweaned heifers and dispersed pregnant heifers compared with operations in the West region (6.7 percent). No operations in the West region and 7.6 percent of operations in the East region obtained and dispersed weaned heifers.

B.2.a. Percentage of operations by primary arrival and departure class of dairy heifers raised during 2010, and by herd size:

Percent Operations

		Region					
		West		East		All operations	
Arrival class	Departure class	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Preweaned	Weaned	24.4	(6.4)	13.1	(2.5)	15.4	(2.4)
Preweaned	Pregnant	6.7	(3.7)	21.9	(3.1)	18.9	(2.6)
Weaned	Weaned	0.0	(—)	7.6	(2.0)	6.1	(1.6)
Weaned	Pregnant	66.7	(7.0)	50.8	(3.7)	53.9	(3.3)
Pregnant	Pregnant	2.2	(2.2)	6.6	(1.8)	5.7	(1.5)
	Total	100.0		100.0		100.0	

The operation average ages at arrival and departure for each heifer class on heifer-raising operations were not different from the ages reported by dairy operations that used heifer-raising operations in the NAHMS Dairy 2007 study. Preweaned heifers averaged 3.4 days of age at arrival. No operations reported heifers leaving prior to weaning. Pregnant heifers averaged 21.4 months of age at departure, which is consistent with the current industry average for age at first calving.

B.2.b. Operation average age of the majority of dairy heifers at arrival and at departure, by heifer class:

Operation Average Age

Heifer Class

	Preweaned		Weaned		Pregnant		All heifers	
Age at . . .	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Arrival (days)	3.4	(0.3)	165.7	(8.3)	435.7	(16.3)	142.7	(9.5)
Departure (months)			7.9	(0.6)	21.4	(0.3)	18.4	(0.5)

3. Dairy heifer sources

Heifer-raising operations can obtain dairy heifers from different sources, including dairy operations, auction markets/sale barns, or dealers. As the number of sources increases, so does the potential for introducting and transmitting disease if contact among cattle from different sources is allowed. Estimates for the percentage of operations by number of sources used to obtain dairy heifers follow a similar pattern as estimates for number of clients presented earlier (tables A.2.a. and A.2.b.).

A higher percentage of small operations (38.6 percent) had two sources for heifers compared with large operations (16.4 percent). Conversely, a higher percentage of large operations had five to nine sources compared with small operations (35.8 and 5.3 percent, respectively). A lower percentage of medium operations had 10 or more sources for heifers compared with large operations (1.0 and 13.4 percent, respectively).

B.3.a. Percentage of operations by number of sources used to obtain dairy heifers raised during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Number sources	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1	31.6	(6.2)	27.9	(4.4)	11.9	(4.0)	24.1	(2.8)
2	38.6	(6.5)	29.8	(4.5)	16.4	(4.5)	28.1	(3.0)
3–4	21.1	(5.4)	26.0	(4.3)	22.4	(5.1)	23.7	(2.8)
5–9	5.3	(3.0)	15.4	(3.5)	35.8	(5.9)	18.9	(2.6)
10 or more	3.5	(2.4)	1.0	(1.0)	13.4	(4.2)	5.3	(1.5)
Total	100.0		100.0		100.0		100.0	

The source of purchased heifers is important for biosecurity reasons. For example, if heifers are purchased from auction markets/sale barns or private sales not associated with a dairy, the origination and animal-contact history of the heifers might not be available.

The majority of operations across all herd sizes obtained heifers from dairy operations. A higher percentage of small operations than large operations obtained heifers from their own operations (33.3 and 10.4 percent, respectively) or from private sales not associated with a dairy operation (28.1 and 9.0 percent, respectively). A higher percentage of medium and large operations obtained heifers from other heifer-raising operations compared with small operations. Almost all “other” sources were heifer-raising operations associated with multiple dairies under single ownership.

B.3.b. Percentage of operations by source of dairy heifers raised during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
This operation	33.3	(6.3)	18.3	(3.8)	10.4	(3.7)	19.7	(2.6)
Other dairy operations	77.2	(5.6)	86.5	(3.4)	86.6	(4.2)	84.2	(2.4)
Auction markets/ sale barns	19.3	(5.2)	10.6	(3.0)	10.4	(3.7)	12.7	(2.2)
Other heifer-raising operations	3.5	(2.4)	17.3	(3.7)	23.9	(5.2)	15.8	(2.4)
Private sales not associated with a dairy operation	28.1	(6.0)	13.5	(3.4)	9.0	(3.5)	15.8	(2.4)
Other	0.0	(—)	1.0	(1.0)	7.5	(3.2)	2.6	(1.1)

As expected, the average number of heifers by source differed by herd size. On average, 2,217 heifers were raised per operation during 2010, ranging from 61 for small operations to almost 7,000 for large operations. Across herd sizes, more than 50 percent of all heifers raised were sourced directly from other dairy operations.

B.3.c. Operation average number of dairy heifers raised during 2010, by source of heifers and by herd size:

	Operation Average Number							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Source	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
This operation	14	(6)	40	(24)	348	(206)	124	(62)
Other dairy operations	34	(4)	312	(25)	4,946	(922)	1,604	(307)
Auction markets/ sale barns	3	(1)	17	(7)	67	(32)	28	(10)
Other heifer-raising operations	1	(1)	47	(14)	365	(131)	129	(40)
Private sales not associated with a dairy operation	9	(2)	30	(11)	132	(72)	55	(22)
Other	0	(—)	3	(3)	939	(569)	277	(170)
All sources	61	(7)	449	(33)	6,797	(1,058)	2,217	(368)

The difference in herd size between the West and East regions is evident in the following table. For example, although the operation average number of heifers obtained from most of the following sources appears to be much larger in the West region, only the operation average number sourced directly from other dairy operations and the number sourced from all sources were different between the two regions, when accounting for standard errors.

B.3.d. Operation average number of dairy heifers raised during 2010, by source of heifers and by region:

	Operation Average Number			
	Region			
	West		East	
Source	**Average**	**Std. error**	**Average**	**Std. error**
This operation	388	(249)	59	(47)
Other dairy operations	5,591	(1,319)	624	(119)
Auction markets/sale barns	22	(14)	30	(12)
Other heifer-raising operations	344	(183)	76	(20)
Private sales not associated with a dairy operation	172	(104)	26	(8)
Other	1,175	(817)	56	(55)
All sources	7,692	(1,521)	871	(142)

4. Animal identification practices

Individual animal identification (ID) on heifer-raising operations is important for multiple reasons, such as general inventory practices and production and treatment information. Applying and maintaining animal ID is important for disease-outbreak situations in which determining the source and movement of affected or exposed cattle is paramount.

More than 95 percent of operations of all herd sizes used some method of individual animal ID. The majority of operations received heifers with nonelectronic ear tags inserted prior to arrival. In general, radio-frequency ID (RFID) was used by a higher percentage of large operations. No small operations inserted RFID at the operation. "Other" ID methods included Dairy Herd Improvement Association tags, USDA tags, and tattoos.

B.4.a. Percentage of operations by individual animal ID methods used for dairy heifers during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Individual-animal ID method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Radio-frequency ID (RFID) ear tags inserted prior to arrival at the operation	7.1	(3.4)	27.7	(4.5)	52.3	(6.2)	29.7	(3.1)
Nonelectronic ear tags inserted prior to arrival at the operation	78.9	(5.4)	91.3	(2.8)	95.5	(2.5)	89.4	(2.0)
Nonelectronic ear tags inserted at the operation	42.9	(6.6)	45.5	(5.0)	43.1	(6.2)	44.1	(3.3)
Radio-frequency ID (RFID) ear tags inserted at the operation	0.0	(—)	4.0	(2.0)	26.2	(5.5)	9.5	(2.0)
Other	12.5	(4.4)	8.1	(2.7)	4.6	(2.6)	8.2	(1.9)
Any of the above	96.5	(2.4)	99.0	(1.0)	98.5	(1.5)	98.2	(0.9)

Many forms of individual animal ID are not permanent, including ear tags, the most common form of individual animal ID. Having two forms of unique ID on each heifer ensures that identification is possible if one of the IDs is lost.

Overall, 62.1 percent of operations required and maintained at least two forms of unique ID for each heifer. Only 32.7 percent of small operations required two forms of ID, compared with 64.1 and 83.3 percent of medium and large operations, respectively.

B.4.b. Percentage of operations that required and maintained at least two forms of unique **individual animal ID** for each dairy heifer during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
32.7	(6.3)	64.1	(4.7)	83.3	(4.6)	62.1	(3.2)

A higher percentage of operations in the West region than in the East region maintained two forms of unique ID.

B.4.c. Percentage of operations that required and maintained at least two forms of unique **individual animal ID** for each dairy heifer during 2010, by region:

Percent Operations

Region

West		**East**	
Percent	**Std. error**	**Percent**	**Std. error**
86.4	(5.2)	56.1	(3.7)

Forms of herd ID include branding, ear tags, and tattoos. Herd ID is especially important for heifer-raising operations that raise heifers for multiple dairies that retain ownership of their heifers. Without a good ID system in place, dairies might not get back their own heifers. Overall, 75.2 percent of operations used herd ID for dairy heifers.

B.4.d. Percentage of operations that required and maintained at least one form of **herd ID** (e.g., branding) that identified each heifer's dairy of origin during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
49.1	(6.6)	79.2	(4.0)	92.2	(3.4)	75.2	(2.9)

Photograph courtesy of Dr. Jason Lombard

A higher percentage of operations in the West region than in the East region required and maintained at least one form of herd ID.

B.4.e. Percentage of operations that required and maintained at least one form of **herd ID** (e.g., branding) that identified each heifer's dairy of origin during 2010, by herd size, by region:

Percent Operations

Region

West		East	
Percent	**Std. error**	**Percent**	**Std. error**
93.2	(3.8)	70.8	(3.4)

Branding is one method of permanent herd ID. In some instances, when numbers instead of characters are used, branding can also be used as individual animal ID. Branding is much more common in the western States, even though most States allow cattle branding.

Branding was not commonly used on most heifer-raising operations; 82.7 percent had no branded dairy heifers. A higher percentage of large operations had heifers branded prior to arrival or at the operation compared with small or medium operations.

B.4.f. Percentage of operations by hide-branding status of any dairy heifer calves during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Brand status	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Not branded	98.2	(1.7)	89.3	(3.0)	59.1	(6.1)	82.7	(2.5)
Branded prior to arrival	1.8	(1.7)	9.6	(2.9)	37.9	(6.0)	15.9	(2.4)
Branded at the operation	1.8	(1.7)	3.9	(1.9)	19.7	(4.9)	8.0	(1.8)

Branding was most common in the West region; 63.6 percent of operations received branded dairy heifers and 40.9 percent branded heifers at the operation. No heifer-raising operations in the East region branded dairy heifers at their operation.

B.4.g. Percentage of operations by hide-branding status of any dairy heifer calves during 2010, and by region:

	Percent Operations			
	Region			
	West		East	
Brand status	**Percent**	**Std. error**	**Percent**	**Std. error**
Not branded	29.5	(6.9)	95.6	(1.5)
Branded prior to arrival	63.6	(7.3)	4.4	(1.5)
Branded at the operation	40.9	(7.4)	0.0	(—)

5. Record-keeping practices

Keeping high-quality, usable records is important to any livestock operation. Record keeping is even more important to heifer-raising operations on which heifers from multiple sources are managed and information is reported to the dairies of origin and/or to the buyers.

Three-fourths of heifer-raising operations that did not own all heifers on their operation tracked heifer inventory on at least a monthly basis. Nine of 10 large operations tracked heifer inventory for clients compared with 1 of 2 small operations.

B.5.a. Of the 78.0 percent of operations that did not own all dairy heifers on their operation, percentage that tracked and reported dairy-heifer inventory to individual clients on at least a monthly basis during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
50.0	(8.9)	73.7	(4.5)	90.2	(3.8)	75.0	(3.2)

Overall, 55.7 percent of operations used a heifer-record accounting program during 2010. Only 14.0 percent of small operations used a heifer-record accounting program, compared with 57.7 and 88.1 percent of medium and large operations, respectively.

B.5.b. Percentage of operations that used a heifer-record accounting program* for management and record-keeping purposes during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
14.0	(4.6)	57.7	(4.9)	88.1	(4.0)	55.7	(3.3)

*PCDart for heifers, Dairy Comp 305, Heifer DOT dat, HeiferPRO.

More than 8 of 10 operations in the West region (82.2 percent) used a heifer-record accounting program, compared with less than 5 of 10 operations in the East region (49.2 percent).

B.5.c. Percentage of operations that used a heifer-record accounting program* for management and record-keeping purposes during 2010, by region:

Percent Operations

Region

West		**East**	
Percent	**Std. error**	**Percent**	**Std. error**
82.2	(5.7)	49.2	(3.7)

*PCDart for heifers, Dairy Comp 305, Heifer DOT dat, HeiferPRO.

Records that include a history of individual animals treated with antibiotics are especially important to ensure that heifers treated at the heifer-raising operation are not marketed from the dairy of origin or the seller before the milk or slaughter withdrawal period.

About 70 percent of operations recorded individual treatments administered to sick dairy heifers and kept written or computerized records of dairy-heifer growth and/or health information. A higher percentage of large operations (61.2 percent) weighed dairy heifers to determine the rate of gain compared with medium and small operations (30.8 and 15.8 percent, respectively). A lower percentage of small operations than medium or large operations recorded the temperature of or treatments for sick dairy heifers or kept written or computerized records of dairy-heifer growth and/or health information. The percentage of operations that used computerized records during 2010 increased as herd size increased.

B.5.d. Percentage of operations by procedure typically used to monitor heifer growth and/or health during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Procedure	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Weighed dairy heifers to determine rate of gain	15.8	(4.8)	30.8	(4.5)	61.2	(6.0)	36.0	(3.2)
Recorded the temperature of sick dairy heifers	29.6	(6.2)	56.7	(4.9)	55.2	(6.1)	49.8	(3.3)
Recorded the individual treatments administered to sick dairy heifers	45.3	(6.9)	79.8	(3.9)	91.0	(3.5)	75.0	(2.9)
Kept written records of dairy-heifer growth and/or health information	59.6	(6.5)	76.7	(4.2)	77.6	(5.1)	72.7	(3.0)
Kept computerized records of dairy-heifer growth and/or health information	8.9	(3.8)	45.2	(4.9)	80.6	(4.8)	46.7	(3.3)
Kept written or computerized records of dairy heifer-growth and/or health information	62.5	(6.5)	87.5	(3.3)	97.0	(2.1)	84.1	(2.4)

More than 6 of 10 operations provided treatment records and breeding history to the dairy of origin or buyer (68.0 and 60.4 percent of operations, respectively). A higher percentage of large operations provided health information on individual calves compared with small operations (84.8 and 46.4 percent, respectively). A higher percentage of large operations than small and medium operations provided information on performance. A higher percentage of medium and large operations (84.5 and 92.4 percent, respectively) provided any information on heifers compared with small operations (58.9 percent).

B.5.e. Percentage of operations that provided the dairy of origin or buyer with information on individual dairy heifers during 2010, by type of information and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Information	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Health of individual calves (treatment records)	46.4	(6.7)	68.9	(4.6)	84.8	(4.4)	68.0	(3.1)
Performance (weight gain, deaths)	16.1	(4.9)	22.5	(4.1)	59.1	(6.1)	31.7	(3.1)
Breeding history/ reproductive records of individual heifers	48.2	(6.7)	63.1	(4.8)	66.7	(5.8)	60.4	(3.3)
Any of the above	58.9	(6.6)	84.5	(3.6)	92.4	(3.3)	80.4	(2.7)

With the exception of breeding records, a higher percentage of operations in the West region than in the East region provided the dairy of origin or buyer with information on heifers.

B.5.f. Percentage of operations that provided the dairy of origin or buyer with information on individual dairy heifers during 2010, by type of information and by region:

	Percent Operations			
	Region			
	West		East	
Information	**Percent**	**Std. error**	**Percent**	**Std. error**
Health of individual calves (treatment records)	86.0	(5.3)	63.7	(3.6)
Performance (weight gain, deaths)	51.2	(7.6)	27.1	(3.3)
Breeding history/ reproductive records of individual heifers	62.8	(7.4)	59.9	(3.6)
Any of the above	93.0	(3.9)	77.5	(3.1)

6. Housing

Housing systems for preweaned heifers have traditionally focused on individual hutches or pens, which ensure that individual calves do not have direct contact with other calves. Current research, however, suggests that grouping preweaned heifers reduces labor for feeding via the use of automatic or free-choice feeding systems, socializes calves earlier in life, and provides growth rates equivalent to individual housing.

Photograph courtesy of Judy Rodriguez

Primary housing types for preweaned heifers varied considerably by region. More than 9 of 10 operations in the West region (92.9 percent) housed heifers in an individual outside hutch/pen. More diverse housing types were observed in the East region. For example, individual outside hutches and individual inside pens in an unheated barn were each used by 30.6 percent of operations in the East region, while almost 2 of 10 operations (19.4 percent) used multiple-animal inside areas/barns/sheds, and approximately 1 of 10 operations (12.9 percent) used individual inside pens in a heated barn. “Other” housing types were usually a combination of the types listed.

B.6.a. Percentage of operations by primary housing type used for **preweaned heifers** during 2010, and by region:

Percent Operations

	Region					
	West		East		All operations	
Housing type	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Individual outside hutch/pen	92.9	(6.9)	30.6	(5.9)	42.1	(5.7)
Individual inside pen—warm (heated) calf barn	0.0	(—)	12.9	(4.3)	10.5	(3.5)
Individual inside pen—cold (unheated) calf barn	7.1	(6.9)	30.6	(5.9)	26.3	(5.1)
Tie stall or stanchion	0.0	(—)	3.2	(2.2)	2.6	(1.8)
Pasture	0.0	(—)	0.0	(—)	0.0	(—)
Freestall	0.0	(—)	0.0	(—)	0.0	(—)
Dry lot/multiple-animal outside area, excluding pasture	0.0	(—)	0.0	(—)	0.0	(—)
Bedded pack/ open shed	0.0	(—)	1.6	(1.6)	1.3	(1.3)
Multiple-animal inside area/barn/shed	0.0	(—)	19.4	(5.0)	15.8	(4.2)
Other	0.0	(—)	1.6	(1.6)	1.3	(1.3)
Total	100.0		100.0		100.0	

Weaned heifer calves have traditionally been housed in similarly aged groups. As was observed for preweaned heifer housing, housing types for weaned heifers varied by region. Reasons for these differences in housing choices are likely due to climate. For example, the West region has more sunshine and less humidity than the East region. In addition, winter temperatures in the West region are not typically as cold as those in the East region. The relatively mild climate in the West region allows producers to use more outside housing than producers in the East region.

Three-fourths of operations in the West region (75.0 percent) housed weaned heifers in a dry lot/multiple-animal outside area, compared with only 1 of 20 operations in the East region (5.3 percent). A higher percentage of operations in the East region used freestalls or multiple-animal inside area/barn/shed compared with operations in the West region. “Other” housing types were usually a combination of the types listed.

B.6.b. Percentage of operations by primary housing type used for **weaned heifers** during 2010, and by region:

Percent Operations

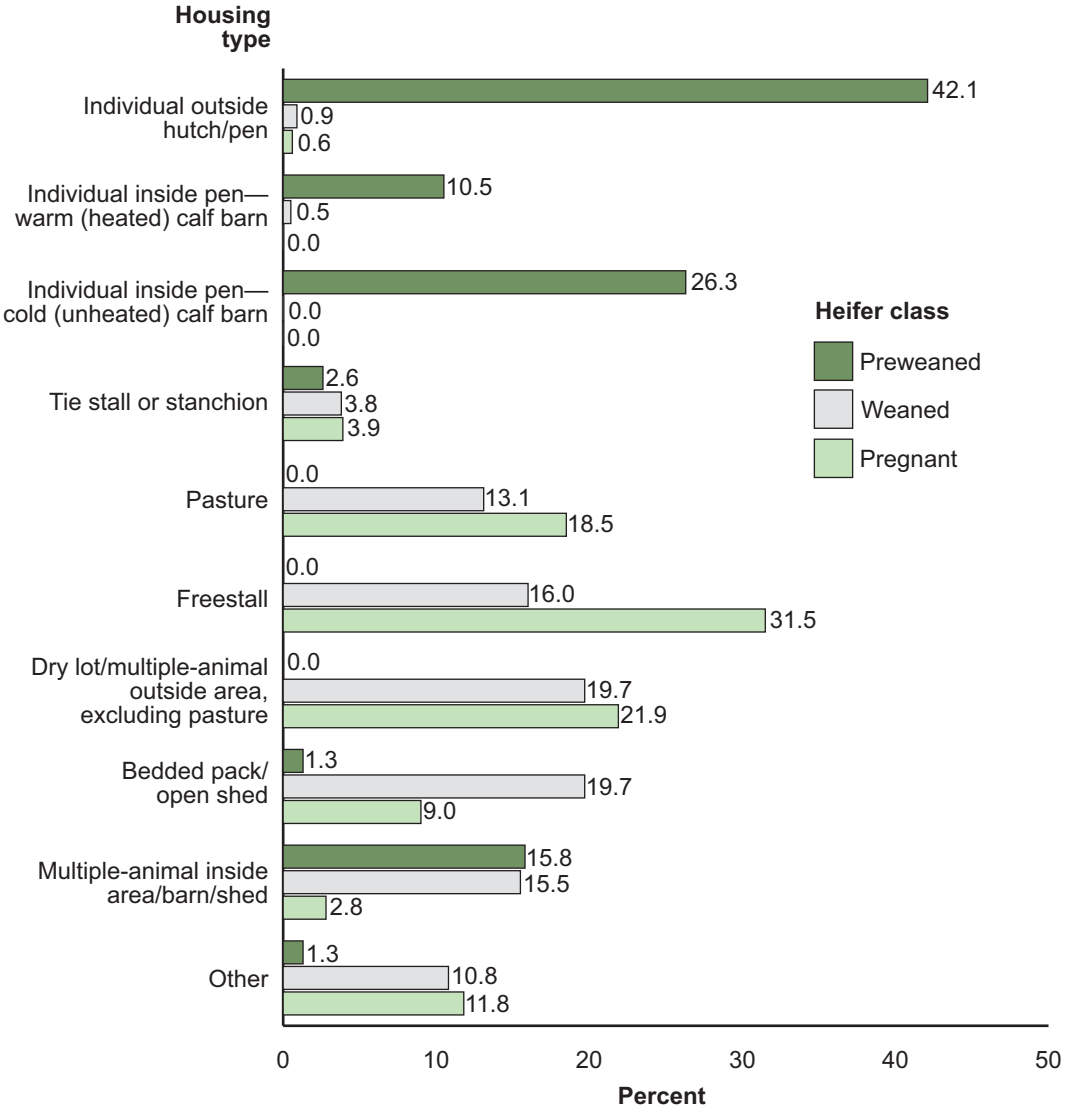
	Region					
	West		East		All operations	
Housing type	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Individual outside hutch/pen	2.3	(2.3)	0.6	(0.6)	0.9	(0.7)
Individual inside pen—warm (heated) calf barn	0.0	(—)	0.6	(0.6)	0.5	(0.5)
Individual inside pen—cold (unheated) calf barn	0.0	(—)	0.0	(—)	0.0	(—)
Tie stall or stanchion	0.0	(—)	4.7	(1.6)	3.8	(1.3)
Pasture	6.8	(3.8)	14.8	(2.7)	13.1	(2.3)
Freestall	0.0	(—)	20.1	(3.1)	16.0	(2.5)
Dry lot/multiple-animal outside area, excluding pasture	75.0	(6.5)	5.3	(1.7)	19.7	(2.7)
Bedded pack/ open shed	13.6	(5.2)	21.3	(3.2)	19.7	(2.7)
Multiple-animal inside area/barn/shed	2.3	(2.3)	18.9	(3.0)	15.5	(2.5)
Other	0.0	(—)	13.6	(2.6)	10.8	(2.1)
Total	100.0		100.0		100.0	

More than 8 of 10 operations in the West region (85.3 percent) housed pregnant heifers in a dry lot/multiple-animal outside area (excluding pasture) compared with less than 1 of 10 operations in the East region (6.9 percent). The highest percentage of operations in the East region (38.9 percent) housed pregnant heifers in freestalls. In addition, a higher percentage of operations in the East region than in the West region used tie stalls/stanchions, bedded pack/open shed, or multiple-animal inside area/barn/shed for housing pregnant heifers. “Other” housing types were usually a combination of the types listed.

B.6.c. Percentage of operations by primary housing type used for **pregnant heifers** during 2010, and by region:

	Percent Operations					
	Region					
	West		East		All operations	
Housing type	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Individual outside hutch/pen	2.9	(2.9)	0.0	(—)	0.6	(0.6)
Individual inside pen—warm (heated) calf barn	0.0	(—)	0.0	(—)	0.0	(—)
Individual inside pen—cold (unheated) calf barn	0.0	(—)	0.0	(—)	0.0	(—)
Tie stall or stanchion	0.0	(—)	4.9	(1.8)	3.9	(1.5)
Pasture	8.8	(4.9)	20.8	(3.4)	18.5	(2.9)
Freestall	0.0	(—)	38.9	(4.1)	31.5	(3.5)
Dry lot/multiple animal outside area, excluding pasture	85.3	(6.1)	6.9	(2.1)	21.9	(3.1)
Bedded pack/ open shed	0.0	(—)	11.1	(2.6)	9.0	(2.1)
Multiple animal inside area/barn/shed	0.0	(—)	3.5	(1.5)	2.8	(1.2)
Other	2.9	(2.9)	13.9	(2.9)	11.8	(2.4)
Total	100.0		100.0		100.0	

Percentage of operations by primary housing type used in 2010, and by heifer class



Air quality and temperature in housing systems are important. Poor air quality can lead to respiratory disease in calves, while extreme hot and cold temperatures can lead to increased risk of disease.

Almost half of operations that primarily housed heifers inside (47.3 percent) used only natural ventilation; about 4 of 10 operations (40.9 percent) used a combination of natural and mechanical ventilation; and about 1 of 10 (11.8 percent) used only mechanical ventilation. All operations provided some form of ventilation for inside housing.

B.6.d. For the 48.2 percent of operations that primarily housed calves inside, percentage of operations by type of facility ventilation and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Ventilation type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Natural only (open sidewalls, windows)	51.4	(8.5)	42.4	(6.4)	56.3	(12.4)	47.3	(4.8)
Mechanical only (fans, forced air)	17.1	(6.4)	10.2	(3.9)	6.3	(6.1)	11.8	(3.1)
Combination natural/ mechanical	31.4	(7.9)	47.5	(6.5)	37.5	(12.1)	40.9	(4.7)
None	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Total	100.0		100.0		100.0		100.0	

C. General Health

1. Preventive practices

More than 5 of 10 operations administered vitamin A-D-E or selenium by injection or in feed to preweaned heifers, and 41.1 percent administered probiotics. No operation administered magnets to prevent hardware disease in preweaned heifers. No herd size differences were noted. “Other” preventive practices included a variety of supplements, including electrolytes, yeast, and minerals.

C.1.a. Percentage of operations by disease-prevention practices normally used for **preweaned heifers** during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Preventive practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Dewormers (e.g., Safe-Guard®, Dectomax®, Ivomec®)	25.0	(9.7)	10.7	(5.9)	33.3	(9.1)	22.7	(4.8)
Administered magnets	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Vitamin A-D-E injection/ feed additive	42.1	(11.4)	51.9	(9.6)	59.3	(9.5)	52.1	(5.9)
Selenium injection/ feed additive (e.g., BO-SE®)	50.0	(11.2)	60.7	(9.2)	70.4	(8.8)	61.3	(5.6)
Probiotics (e.g., Probios®, Fastrack®)	47.4	(11.5)	28.6	(8.6)	50.0	(9.8)	41.1	(5.8)
Other	15.8	(8.4)	7.1	(4.9)	7.7	(5.2)	9.6	(3.5)

More than three of four operations (76.2 percent) dewormed weaned heifers. Magnets to prevent hardware disease were administered to weaned heifers on 10.0 percent of small operations and 37.7 percent of large operations. “Other” preventive practices included a variety of supplements including electrolytes, yeast, and minerals.

C.1.b. Percentage of operations by disease-prevention practices normally used for **weaned heifers** during 2010, and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Preventive practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Dewormers (e.g., Safe-Guard, Dectomax, Ivomec)	76.9	(5.9)	80.2	(4.1)	69.4	(5.9)	76.2	(2.9)
Administered magnets	10.0	(4.3)	14.7	(3.6)	37.7	(6.2)	20.4	(2.8)
Vitamin A-D-E injection/ feed additive	36.0	(6.8)	42.7	(5.1)	45.9	(6.4)	42.0	(3.4)
Selenium injection/ feed additive (e.g., BO-SE)	26.0	(6.2)	28.4	(4.6)	20.0	(5.2)	25.4	(3.0)
Probiotics (e.g., Probios, Fastrack)	6.0	(3.4)	10.3	(3.1)	16.7	(4.8)	11.1	(2.2)
Other	6.0	(3.4)	2.1	(1.5)	3.3	(2.3)	3.4	(1.3)

Approximately two of three operations (66.9 percent) dewormed pregnant heifers. Vitamins A-D-E and selenium were administered to pregnant heifers by injection or in feed on 35.7 and 23.4 percent of operations, respectively. No herd size differences were noted. “Other” preventive practices included a variety of supplements including electrolytes, yeast, and minerals.

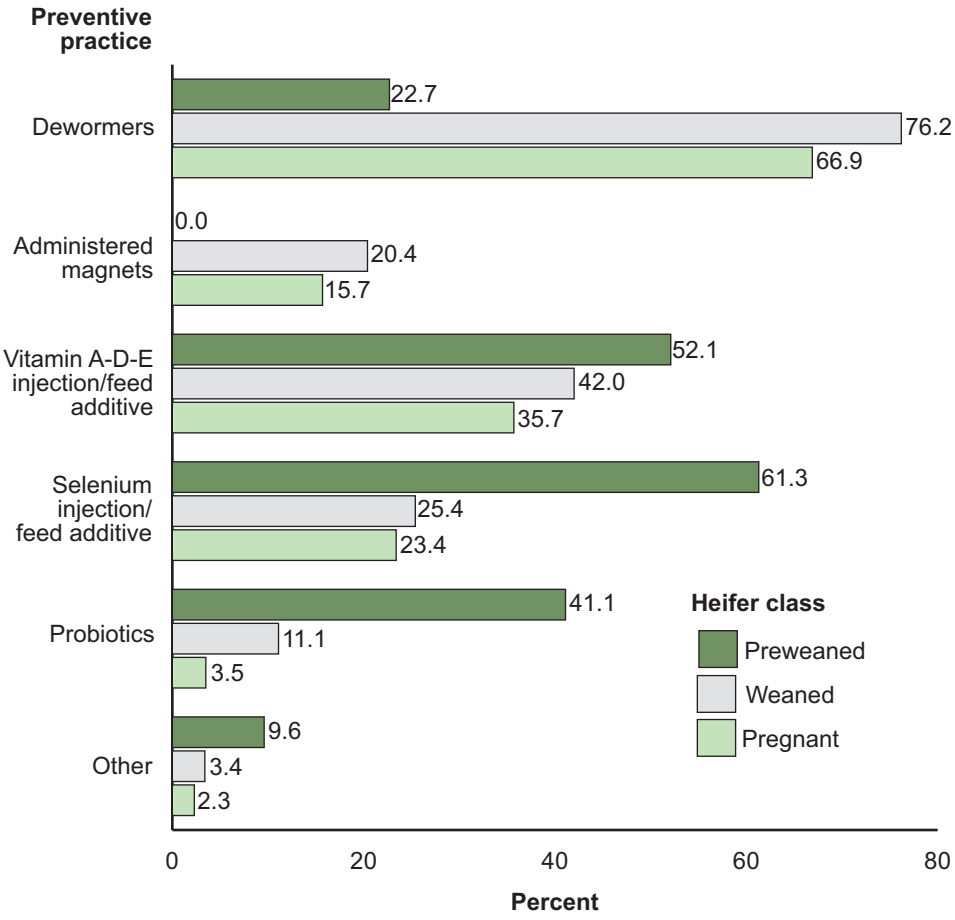
C.1.c. Percentage of operations by disease-prevention practices usually used for **pregnant heifers** during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Preventive practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Dewormers (e.g., Safe-Guard, Dectomax, Ivomec)	59.6	(7.2)	72.2	(5.1)	65.3	(6.8)	66.9	(3.6)
Administered magnets	11.1	(4.7)	17.9	(4.4)	16.3	(5.3)	15.7	(2.8)
Vitamin A-D-E injection/ feed additive	33.3	(7.0)	34.6	(5.4)	39.6	(7.1)	35.7	(3.7)
Selenium injection/ feed additive (e.g., BO-SE)	24.4	(6.4)	26.0	(5.0)	18.4	(5.5)	23.4	(3.2)
Probiotics (e.g., Probios, Fastrack)	0.0	(—)	3.8	(2.2)	6.1	(3.4)	3.5	(1.4)
Other	2.2	(2.2)	1.3	(1.3)	4.1	(2.8)	2.3	(1.2)

Percentage of operations by disease-prevention practices normally used for heifers during 2010, by heifer class



2. Vaccination practices

Vaccination remains a key component of disease control and prevention on livestock operations.

Vaccinating dairy heifers against brucellosis is no longer mandatory in many States, and all States have been considered brucellosis free since February 2012. More than 40 percent of operations received heifers of appropriate age for brucellosis vaccination but did not vaccinate against brucellosis, and 16.4 percent of operations received heifers that were already vaccinated against brucellosis. A higher percentage of small and medium operations (50.0 and 48.5 percent, respectively) did not vaccinate heifers of appropriate age compared with large operations (23.9 percent).

C.2.a. Percentage of operations by practices used to vaccinate heifers against brucellosis during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Vaccination practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Vaccinated prior to arrival	7.1	(3.4)	14.6	(3.5)	26.9	(5.4)	16.4	(2.5)
Vaccinated while on operation	25.0	(5.8)	19.4	(3.9)	41.8	(6.0)	27.4	(3.0)
Not vaccinated but of appropriate age for vaccination when on operation	50.0	(6.7)	48.5	(4.9)	23.9	(5.2)	41.6	(3.3)
Not vaccinated—heifers too young to vaccinate while on operation	0.0	(—)	7.8	(2.6)	3.0	(2.1)	4.4	(1.4)
Not vaccinated—heifers too old to vaccinate while on operation	16.1	(4.9)	8.7	(2.8)	3.0	(2.1)	8.8	(1.9)
Other	1.8	(1.8)	1.0	(1.0)	1.5	(1.5)	1.3	(0.8)
Total	100.0		100.0		100.0		100.0	

A higher percentage of operations in the West region (35.6 percent) received vaccinated heifers or vaccinated heifers on the operation (53.3 percent) compared with operations in the East region (11.6 and 21.0 percent, respectively).

C.2.b. Percentage of operations by practices used to vaccinate heifers against brucellosis during 2010, and by region:

	Percent Operations			
	Region			
	West		East	
Vaccination practice	**Percent**	**Std. error**	**Percent**	**Std. error**
Vaccinated prior to arrival	35.6	(7.2)	11.6	(2.4)
Vaccinated while on the operation	53.3	(7.5)	21.0	(3.0)
Not vaccinated but of appropriate age for vaccination when on the operation	8.9	(4.3)	49.7	(3.7)
Not vaccinated—heifers too young to vaccinate while on the operation	2.2	(2.2)	5.0	(1.6)
Not vaccinated—heifers too old to vaccinate while on the operation	0.0	(—)	11.0	(2.3)
Other	0.0	(—)	1.7	(1.0)
Total	100.0		100.0	

Official brucellosis vaccination of heifers requires a tattoo that includes an official shield and the last digit of the year vaccinated. Disinfecting tattoo pliers between heifers helps prevent the spread of diseases such as bovine leukemia virus (BLV), ringworm, and warts. Heifers in direct contact with each other can spread ringworm and warts, but BLV is primarily spread via blood contamination.

During brucellosis vaccination, about two-thirds of large operations (66.7 percent) disinfected tattoo pliers between calves, compared with less than one-tenth of small operations (7.7 percent).

C.2.c. For the 27.4 percent of operations that vaccinated heifers against brucellosis, percentage of operations that cleaned or placed brucellosis vaccination equipment (tattoo pliers) in disinfectant between calves, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
7.7	(7.4)	35.0	(10.7)	66.7	(9.1)	43.3	(6.4)

On approximately 3 of 10 operations, vaccination protocols were developed by the operation's management, the operation's veterinarian, the owner of the heifers, or the owner's veterinarian. A higher percentage of small operations (52.3 percent) developed their own vaccination protocols compared with medium and large operations (25.5 and 25.4 percent, respectively). The operation's veterinarian developed the vaccination protocols on 29.9 percent of large operations. "Other" personnel usually included a combination of the listed personnel.

C.2.d. Percentage of operations by person responsible for determining the vaccination protocol used by the operation on calves owned by others, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Personnel	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
The operation's management	52.3	(7.5)	25.5	(4.4)	25.4	(5.3)	31.1	(3.2)
Veterinarian for the operation	9.1	(4.3)	18.4	(3.9)	29.9	(5.6)	20.1	(2.8)
Owner of heifers or owner's veterinarian	29.5	(6.9)	34.7	(4.8)	19.4	(4.8)	28.7	(3.1)
The operation and owner design program together	4.5	(3.1)	17.3	(3.8)	16.4	(4.5)	14.4	(2.4)
Other	4.5	(3.1)	4.1	(2.0)	9.0	(3.5)	5.7	(1.6)
Total	100.0		100.0		100.0		100.0	

About 7 of 10 operations (70.7 percent) vaccinated preweaned heifers against at least one disease during 2010. A higher percentage of large operations (92.6 percent) administered at least one vaccination compared with small operations (47.6 percent). More than 4 of 10 operations vaccinated preweaned heifers against Infectious bovine rhinotracheitis (IBR) and parainfluenza type 3 (PI3). No operations vaccinated preweaned heifers against *Mycobacterium avium* subspecies *paratuberculosis* or rabies.

C.2.e. Percentage of operations by disease that **preweaned heifers** were normally vaccinated against during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Disease	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bovine viral diarrhea (BVD)	19.0	(8.6)	14.8	(6.9)	18.5	(7.5)	17.3	(4.4)
Infectious bovine rhinotracheitis (IBR)	19.0	(8.6)	55.6	(9.6)	55.6	(9.6)	45.3	(5.8)
Parainfluenza type 3 (PI3)	19.0	(8.6)	51.9	(9.6)	48.1	(9.6)	41.3	(5.7)
Bovine respiratory syncytial virus (BRSV)	9.5	(6.4)	37.0	(9.3)	40.7	(9.5)	30.7	(5.3)
Haemophilus somnus	4.8	(4.7)	0.0	(—)	0.0	(—)	1.3	(1.3)
Leptospirosis	9.5	(6.4)	0.0	(—)	3.7	(3.6)	4.0	(2.3)
Salmonella	0.0	(—)	3.7	(3.6)	0.0	(—)	1.3	(1.3)
Clostridia	23.8	(9.3)	7.4	(5.1)	33.3	(9.1)	21.3	(4.7)
Mycobacterium avium subspecies *paratuberculosis*	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Rabies	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Any disease	47.6	(10.9)	66.7	(9.1)	92.6	(5.1)	70.7	(5.3)

About 8 or 10 operations (83.5 percent) vaccinated weaned heifers against at least one disease during 2010. A higher percentage of large operations (91.4 percent) administered at least one vaccination compared with small operations (70.6 percent). A higher percentage of large operations than medium operations vaccinated against brucellosis (41.8 and 19.4 percent, respectively). No operations vaccinated weaned heifers against *Mycobacterium avium* subspecies *paratuberculosis* or rabies.

C.2.f. Percentage of operations by disease that **weaned heifers** were normally vaccinated against during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Disease	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bovine viral diarrhea (BVD)	47.1	(7.0)	31.9	(4.9)	24.1	(5.6)	33.5	(3.3)
Infectious bovine rhinotracheitis (IBR)	41.2	(6.9)	34.1	(5.0)	32.8	(6.2)	35.5	(3.4)
Parainfluenza type 3 (PI3)	39.2	(6.9)	30.8	(4.8)	29.3	(6.0)	32.5	(3.3)
Bovine respiratory syncytial virus (BRSV)	29.4	(6.4)	20.9	(4.3)	22.4	(5.5)	23.5	(3.0)
Haemophilus somnus	2.0	(1.9)	2.2	(1.5)	0.0	(—)	1.5	(0.9)
Leptospirosis	31.4	(6.5)	18.7	(4.1)	17.2	(5.0)	21.5	(2.9)
Salmonella	0.0	(—)	0.0	(—)	3.4	(2.4)	1.0	(0.7)
Clostridia	17.6	(5.3)	39.6	(5.1)	37.9	(6.4)	33.5	(3.3)
Brucellosis	25.0	(5.8)	19.4	(3.9)	41.8	(6.0)	27.4	(3.0)
Mycobacterium avium subspecies *paratuberculosis*	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Rabies	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Any disease	70.6	(6.4)	85.7	(3.7)	91.4	(3.7)	83.5	(2.6)

About 7 or 10 operations (71.1 percent) vaccinated pregnant heifers against at least one disease during 2010. A higher percentage of large operations administered at least one vaccination compared with small operations (88.4 and 58.1 percent, respectively). Clostridia vaccine was administered on a higher percentage of large operations than small operations (32.6 and 4.7 percent, respectively).

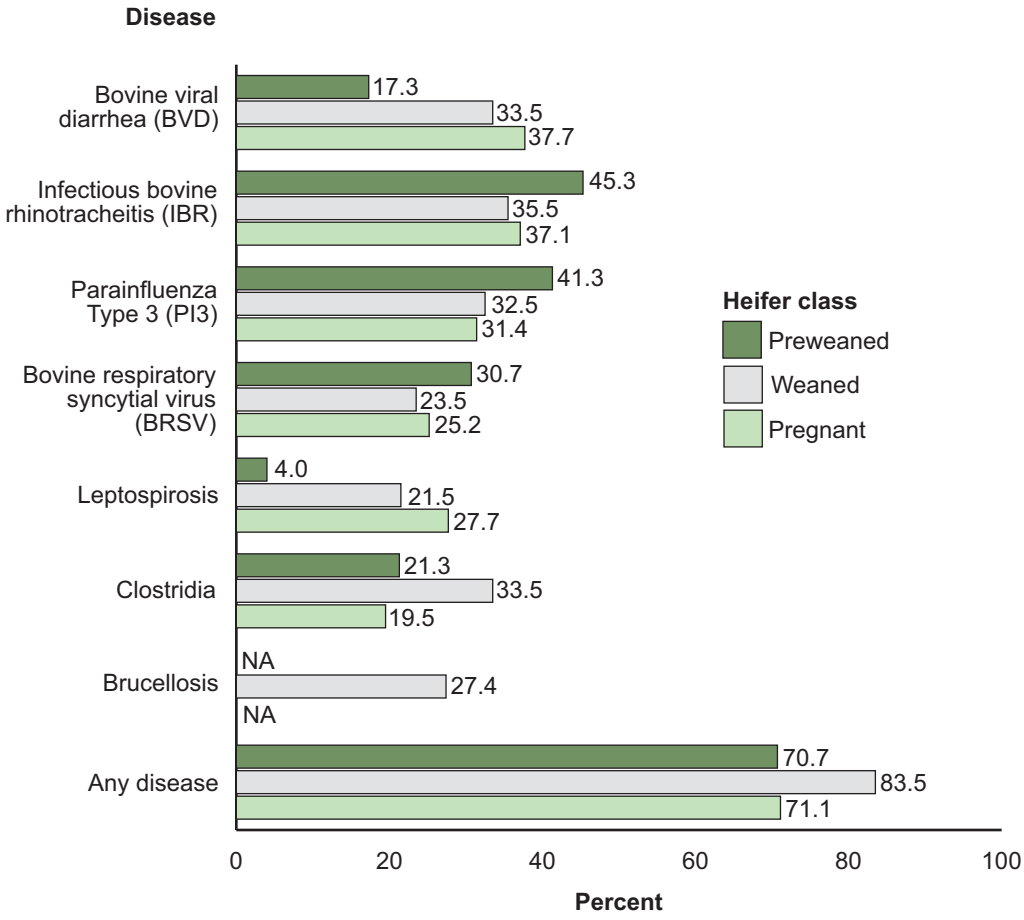
C.2.g. Percentage of operations by disease that **pregnant heifers** were normally vaccinated against during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Disease	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bovine viral diarrhea (BVD)	46.5	(7.6)	38.4	(5.7)	27.9	(6.9)	37.7	(3.9)
Infectious bovine rhinotracheitis (IBR)	41.9	(7.5)	39.7	(5.7)	27.9	(6.9)	37.1	(3.8)
Parainfluenza type 3 (PI3)	39.5	(7.5)	31.5	(5.4)	23.3	(6.5)	31.4	(3.7)
Bovine respiratory syncytial virus (BRSV)	37.2	(7.4)	21.9	(4.9)	18.6	(5.9)	25.2	(3.4)
Haemophilus somnus	2.3	(2.3)	0.0	(—)	0.0	(—)	0.6	(0.6)
Leptospirosis	34.9	(7.3)	23.3	(5.0)	27.9	(6.9)	27.7	(3.6)
Salmonella	0.0	(—)	1.4	(1.4)	7.0	(3.9)	2.5	(1.2)
E. coli mastitis	0.0	(—)	2.7	(1.9)	16.3	(5.6)	5.7	(1.8)
Clostridia	4.7	(3.2)	20.5	(4.7)	32.6	(7.2)	19.5	(3.1)
Rabies	2.3	(2.3)	0.0	(—)	0.0	(—)	0.6	(0.6)
Any disease	58.1	(7.5)	68.5	(5.4)	88.4	(4.9)	71.1	(3.6)

Percentage of operations by diseases heifers were normally vaccinated against during 2010, by heifer class



Using a single needle to vaccinate multiple heifers can result in the transmission of bloodborne diseases such as BLV and anaplasmosis. In addition, needles used on multiple heifers eventually become dull, resulting in tissue trauma, pain, and the possibility of broken needles.

Almost 4 of 10 operations (38.8 percent) vaccinated 2 to 10 heifers with each needle, while one-fourth (25.2 percent) vaccinated 11 to 20 heifers before changing needles. More than 30 heifers were vaccinated with a single needle on 14.6 percent of operations.

C.2.h. Percentage of operations by number of dairy heifers vaccinated with each needle, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Number heifers/needle	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1 (new needle for each heifer)	14.6	(5.5)	14.1	(3.5)	15.2	(4.4)	14.6	(2.5)
2–10	43.9	(7.8)	37.4	(4.9)	37.9	(6.0)	38.8	(3.4)
11–20	19.5	(6.2)	28.3	(4.5)	24.2	(5.3)	25.2	(3.0)
21–30	14.6	(5.5)	6.1	(2.4)	3.0	(2.1)	6.8	(1.8)
More than 30	7.3	(4.1)	14.1	(3.5)	19.7	(4.9)	14.6	(2.5)
Total	100.0		100.0		100.0		100.0	

3. Disease testing

Testing individual heifers for disease prior to arrival or at arrival is recommended. If heifers test positive, then mitigation steps can be taken to reduce the risk of transmitting disease to the rest of the herd. Since the majority of operations raise heifers owned by the dairies of origin, testing also gives an indication of the disease status of the source herd. Depending on which States the heifers travel to, State regulations may require testing for brucellosis and/or TB. Heifers shipped out of the United States are required to have some disease testing performed prior to shipment.

Half of operations (50.4 percent) tested heifers for any disease during 2010, with a lower percentage of small operations performing any testing (22.8 percent) compared with medium and large operations (53.8 and 68.7 percent, respectively). Heifers were tested for TB on a higher percentage of large operations (42.4 percent) than medium (20.4 percent) or small operations (16.1 percent). “Other” disease testing was primarily conducted for bluetongue and BLV, and this testing was associated with heifers shipped out of the country.

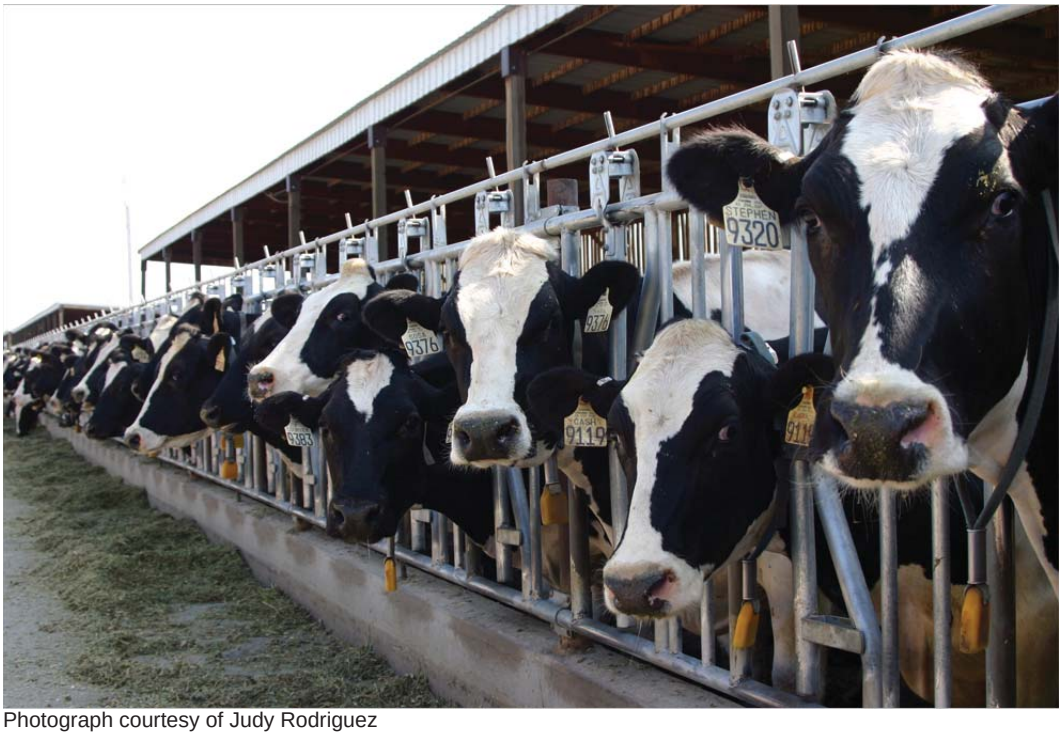
C.3.a. Percentage of operations that tested dairy heifers for disease prior to or after arrival at the operation during 2010, by disease tested for and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Disease	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bovine viral diarrhea—persistently infected (BVD-PI)	10.5	(4.1)	42.2	(4.9)	50.7	(6.1)	36.7	(3.2)
Brucellosis	7.1	(3.4)	2.0	(1.4)	22.7	(5.2)	9.4	(2.0)
TB	16.1	(4.9)	20.4	(4.0)	42.4	(6.1)	25.8	(2.9)
Other	1.8	(1.8)	2.9	(1.7)	15.2	(4.4)	6.3	(1.6)
Any	22.8	(5.6)	53.8	(4.9)	68.7	(5.7)	50.4	(3.3)
None	77.2	(5.6)	46.2	(4.9)	31.3	(5.7)	49.6	(3.3)

More than twice the percentage of operations in the West region (46.7 percent) tested for TB compared with operations in the East region (20.6 percent).

C.3.b. Percentage of operations that tested dairy heifers for diseases prior to or after arrival at the operation during 2010, by disease tested for and by region:

	Percent Operations			
	Region			
	West		East	
Disease	**Percent**	**Std. error**	**Percent**	**Std. error**
Bovine viral diarrhea—persistently infected (BVD-PI)	25.0	(6.5)	39.6	(3.6)
Brucellosis	18.2	(5.8)	7.2	(1.9)
TB	46.7	(7.5)	20.6	(3.0)
Other	15.9	(5.5)	3.9	(1.4)
Any	55.6	(7.4)	49.2	(3.7)
None	44.4	(7.4)	50.8	(3.7)



Photograph courtesy of Judy Rodriguez

D. Heifer Movement

Note: A shipment refers to one group of animals moved at once, regardless of the number of vehicles required to move them.

1. Heifers moved to the operation

The average number of dairy-heifer shipments in 2010 from all sources increased from small (8.9) to medium (54.7) to large (481.3) operations. This increase in shipments by herd size was due primarily to the number of shipments from dairy operations. Almost 170 shipments (168.6) were received on average from dairy operations, with the number of shipments increasing as herd size increased.

D.1.a. Average number of dairy-heifer shipments during 2010, by source of heifers and by herd size:

	Average Number of Shipments							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Source	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Dairy operation	7.4	(1.7)	50.3	(9.4)	473.7	(104.5)	164.0	(33.8)
Auction market/ sale barn	0.7	(0.2)	2.3	(1.5)	1.6	(0.7)	1.7	(0.7)
Other heifer-raising operations	0.2	(0.1)	1.2	(0.6)	5.4	(1.9)	2.2	(0.6)
Private sales not associated with a dairy operation	0.6	(0.2)	0.7	(0.3)	0.6	(0.3)	0.6	(0.2)
All	8.9	(1.6)	54.7	(9.4)	481.3	(104.1)	168.6	(33.7)

Each shipment to heifer-raising operations averaged 9.9 heifers during 2010. Differences by herd size included the number of heifers per shipment from auction markets in which large operations had a higher average number of heifers per shipment (33.4) compared with small and medium operations (5.7 and 7.2, respectively), and large operations had a higher number of heifers per shipment from other heifer-raising operations (57.3) compared with small operations (2.8). In addition, the average number of heifers per shipment from private sales was higher for large operations (15.2) compared with small operations (14.8). The average number of heifers per shipment from "other" sources decreased as herd size increased, but the number of shipments from these sources was small (table D.1.a).

D.1.b. Average number of dairy heifers per shipment during 2010, by source of heifers and by herd size:

	Average Number of Heifers							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Source	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Dairy operation	5.2	(0.9)	6.8	(1.1)	9.5	(1.8)	9.1	(1.5)
Auction market/ sale barn	5.7	(0.9)	7.2	(3.9)	33.4	(6.9)	14.2	(5.9)
Other heifer-raising operations	2.8	(3.2)	18.4	(7.8)	57.3	(13.5)	46.3	(11.7)
Private sales not associated with a dairy operation	14.8	(2.8)	40.7	(15.9)	151.2	(59.6)	67.6	(25.7)
All	5.9	(0.9)	7.6	(1.1)	10.3	(2.0)	9.9	(1.6)

In general, shipment distance to the heifer-raising facility increased as herd size increased. Almost 3 of 10 shipments (28.4 percent) traveled 100.0 miles or more to reach the heifer-raising facility.

D.1.c. Percentage of dairy-heifer shipments by average distance shipment traveled to the heifer-raising facility, and by herd size:

Percent Shipments

Herd Size (number of dairy heifers)

Distance (miles)	**Small** (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
	Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Less than 5.0	17.0	(5.2)	5.1	(2.2)	1.6	(1.6)	7.0	(1.7)
5.0–19.9	43.4	(6.8)	23.2	(4.3)	12.7	(4.2)	25.1	(3.0)
20.0–49.9	22.6	(5.8)	27.3	(4.5)	15.9	(4.6)	22.8	(2.9)
50.0–99.9	1.9	(1.9)	17.2	(3.8)	28.6	(5.7)	16.7	(2.6)
100.0 or more	15.1	(4.9)	27.3	(4.5)	41.3	(6.2)	28.4	(3.1)
Total	100.0		100.0		100.0		100.0	

Approximately one of three heifer-raising operations (34.1 percent) received shipments that had crossed State lines. For shipments from dairy operations, almost one of four operations (24.7 percent) received shipments that had crossed State lines. For shipments from private sales not associated with a dairy operation, more than half of operations (54.5 percent) received shipments that had crossed State lines.

D.1.d. Percentage of operations that received dairy-heifer shipments that had crossed State lines, by source of shipments and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Dairy operations	9.1	(4.3)	22.5	(4.4)	39.3	(6.3)	24.7	(3.1)
Auction market/ sale barn	18.2	(11.7)	33.3	(13.6)	45.5	(15.0)	32.4	(8.0)
Other heifer-raising operations	0.0	(—)	23.1	(11.7)	64.3	(12.8)	42.9	(9.4)
Private sales not associated with a dairy operation	61.5	(13.5)	45.5	(15.0)	55.6	(16.6)	54.5	(8.7)
All	25.0	(5.8)	31.4	(4.6)	46.2	(6.2)	34.1	(3.2)

2. Heifers moved off the operation

The average number of shipments of dairy heifers to all destinations increased from small (7.3) to medium (30.5) to large (143.9) operations. The increase in number of shipments by herd size was due primarily to the number of shipments back to the dairy of origin.

D.2.a. Average number of dairy-heifer shipments during 2010, by destination and by herd size:

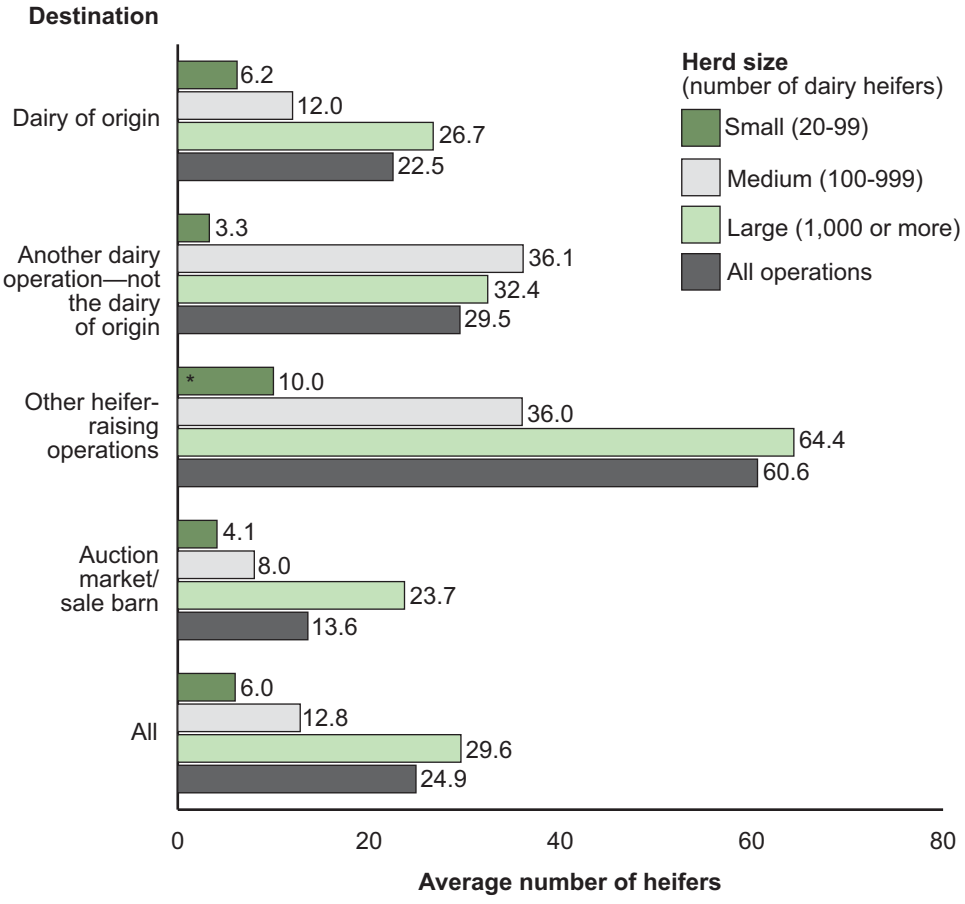
	Average Number of Shipments							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Destination	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Dairy of origin	5.2	(1.0)	28.3	(4.1)	129.2	(39.7)	52.2	(12.3)
Another dairy operation—not the dairy of origin	0.5	(0.3)	0.4	(0.3)	2.6	(1.2)	1.1	(0.4)
Other heifer-raising operations	5.0	(0.0)	0.6	(0.3)	6.7	(3.0)	2.3	(0.9)
Auction market/ sale barn	1.1	(0.5)	0.7	(0.3)	1.5	(0.6)	1.0	(0.3)
All	7.3	(1.0)	30.5	(4.1)	143.9	(39.8)	58.0	(12.4)

Overall, shipments of heifers departing heifer-raising operations averaged 24.9 heifers per shipment, more than double the number of heifers for incoming shipments. The average number of heifers per departing shipment for all destinations increased from 6.0 heifers per shipment for small operations to 29.6 heifers for large operations. The average number of heifers per shipment back to dairy of origin was higher for large operations than for small operations (26.7 and 6.2, respectively).

D.2.b. Average number of dairy heifers per shipment during 2010, by destination and by herd size:

	Average Number of Heifers							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Destination	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Dairy of origin	6.2	(1.1)	12.0	(1.1)	26.7	(5.7)	22.5	(3.6)
Another dairy operation—not the dairy of origin	3.3	(0.3)	36.1	(2.6)	32.4	(8.4)	29.5	(6.2)
Other heifer-raising operations	10.0	(0.0)	36.0	(11.6)	64.4	(17.1)	60.6	(14.7)
Auction market/ sale barn	4.1	(1.3)	8.0	(1.3)	23.7	(10.3)	13.6	(5.2)
All	6.0	(0.9)	12.8	(1.2)	29.6	(6.0)	24.9	(3.7)

Average number of dairy heifers per shipment during 2010, by destination and by herd size



More than 3 of 10 shipments (31.2 percent) traveled 100.0 miles or more to reach their destination. In general, as herd size increased a higher percentage of shipments traveled farther from the heifer-raising facility.

D.2.c. Percentage of shipments by average distance traveled from the heifer-raising facility, and by herd size:

Percent Shipments

Herd Size (number of dairy heifers)

Distance (miles)	**Small** (20–99) Pct.	Std. error	**Medium** (100–999) Pct.	Std. error	**Large** (1,000 or more) Pct.	Std. error	**All operations** Pct.	Std. error
Less than 5.0	19.6	(5.9)	9.4	(3.0)	0.0	(—)	8.9	(2.0)
5.0–19.9	28.3	(6.7)	22.9	(4.3)	15.0	(4.6)	21.8	(2.9)
20.0–49.9	30.4	(6.8)	27.1	(4.5)	13.3	(4.4)	23.8	(3.0)
50.0–99.9	8.7	(4.2)	14.6	(3.6)	18.3	(5.0)	14.4	(2.5)
100.0 or more	13.0	(5.0)	26.0	(4.5)	53.3	(6.5)	31.2	(3.3)
Total	100.0		100.0		100.0		100.0	

As was observed for incoming shipments, about one of three operations (32.9 percent) had outgoing shipments that crossed State lines. For shipments to the dairy of origin and for shipments to all destinations, a higher percentage of large operations than small operations sent shipments that had crossed State lines.

D.2.d. Percentage of operations that had outgoing shipments that crossed State lines, by destination and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Destination	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Dairy of origin	9.7	(5.3)	21.1	(4.3)	47.2	(6.9)	27.0	(3.4)
Another dairy operation—not the dairy of origin	16.7	(15.2)	60.0	(22.0)	66.7	(15.7)	50.0	(11.2)
Other dairy heifer-raising operations	0.0	(—)	33.3	(19.3)	53.8	(13.9)	45.0	(11.1)
Auction market/ sale barn	16.7	(10.8)	12.5	(11.7)	20.0	(12.7)	16.7	(6.8)
All	14.6	(5.1)	26.7	(4.4)	57.4	(6.3)	32.9	(3.2)

3. International movement

Overall, 12.2 percent of operations sent heifers to another country. More than twice the percentage of operations in the West region than in the East region sent heifers abroad (27.3 and 8.4 percent, respectively). Turkey, Mexico, and Russia were the top three destinations for heifers sent abroad.

D.3.a. Percentage of operations that sent dairy heifers to another country, by region:

Percent Operations					
Region					
West		East		All operations	
Percent	Std. error	Percent	Std. error	Percent	Std. error
27.3	(6.7)	8.4	(2.1)	12.2	(2.2)

D.3.b. Percentage of operations that sent dairy heifers to another country, by country:

Country	Percent operations	Std. error
Turkey	8.1	(1.8)
Mexico	4.1	(1.3)
Russia	3.2	(1.2)
Canada	0.5	(0.5)
Egypt	0.5	(0.5)
Vietnam	0.5	(0.5)
Any	12.2	(2.2)
None	87.8	(2.2)

E. Feeding Practices

Note: Except where noted, estimates in this section are only for operations with preweaned heifers.

1. Colostrum and passive transfer

Administering colostrum to newborn calves is necessary for the absorption of immunoglobulins. Calves should receive colostrum within 2 to 3 hours of birth to increase the potential for passive transfer of immunity. Since heifers are not routinely moved to heifer-raising operations within 2 to 3 hours of birth, colostrum should be fed at the dairy of origin, before shipment to the heifer-raising operation. Ideally, colostrum should be fed from an individual cow to an individual calf and should not be pooled. Pooling unpasteurized colostrum increases the risk of transmitting diseases such as *Mycoplasma*, *Salmonella,* and *Mycobacterium avium* subspecies *paratuberculosis.* Pasteurizing colostrum and milk reduces or eliminates most pathogens of concern on dairy operations.

All operations reported that colostrum was administered at the dairy of origin, and 2 of 10 operations (20.5 percent) administered colostrum at the heifer-raising operation as well.

E.1.a. Percentage of operations that administered colostrum to newborn dairy heifers during 2010, by location of administration and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Location	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
At dairy of origin	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)	100.0	(0.0)
At heifer-raising operation	19.0	(8.6)	17.9	(7.3)	24.1	(8.0)	20.5	(4.6)

Of the 20.5 percent of heifer-raising operations that administered colostrum to newborn calves, 64.3 percent administered individual-cow colostrum from the dairy of origin. Almost one-fourth of operations (23.1 percent) fed pooled colostrum from the dairy of origin. The study questionnaire did not ask whether colostrum was pasteurized. More than half of operations (53.8 percent) fed a commercial colostrum replacer.

E.1.b. For the 20.5 percent of heifer-raising operations that administered colostrum to newborn calves during 2010 (n=14), percentage of operations by source of colostrum:

Source	Percent operations	Std. error
Individual-cow colostrum from dairy of origin	64.3	(12.8)
Individual-cow colostrum not from dairy of origin	15.4	(10.0)
Pooled cow colostrum from dairy of origin	23.1	(11.7)
Pooled cow colostrum not from dairy of origin	7.7	(7.4)
Commercial colostrum replacer (e.g., Acquire®/Secure®)	53.8	(13.9)

Measuring serum proteins in calves less than a week old provides information on the passive transfer status of the calves. Heifer-raising operations that test serum proteins can provide information to the dairy of origin about their colostrum management program.

Serum proteins were measured on 40.3 percent of operations; a higher percentage of large operations (72.4 percent) monitored serum proteins compared with small and medium operations (5.0 and 32.1 percent, respectively).

E.1.c. Percentage of operations that routinely monitored serum proteins of newborn heifer calves prior to or upon arrival at the operation, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
5.0	(4.9)	32.1	(8.8)	72.4	(8.3)	40.3	(5.6)

More than twice the percentage of operations in the West region monitored serum proteins compared with operations in the East region.

E.1.d. Percentage of operations that routinely monitored serum proteins of newborn heifer calves prior to or upon arrival at the operation, by region:

Percent Operations			
Region			
West		East	
Percent	Std. error	Percent	Std. error
78.6	(11.0)	31.7	(5.9)

Photograph courtesy of Judy Rodriguez

Almost half of operations that monitored serum proteins (48.4 percent) accepted calves with failure of passive transfer, although with conditions such as operation was not liable for calves' death. Few operations refused these heifers after testing (6.7 percent). "Other" measures were not aimed at individual heifers but included providing a report to the dairy of origin, which was used as monitoring tool for the dairy's colostrum management program.

E.1.e. For the 40.3 percent of operations that routinely monitored serum proteins of newborn heifer calves (n=31), percentage of operations by measures taken for calves with failure of passive transfer, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Measure	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Calves were refused at operation	*		11.1	(10.5)	4.8	(4.7)	6.5	(4.4)
Calves were purchased or accepted, with conditions	*		44.4	(16.6)	47.6	(10.9)	48.4	(9.0)
Other	*		44.4	(16.6)	9.5	(6.4)	19.4	(7.1)
None	*		33.3	(15.7)	38.1	(10.6)	35.5	(8.6)

*Too few to report.

2. Liquid diets

The majority of operations (85.9 percent) fed any milk replacer to preweaned heifers. More than 6 of 10 operations (62.8 percent) fed medicated milk replacer. Under new regulations imposed in 2009, medications used in milk replacer to control or treat diarrhea can only be fed for 14 days. Although producers could continue to use medications for improved weight gain and feed efficiency, the lower dose of medication might not be cost effective.

Any milk was fed to preweaned heifers on 32.1 percent of operations. A higher percentage of operations in the West region fed any milk or pasteurized nonsaleable milk (64.3 and 78.6 percent, respectively) compared with operations in the East region (14.1 and 21.9 percent, respectively). “Other” diets were primarily saleable milk.

E.2.a. Percentage of operations by type of liquid diet fed to preweaned heifers, and by region:

Percent Operations

	Region					
	West		East		All operations	
Liquid diet*	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Nonmedicated milk replacer	35.7	(12.8)	34.4	(6.0)	34.6	(5.4)
Medicated milk replacer	64.3	(12.8)	62.5	(6.1)	62.8	(5.5)
Any milk replacer	92.9	(6.9)	84.4	(4.5)	85.9	(3.9)
Unpasteurized nonsaleable (waste) milk	21.4	(11.0)	7.8	(3.4)	10.3	(3.4)
Pasteurized nonsaleable (waste) milk	64.3	(12.8)	14.1	(4.4)	23.1	(4.8)
Any milk	78.6	(11.0)	21.9	(5.2)	32.1	(5.3)
Other	14.3	(9.4)	4.7	(2.6)	6.4	(2.8)

*Some operations fed more than one diet.

About 3 of 10 preweaned heifers (30.7 percent) received nonmedicated milk replacer, and 6 of 10 heifers (59.2 percent) received medicated milk replacer. More heifers in the West region (51.8 percent) were fed pasteurized nonsaleable milk compared with heifers in the East region (12.7 percent).

E.2.b. Percentage of preweaned heifers by type of liquid diet fed during 2010, and by region:

	Percent Preweaned Heifers					
	Region					
	West		East		All operations	
Liquid diet*	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Nonmedicated milk replacer	30.4	(11.9)	30.8	(5.6)	30.7	(5.1)
Medicated milk replacer	60.7	(12.3)	58.9	(5.9)	59.2	(5.3)
Unpasteurized nonsaleable (waste) milk	21.4	(11.0)	4.8	(2.4)	7.8	(2.9)
Pasteurized nonsaleable (waste) milk	51.8	(12.3)	12.7	(4.0)	19.7	(4.3)
Other	14.3	(9.4)	4.7	(2.6)	6.4	(2.8)

*Some heifers were fed more than one diet.

Traditional milk replacers contained 20 percent protein and 20 percent fat. Newer formulations have shown that increasing the protein fraction to 28 percent and leaving the fat at 20 percent results in healthier and larger calves.

The majority of operations (84.7 percent) fed preweaned heifers milk replacer with a protein content of 20 to 24 percent. More than 8 of 10 operations (82.8 percent) fed preweaned heifers milk replacer with a fat percentage of 20 to 24 percent. There were no differences by herd size in the percentages of protein or fat in milk replacers.

E.2.c. For the 85.9 percent of operations that fed preweaned heifers milk replacer, percentage of operations by percentage of protein and fat in milk replacer:

	Percent Operations			
	Constituent			
	Protein		Fat	
Percent	Percent	Std. error	Percent	Std. error
Less than 20	1.7	(1.7)	12.1	(4.3)
20–24	84.7	(4.7)	82.8	(5.0)
25 or more	13.6	(4.5)	5.2	(2.9)
Total	100.0		100.0	

The most commonly fed medication in milk replacer was a combination of oxytetracycline and neomycin (NT). Prior to new regulations in 2009, NT was one part oxytetracycline and two parts neomycin. The 2009 regulations now require that the two medications be mixed with a ratio of 1:1. Decoquinate and lasalocid were each fed to preweaned heifers by about one of five operations (19.7 and 19.6 percent, respectively). The majority of operations that fed "other" medication in milk replacers added the coccidiostat Corid® to the milk.

E.2.d. Percentage of operations that fed preweaned heifers medicated milk replacer during 2010, by type of medication in milk and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Chlortetracycline (CTC)	0.0	(—)	5.3	(5.1)	13.6	(7.3)	7.1	(3.4)
Oxytetracycline (OTC)	0.0	(—)	15.0	(8.0)	0.0	(—)	5.5	(3.1)
Oxytetracycline in combination with neomycin (NT)	20.0	(10.4)	40.9	(10.5)	39.1	(10.2)	35.0	(6.2)
Decoquinate (e.g., Deccox®)	18.8	(9.8)	19.0	(8.6)	20.8	(8.3)	19.7	(5.1)
Lasalocid (e.g., Bovatec®)	13.3	(8.8)	19.0	(8.6)	25.0	(9.7)	19.6	(5.3)
Other	7.1	(6.9)	14.3	(7.7)	15.0	(8.0)	12.7	(4.5)
Any medicated milk replacer	52.4	(10.9)	67.9	(8.8)	65.5	(8.8)	62.8	(5.5)
None	47.6	(10.9)	32.1	(8.8)	34.5	(8.8)	37.2	(5.5)

The percentage of preweaned heifers that received the following medications in milk replacer was similar to the percentage of operations that fed individual medications.

E.2.e. Percentage of preweaned heifers that received medicated milk replacer during 2010, by type of medication and by herd size:

	Percent Preweaned Heifers							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Chlortetracycline (CTC)	0.0	(—)	6.8	(6.6)	8.8	(6.6)	8.7	(6.3)
Oxytetracycline (OTC)	0.0	(—)	14.0	(8.6)	0.0	(—)	0.6	(0.4)
Oxytetracycline in combination with neomycin (NT)	17.8	(11.5)	16.0	(6.3)	37.6	(18.7)	36.6	(17.9)
Decoquinate (e.g., Deccox®)	20.0	(14.5)	8.6	(4.7)	20.8	(10.3)	20.4	(9.9)
Lasalocid (e.g., Bovatec®)	18.0	(14.0)	7.1	(4.2)	17.9	(13.8)	17.4	(13.2)
Other	7.1	(7.1)	13.9	(8.4)	5.8	(4.8)	6.2	(4.6)
Any medicated milk replacer	50.0	(10.7)	63.2	(8.7)	62.1	(8.6)	59.2	(5.3)
None	50.0	(10.7)	36.8	(8.7)	37.9	(8.6)	40.8	(5.3)

Similar percentages of operations fed preweaned heifers milk from a single dairy operation (13.5 percent) or fed pooled milk from multiple sources (17.1 percent). Pooled milk from multiple sources was fed on a higher percentage of large operations (40.7 percent) compared with small or medium operations (0.0 and 7.1 percent, respectively).

E.2.f. Percentage of operations by source of milk fed to preweaned heifers during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Source	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
A single dairy operation	14.3	(7.7)	17.9	(7.3)	8.0	(5.4)	13.5	(4.0)
Pooled milk from multiple sources/ dairies	0.0	(—)	7.1	(4.9)	40.7	(9.5)	17.1	(4.3)
Rejected milk from processing plant	0.0	(—)	0.0	(—)	4.0	(3.9)	1.4	(1.3)
Other	4.8	(4.7)	0.0	(—)	7.7	(5.2)	4.0	(2.3)
Any milk	19.0	(8.6)	25.0	(8.2)	48.3	(9.3)	32.1	(5.3)
No milk fed (only milk replacer fed)	81.0	(8.6)	75.0	(8.2)	51.7	(9.3)	67.9	(5.3)

Any milk was fed to preweaned heifers on a higher percentage of operations in the West region than in the East region (78.6 and 21.9 percent, respectively).

E.2.g. Percentage of operations by source of milk fed to preweaned heifers during 2010, and by region:

	Percent Operations			
	Region			
	West		East	
Source	**Percent**	**Std. error**	**Percent**	**Std. error**
A single dairy operation	20.0	(12.7)	12.5	(4.1)
Pooled milk from multiple sources/dairies	66.7	(13.6)	7.8	(3.4)
Rejected milk from processing plant	10.0	(9.5)	0.0	(—)
Other	18.2	(11.7)	1.6	(1.6)
Any milk	78.6	(11.0)	21.9	(5.2)
No milk fed (only milk replacer fed)	21.4	(11.0)	78.1	(5.2)

The majority of operations (93.4 percent) fed preweaned heifers milk or milk replacer twice daily.

E.2.h. Percentage of operations by number of times per day milk or milk replacer was fed to preweaned heifers, and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Times per day	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Twice	100.0	(0.0)	100.0	(0.0)	82.1	(7.3)	93.4	(2.9)
Three times	0.0	(—)	0.0	(—)	14.3	(6.6)	5.3	(2.6)
Other	0.0	(—)	0.0	(—)	3.6	(3.5)	1.3	(1.3)
Total	100.0		100.0		100.0		100.0	

Three-fourths of operations (74.0 percent) fed 2 to less than 3 quarts to each heifer calf at each feeding.

E.2.i. Percentage of operations by average amount of milk or milk replacer (in quarts) fed to each preweaned heifer at each feeding during 2010, and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Milk or milk replacer fed (qt)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
2 to less than 3	76.2	(9.3)	73.1	(8.7)	73.1	(8.7)	74.0	(5.1)
3 or more	23.8	(9.3)	26.9	(8.7)	26.9	(8.7)	26.0	(5.1)
Total	100.0		100.0		100.0		100.0	

Four to 5 quarts of milk or milk replacer were fed daily to each preweaned heifer on 70.4 percent of operations. About 1 of 10 operations fed 8 or more quarts of milk or milk replacer per calf,per day.

E.2.j. Percentage of operations by amount of milk or milk replacer fed to each per heifer calf per day during 2010, and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Milk or milk replacer fed (qt)	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
4–5	76.2	(9.3)	72.0	(9.0)	64.0	(9.6)	70.4	(5.4)
6–7	14.3	(7.7)	24.0	(8.6)	24.0	(8.6)	21.1	(4.9)
8 or more	9.5	(6.4)	4.0	(3.9)	12.0	(6.5)	8.5	(3.3)
Total	100.0		100.0		100.0		100.0	

Buckets were the primary equipment used to feed milk or milk replacer to preweaned heifers on 61.5 percent of operations. A higher percentage of small and medium operations used buckets than used bottles to feed milk or milk replacer. The majority of other feeding equipment types included mob feeders (milk bar) or a combination of bottles and buckets.

E.2.k. Percentage of operations by primary equipment used to feed milk or milk replacer to preweaned heifers, and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Primary equipment	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Bottle	14.3	(7.7)	17.9	(7.3)	44.8	(9.3)	26.9	(5.0)
Bucket	71.4	(9.9)	64.3	(9.1)	51.7	(9.3)	61.5	(5.5)
Other	14.3	(7.7)	17.9	(7.3)	3.4	(3.4)	11.5	(3.6)
Total	100.0		100.0		100.0		100.0	

More than 9 of 10 operations in the West region (92.9 percent) used bottles to feed preweaned heifers compared with slightly more than 1 of 10 operations in the East region (12.5 percent). Conversely, a lower percentage of operations in the West region (7.1 percent) used a bucket to feed preweaned heifers compared with operations in the East region (73.4 percent).

E.2.l. Percentage of operations by primary equipment used to feed milk or milk replacer to preweaned heifers, and by region:

	Percent Operations			
	Region			
	West		East	
Primary equipment	**Percent**	**Std. error**	**Percent**	**Std. error**
Bottle	92.9	(6.9)	12.5	(4.1)
Bucket	7.1	(6.9)	73.4	(5.5)
Other	0.0	(—)	14.1	(4.4)
Total	100.0		100.0	

The percentage of operations in which personnel usually wore gloves when working with preweaned calves increased as herd size increased. Overall, personnel wore gloves on almost 5 of 10 operations.

E.2.m. Percentage of operations in which personnel wore latex or nitrile gloves when handling/feeding preweaned dairy heifers during 2010, by herd size:

Percent Operations							
Herd Size (number of dairy heifers)							
Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
9.5	(6.4)	39.3	(9.2)	82.8	(7.0)	47.4	(5.7)

Personnel on more the twice the percentage of operations in the West region than the East region wore gloves when handling/feeding preweaned heifers.

E.2.n. Percentage of operations in which personnel wore latex or nitrile gloves when handling/feeding preweaned dairy heifers during 2010, by region:

Percent Operations			
Region			
West		East	
Percent	Std. error	Percent	Std. error
85.7	(9.4)	39.1	(6.1)

Ideally, milk-feeding equipment should be cleaned and disinfected between calves to reduce the risk of disease transmission. Almost half of operations (46.2 percent) cleaned and disinfected equipment between each feeding, and one-third (33.3 percent) rinsed milk feeding equipment with water between each feeding. “Other” procedures included using more than one of the listed procedures and adding water to the milk-feeding bucket after the calves had finished their milk.

E.2.o. Percentage of operations by management of milk-feeding equipment during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Management of milk-feeding equipment	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Rinsed with water between each feeding (two or three times/day)	47.6	(10.9)	35.7	(9.1)	20.7	(7.5)	33.3	(5.3)
Rinsed with water once daily	0.0	(—)	0.0	(—)	3.4	(3.4)	1.3	(1.3)
Cleaned and disinfected between each feeding (two or three times/day)	42.9	(10.8)	39.3	(9.2)	55.2	(9.3)	46.2	(5.7)
Cleaned and disinfected once daily	4.8	(4.7)	0.0	(—)	6.9	(4.7)	3.8	(2.2)
Cleaned and disinfected less often than daily	0.0	(—)	7.1	(4.9)	0.0	(—)	2.6	(1.8)
Cleaned and disinfected after dairy heifers were moved from milk-feeding area	0.0	(—)	3.6	(3.5)	3.4	(3.4)	2.6	(1.8)
Other	4.8	(4.7)	14.3	(6.6)	10.3	(5.7)	10.3	(3.4)
Total	100.0		100.0		100.0		100.0	

All operations in the West region (100.0 percent) cleaned and disinfected milk-feeding equipment between each feeding, compared with 34.4 percent of operations in the East region. Milk-feeding equipment was rinsed with water between each feeding on approximately 4 of 10 operations in the East region (40.6 percent)

E.2.p. Percentage of operations by management of milk-feeding equipment during 2010, and by region:

	Percent Operations			
	Region			
	West		East	
Management of milk-feeding equipment	**Percent**	**Std. error**	**Percent**	**Std. error**
Rinsed with water between each feeding (two or three times/day)	0.0	(—)	40.6	(6.2)
Rinsed with water once daily	0.0	(—)	1.6	(1.6)
Cleaned and disinfected between each feeding (two or three times/day)	100.0	(0.0)	34.4	(6.0)
Cleaned and disinfected once daily	0.0	(—)	4.7	(2.6)
Cleaned and disinfected less often than daily	0.0	(—)	3.1	(2.2)
Cleaned and disinfected after dairy heifers were moved from milk feeding area	0.0	(—)	3.1	(2.2)
Other	0.0	(—)	12.5	(4.1)
Total	100.0		100.0	

Calves should get water at 1 day of age, starter grain or other concentrates at around 4 days of age, and hay or roughage after weaning. Research has shown that calves given free-choice water from birth to 4 weeks of age ate more dry feed, had improved daily weight gain, and had no increase in the incidence of scours compared with calves deprived of water. Rumen maturation, which is important for the early weaning of calves, is triggered by the formation of volatile fatty acids, which are generated from starter feed. Compared with feeding starter, feeding hay prior to weaning results in slower rumen maturation.

On average, water and starter were first offered to heifers at a little more than 6 days of age, with no differences across herd sizes. The average age that hay or other roughages were first offered to heifers was greater on medium and large operations (52.9 and 69.9 days, respectively), compared with small operations (21.5 days).

E.2.q. Operation average age (in days) heifers were first offered the following diets during 2010, by herd size:

Operation Average Age (days)

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Diet	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
Water	10.6	(3.4)	6.1	(2.0)	4.1	(1.1)	6.6	(1.3)
Starter grain or other concentrates	10.8	(4.4)	5.7	(0.7)	3.5	(0.6)	6.3	(1.3)
Hay or other roughages	21.5	(4.1)	52.9	(4.9)	69.9	(5.4)	49.8	(3.6)

Although operations have target ages for weaning, calves can be weaned when they eat 2 pounds of starter for at least 3 consecutive days. The average age at weaning across all operations was 7.1 weeks.

E.2.r. Operation average age (in weeks) of heifers at weaning, by herd size:

Operation Average Age (weeks)

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Avg.	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**	**Avg.**	**Std. error**
6.6	(0.4)	6.9	(0.3)	7.7	(0.4)	7.1	(0.2)

Heifers' average age at weaning was higher in the West region (8.9 weeks) compared with operations in the East region (6.7 weeks).

E.2.s. Operation average age (in weeks) of heifers at weaning, by region:

Operation Average Age (weeks)

Region

West		**East**	
Average	**Std. error**	**Average**	**Std. error**
8.9	(0.7)	6.7	(0.2)

The average age of heifers at weaning ranged from 4 to more than 10 weeks of age. More than 75 percent of operations weaned heifers between 6 and 8 weeks of age.

E.2.t. Percentage of operations by operation average age (in weeks) of heifers at weaning:

Operation average weaning age (weeks)	**Percent operations**	**Std. error**
4	3.8	(2.2)
5	7.7	(3.0)
6	34.6	(5.4)
7	15.4	(4.1)
8	26.9	(5.0)
9	3.8	(2.2)
10 or more	7.7	(3.0)
Total	100.0	

3. Medicated feeds

The use of antibiotics in livestock feed is under scrutiny due to concerns about antibiotic-resistant strains of bacteria that could impact human health. There are three general types of medications used in feed for heifers: ionophores, coccidiostats, and antibiotics. Ionophores alter the rumen bacterial population, change the production of certain volatile fatty acids, act as growth promotants, and prevent coccidiosis. Although ionophores are antibiotics, they are not used in human medicine and are not under scrutiny. Common ionophores are lasalocid (Bovatec) and monensin (Rumensin). Coccidoistats, such as Deccox (decoquinate), are also used in the prevention of coccidiosis. Antibiotics, such as chlortetracycline and neomycin, are labeled for the prevention or treatment of respiratory disease or scours. Some antibiotics are also labeled to increase rate of gain and improve feed efficiency.

Medicated feed was fed to weaned heifers on almost 9 of 10 operations (87.1 percent). More than three-fourths of operations (77.3 percent) fed ionophores to weaned heifers. Approximately one of four operations fed coccidiostats, aureomycin, or a combination of aureomycin and sulfamethazine. A lower percentage of small operations fed any medications in feed, or ionophores, compared with medium and large operations. There were no regional differences in medications fed to weaned heifers (data not shown).

E.3.a. Percentage of operations that used medicated feed in rations for **weaned heifers** to prevent disease or promote growth during 2010, by medication in feed and by herd size:

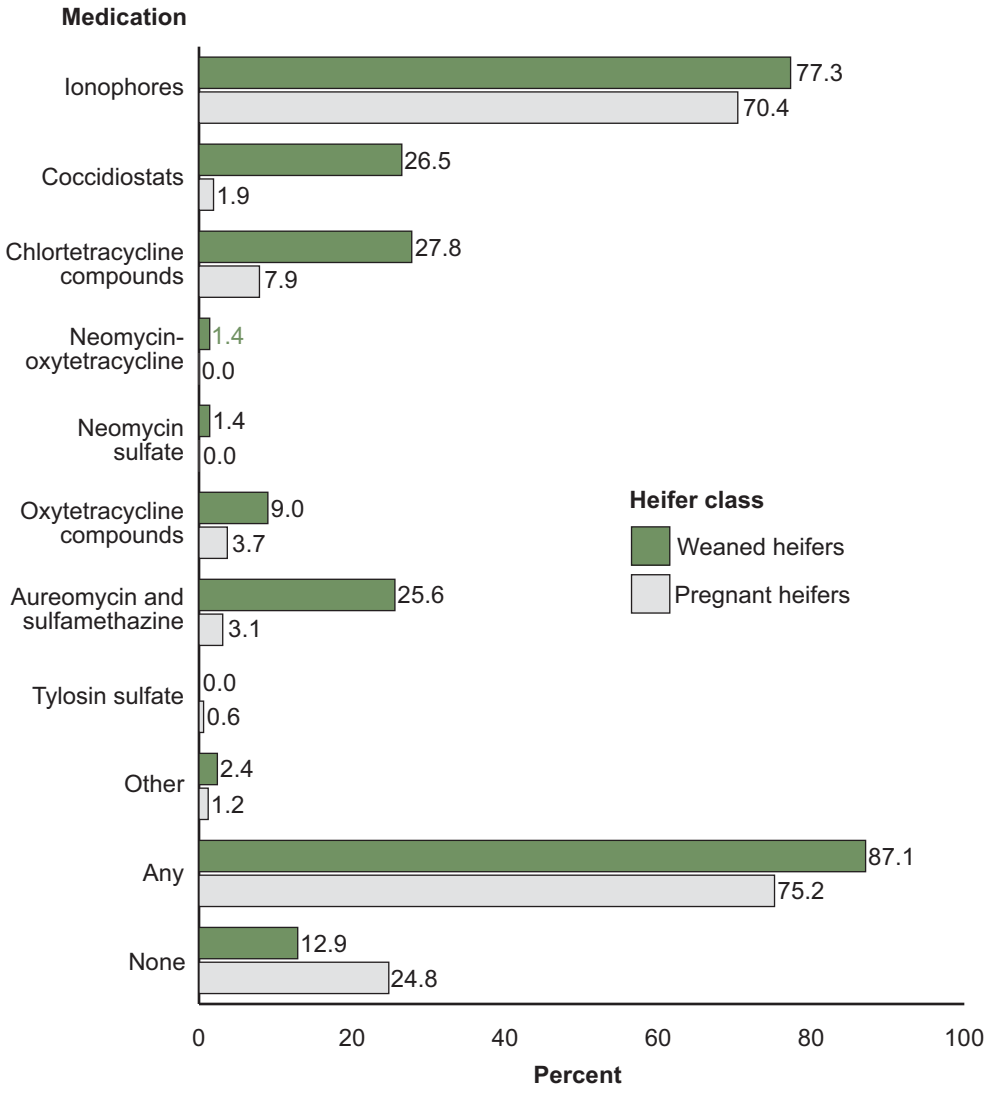
	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Ionophores (e.g., Rumensin®, Bovatec®, Cattlyst®)	59.6	(6.8)	82.3	(3.9)	84.1	(4.6)	77.3	(2.9)
Coccidiostats (e.g., Corid®, Deccox®)	17.3	(5.3)	26.0	(4.5)	34.9	(6.0)	26.5	(3.0)
Chlortetracycline compounds (e.g., Aureomycin®)	15.4	(5.0)	29.9	(4.7)	34.9	(6.0)	27.8	(3.1)
Neomycin-oxytetracycline (e.g., Neo-Terramycin® 100/100)	0.0	(—)	1.0	(1.0)	3.2	(2.2)	1.4	(0.8)
Neomycin sulfate	0.0	(—)	0.0	(—)	4.8	(2.7)	1.4	(0.8)
Oxytetracycline compounds (e.g., OTC 4 Crumbles®, Terramycin® 200)	1.9	(1.9)	9.4	(3.0)	14.3	(4.4)	9.0	(2.0)
Aureomycin and sulfamethazine (e.g., Aureo S 700® 2G Crumbles)	9.6	(4.1)	32.3	(4.8)	28.6	(5.7)	25.6	(3.0)
Tylosin sulfate	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Other	0.0	(—)	3.1	(1.8)	3.2	(2.2)	2.4	(1.0)
Any medication	70.6	(6.4)	93.7	(2.5)	90.5	(3.7)	87.1	(2.3)
None	29.4	(6.4)	6.3	(2.5)	9.5	(3.7)	12.9	(2.3)

Medicated feed was fed to pregnant heifers on 75.2 percent of operations. Ionophores were the predominant medication fed to pregnant heifers (70.4 percent of operations). In general, a lower percentage of operations fed medicated feed to pregnant heifers than to weaned heifers. There were no differences by medication or by herd size in the percentages of operations that fed medicated feeds to pregnant heifers. Oxytetracycline compounds and a combination of aureomycin and sulfamethazine were fed on approximately 5.0 percent of operations in the East region and not fed in the West region (data not shown).

E.3.b. Percentage of operations that used medicated feed in rations for **pregnant heifers** to prevent disease or promote growth during 2010, by medication in feed and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Ionophores (e.g., Rumensin, Bovatec, Cattlyst)	56.1	(7.8)	76.1	(5.1)	74.0	(6.2)	70.4	(3.6)
Coccidiostats (e.g., Corid, Deccox)	4.9	(3.4)	1.4	(1.4)	0.0	(—)	1.9	(1.1)
Chlortetracycline compounds (e.g., Aureomycin)	2.4	(2.4)	9.6	(3.5)	10.0	(4.3)	7.9	(2.1)
Neomycin-oxytetracycline (e.g., Neo-Terramycin 100/100)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Neomycin sulfate	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Oxytetracycline compounds (e.g., OTC 4 Crumbles, Terramycin 200)	2.4	(2.4)	5.6	(2.7)	2.0	(2.0)	3.7	(1.5)
Aureomycin and sulfamethazine (e.g., Aureo S 700 2G Crumbles)	2.4	(2.4)	2.8	(2.0)	4.0	(2.8)	3.1	(1.4)
Tylosin sulfate	0.0	(—)	0.0	(—)	2.0	(2.0)	0.6	(0.6)
Other	0.0	(—)	1.4	(1.4)	2.0	(2.0)	1.2	(0.9)
Any medication	61.0	(7.6)	80.6	(4.7)	79.2	(5.9)	75.2	(3.4)
None	39.0	(7.6)	19.4	(4.7)	20.8	(5.9)	24.8	(3.4)

Percentage of operations that used medicated feed in rations to prevent disease or promote growth during 2010, by medication and by heifer class



Medicated feed was fed to more than 9 of 10 weaned heifers (92.4 percent). A lower percentage of weaned heifers on small operations (69.4 percent) received any medicated feed compared with weaned heifers on medium and large operations (91.6 and 92.6 percent, respectively). About 9 of 10 weaned heifers (87.3 percent) received ionophores in their feed. Less than 25 percent of weaned heifers on all operations received any of other listed medications in feed. There were no regional differences in the percentage of weaned heifers fed medicated feed (data not shown).

E.3.c. Percentage of **weaned heifers** that received the following medications in feed during 2010, by herd size:

Percent Weaned Heifers

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Ionophores (e.g., Rumensin, Bovatec, Cattlyst)	65.5	(7.1)	81.8	(4.5)	87.9	(4.9)	87.3	(4.5)
Coccidiostats (Corid, Deccox)	11.0	(4.2)	17.4	(4.1)	18.8	(6.2)	18.7	(5.7)
Chlortetracycline compounds (e.g., Aureomycin)	8.8	(4.0)	26.4	(5.3)	23.6	(8.8)	23.8	(8.0)
Neomycin-oxytetracycline (e.g., Neo-Terramycin 100/100)	0.0	(—)	0.6	(0.6)	11.9	(9.2)	10.9	(8.4)
Neomycin sulfate	0.0	(—)	0.0	(—)	9.6	(8.4)	8.8	(7.7)
Oxytetracycline compounds (e.g., OTC 4 Crumbles, Terramycin 200)	2.1	(2.1)	5.0	(2.3)	0.6	(0.3)	1.0	(0.4)
Aureomycin and sulfamethazine (e.g., Aureo S 700 2G Crumbles)	10.6	(5.0)	19.0	(4.3)	15.3	(6.2)	15.6	(5.7)
Tylosin sulfate	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Other	0.0	(—)	2.6	(1.8)	1.7	(1.6)	1.8	(1.4)
Any medication	69.4	(6.9)	91.6	(3.0)	92.6	(3.6)	92.4	(3.3)
None	30.6	(6.9)	8.4	(3.0)	7.4	(3.6)	7.6	(3.3)

Medicated feed was fed to 84.8 percent of pregnant heifers. More than 8 of 10 pregnant heifers (83.4 percent) received medicated feed with ionophores. A lower percentage of pregnant heifers on small operations were fed any medicated feed compared with pregnant heifers on large operations. With the exception of ionophores, less than 6 percent of pregnant heifers were fed any single medication listed. Chlortetracycline compounds were fed to a higher percentage of pregnant heifers on medium operations than on small operations. There were no regional differences in the percentage of pregnant heifers fed medicated feed (data not shown).

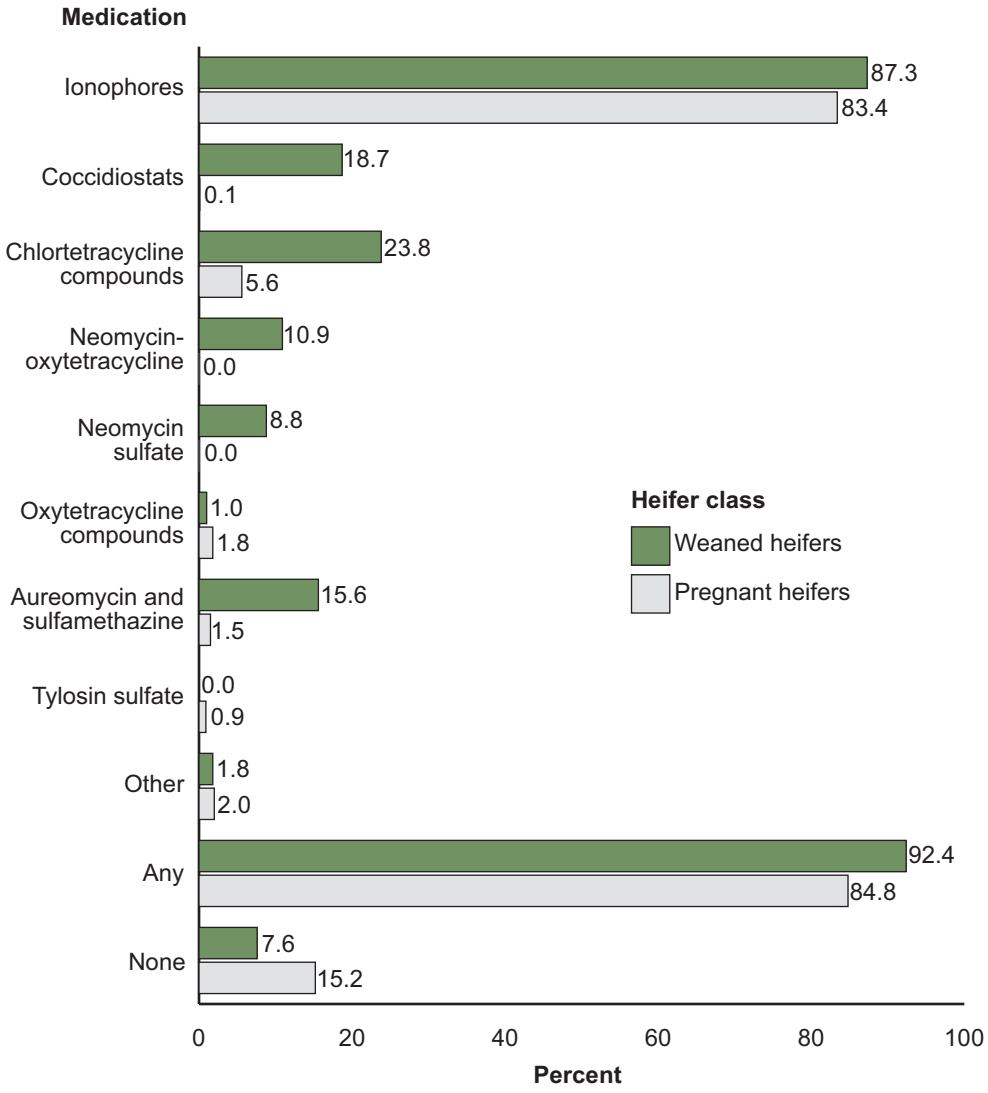
E.3.d. Percentage of **pregnant heifers** that received the following medications in feed during 2010, by herd size:

Percent Pregnant Heifers

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Medication	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Ionophores (e.g., Rumensin, Bovatec, Cattlyst)	54.7	(8.5)	73.1	(5.9)	84.7	(5.6)	83.4	(5.2)
Coccidiostats (e.g., Corid, Deccox)	5.0	(4.7)	1.1	(1.1)	0.0	(—)	0.1	(0.1)
Chlortetracycline compounds (e.g., Aureomycin)	0.5	(0.5)	10.8	(4.2)	5.1	(2.8)	5.6	(2.6)
Neomycin-oxytetracycline (e.g., Neo-Terramycin 100/100)	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Neomycin sulfate	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Oxytetracycline compounds (e.g., OTC 4 Crumbles, Terramycin 200)	2.3	(2.3)	4.8	w(2.9)	1.5	(1.5)	1.8	(1.4)
Aureomycin and sulfamethazine (e.g., Aureo S 700 2G Crumbles)	2.3	(2.3)	0.9	(0.8)	1.5	(1.4)	1.5	(1.3)
Tylosin sulfate	0.0	(—)	0.0	(—)	1.0	(1.0)	0.9	(0.9)
Other	0.0	(—)	0.4	(0.4)	2.2	(2.2)	2.0	(2.0)
Any medication	57.0	(8.3)	74.0	(5.7)	86.2	(5.3)	84.8	(4.9)
None	43.0	(8.3)	26.0	(5.7)	13.8	(5.3)	15.2	(4.9)

Percentage of heifers that received the following medications in feed during 2010, by medication and by heifer class



Feeding leftover feed from older cattle to younger heifers has been implicated in the transmission of diseases such as Johne's disease and is not recommended. Nine of 10 operations never fed leftover feed from older cattle to younger heifers.

E.3.e. Percentage of operations by frequency leftover feed (weight backs) from older cattle were fed to younger heifers during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Routinely (daily or weekly)	5.6	(3.1)	2.9	(1.7)	3.1	(2.2)	3.6	(1.3)
Rarely (less often than once per month)	7.4	(3.6)	5.8	(2.3)	6.3	(3.0)	6.3	(1.6)
Never	87.0	(4.6)	91.3	(2.8)	90.6	(3.7)	90.0	(2.0)
Total	100.0		100.0		100.0		100.0	

F. Biosecurity Practices

1. Commingling on the operation

Ideally, heifer-raising operations would either raise heifers from a single source or not allow contact or commingling among heifers from different dairies. Commingling or allowing contact among heifers from different dairies can result in the transmission of many important dairy cattle diseases, including TB, brucellosis, salmonellosis, BVD, and hairy heel warts. In addition, disease can be transmitted if heifers have contact and/or commingle with adult dairy cattle, beef cattle, or feeder cattle. Of particular concern is the risk of transmitting TB when any breeding stock, particularly dairy heifers, are commingled with cattle of Mexican origin.

Heifers were commingled with heifers from other operations on 60.3 percent of operations. Heifers were housed separately but allowed nose-to-nose contact with other heifers from other operations on 20.9 percent of operations. Some operations commingled some heifers and allowed only nose-to-nose contact for others. A higher percentage of large operations (38.1 percent) housed heifers separately but allowed nose-to-nose contact with heifers from other operations compared with small and medium operations (8.5 and 15.8 percent, respectively). Approximately 2 of 10 operations (19.0 percent) allowed heifers to have contact or commingle with beef or dairy-beef cattle. No operations allowed heifers to have contact with Mexican-origin cattle.

F.1.a. Percentage of operations by type of contact/commingling heifers had during 2010, and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Type of contact/ commingling	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Commingled with dairy heifers from other operations	54.2	(7.2)	58.4	(4.9)	67.7	(5.8)	60.3	(3.4)
Housed separately but allowed nose-to-nose contact with dairy heifers from other operations	8.5	(4.1)	15.8	(3.6)	38.1	(6.1)	20.9	(2.8)
Commingled or allowed nose-to-nose contact with beef or dairy-beef cattle	25.0	(6.3)	12.1	(3.3)	25.4	(5.5)	19.0	(2.7)
Commingled or allowed nose-to-nose contact with Mexican-origin cattle	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
No contact with cattle from other operations	42.9	(7.1)	34.7	(4.7)	15.4	(4.5)	30.7	(3.2)

Heifers were housed separately but allowed nose-to-nose contact with heifers from other operations on a higher percentage of operations in the West region than the East region (50.0 and 13.6 percent, respectively). A higher percentage of operations in the East region than in the West region (34.9 and 14.0 percent, respectively) did not allow heifers to have contact with cattle from other operations.

F.1.b. Percentage of operations by type of contact/commingling heifers had during 2010, and by region:

	Percent Operations			
	Region			
	West		East	
Type of contact/ commingling	**Percent**	**Std. error**	**Percent**	**Std. error**
Commingled with dairy heifers from other operations	65.1	(7.3)	59.1	(3.8)
Housed separately but allowed nose-to-nose contact with dairy heifers from other operations	50.0	(7.7)	13.6	(2.6)
Commingled or allowed nose-to-nose contact with beef or dairy-beef cattle	23.8	(6.6)	17.9	(3.0)
Commingled or allowed nose-to-nose contact with Mexican-origin cattle	0.0	(—)	0.0	(—)
No contact with cattle from other operations	14.0	(5.3)	34.9	(3.6)

Hospital pens were used by 71.3 percent of operations that raised heifers from more than one source during 2010. A lower percentage of small operations used a hospital pen compared with medium and large operations.

F.1.c. For the 75.9 percent of operations that raised heifers from more than one source during 2010, percentage of operations that used a hospital pen, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
38.7	(8.8)	71.2	(5.3)	89.3	(4.1)	71.3	(3.6)

More than one-third of operations (37.2 percent) housed dairy heifers from more than one source in a hospital pen at the same time. As herd size increased so did the percentage of operations that housed dairy heifers from more than one source in a hospital pen at the same time.

F.1.d. Percentage of operations that housed heifers from more than one source in a hospital pen at the same time, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
8.9	(3.8)	33.7	(4.6)	66.7	(5.8)	37.2	(3.2)

More than twice the percentage of operations in the West region than the East region housed dairy heifers from more than one source in a hospital pen at the same time.

F.1.e. Percentage of operations that housed dairy heifers from more than one source in a hospital pen at the same time, by region:

Percent Operations

Region

West		East	
Percent	**Std. error**	**Percent**	**Std. error**
65.9	(7.2)	30.2	(3.4)

Almost one-fourth of operations (22.5 percent) allowed dairy heifers in the hospital pen to have nose-to-nose or fence-line contact with cattle outside the hospital pen. Heifers in the hospital pen had contact with cattle outside the hospital pen on a higher percentage of large operations (40.9 percent) than medium (19.2 percent) and small (7.0 percent) operations.

F.1.f. Percentage of operations in which dairy heifers in the hospital pen had nose-to-nose or fence-line contact with cattle outside the hospital pen, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
7.0	(3.4)	19.2	(3.9)	40.9	(6.1)	22.5	(2.8)

2. Contact with other animals

The majority of heifer-raising operations had dogs or cats on the operation. Cats were present on a higher percentage of small and medium operations (91.1 and 88.2 percent, respectively) compared with large operations (67.7 percent). Between 20 and 30 percent of operations had beef cattle; chickens or other poultry; or horses, donkeys, mules. Chickens or other poultry were present on a higher percentage of small operations (39.3 percent) compared with medium or large operations (16.7 and 9.2 percent, respectively). Domestic pigs were on a higher percentage of operations in the East region than the West region (13.4 and 2.3 percent, respectively).

F.2.a. Percentage of operations by type of animals in addition to dairy heifers on the operation during 2010, and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Animal type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Beef cattle	36.8	(6.4)	23.3	(4.2)	31.3	(5.8)	29.0	(3.0)
Chickens or other poultry	39.3	(6.5)	16.7	(3.7)	9.2	(3.6)	20.2	(2.7)
Horses, donkeys, mules	41.1	(6.6)	20.6	(4.0)	24.6	(5.4)	26.9	(3.0)
Pigs (domestic)	16.1	(4.9)	10.8	(3.1)	7.8	(3.4)	11.3	(2.1)
Sheep	12.5	(4.4)	3.9	(1.9)	6.3	(3.0)	6.8	(1.7)
Goats	12.5	(4.4)	5.9	(2.3)	4.7	(2.6)	7.2	(1.7)
Dogs	66.1	(6.3)	69.6	(4.6)	50.0	(6.3)	63.1	(3.2)
Cats	91.1	(3.8)	88.2	(3.2)	67.7	(5.8)	83.0	(2.5)
Captive deer or elk	0.0	(—)	0.0	(—)	3.1	(2.1)	0.9	(0.6)
Llamas, alpacas	5.4	(3.0)	0.0	(—)	1.6	(1.6)	1.8	(0.9)
Bison	0.0	(—)	0.0	(—)	1.5	(1.5)	0.4	(0.4)
Other	5.4	(3.0)	1.0	(1.0)	3.1	(2.1)	2.7	(1.1)

Cats, dogs, beef cattle, and horses, donkeys, and mules were observed on operations adjacent to 42.2, 34.8, 18.7, and 14.8 percent of heifer-raising operations, respectively. Horses, donkeys, and mules were adjacent to a higher percentage of small operations (26.4 percent) than large operations (6.6 percent). A lower percentage of large operations than small or medium operations reported dogs on adjacent operations. Cats were adjacent to a higher percentage of medium operations than large operations. There were no regional differences in the percentages of operations by type of animals on adjacent operations (data not shown).

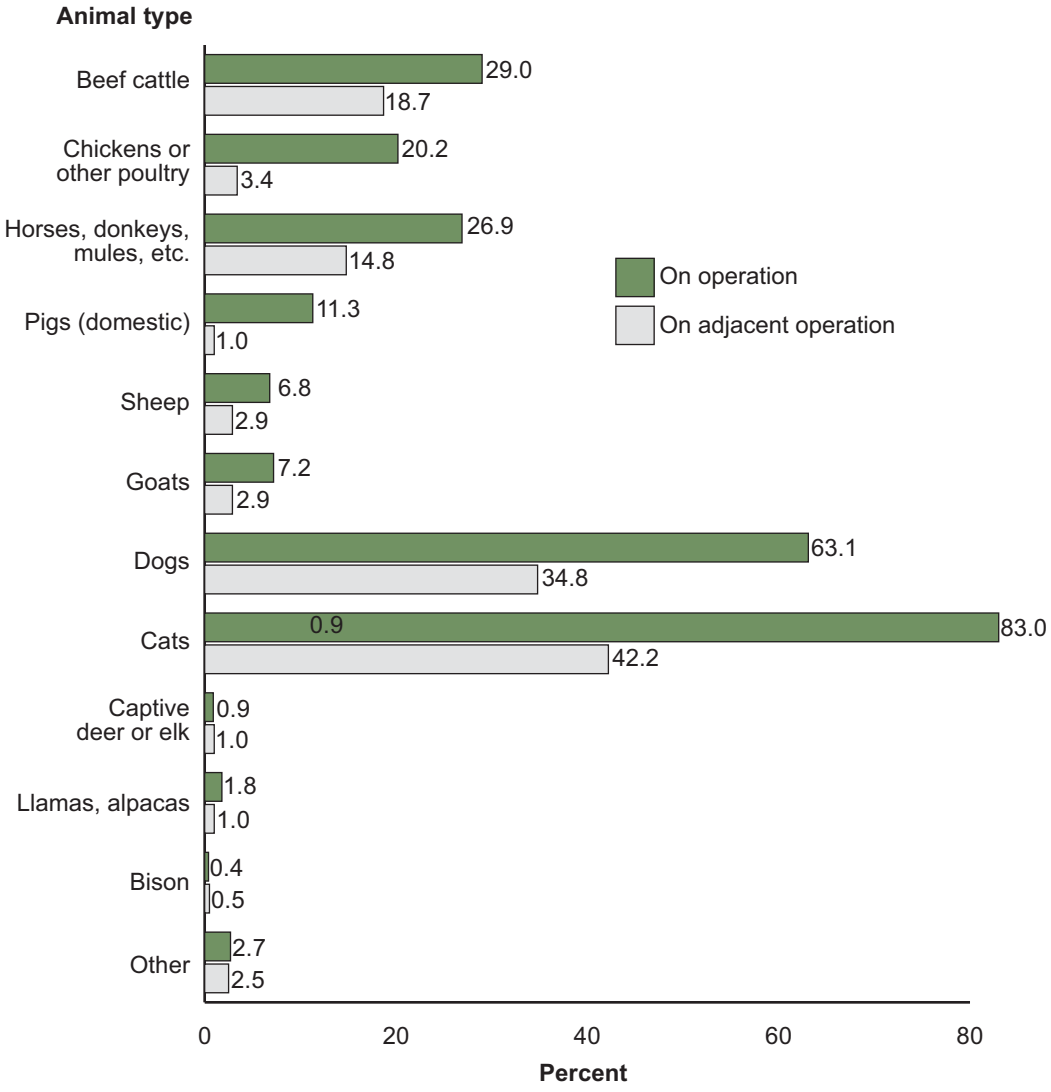
F.2.b. Percentage of operations by type of animals on adjacent operations (with possible fence-line contact) during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Animal type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Beef cattle	15.4	(5.0)	20.8	(4.2)	18.0	(4.9)	18.7	(2.7)
Chickens or other poultry	5.7	(3.2)	3.2	(1.8)	1.7	(1.7)	3.4	(1.3)
Horses, donkeys, mules	26.4	(6.1)	13.7	(3.5)	6.6	(3.2)	14.8	(2.5)
Pigs (domestic)	0.0	(—)	1.1	(1.1)	1.7	(1.7)	1.0	(0.7)
Sheep	3.8	(2.7)	3.2	(1.8)	1.7	(1.7)	2.9	(1.2)
Goats	5.8	(3.2)	1.1	(1.1)	3.3	(2.3)	2.9	(1.2)
Dogs	40.4	(6.8)	43.0	(5.1)	16.9	(4.9)	34.8	(3.3)
Cats	42.3	(6.9)	51.6	(5.1)	27.1	(5.8)	42.2	(3.4)
Captive deer or elk	0.0	(—)	0.0	(—)	3.3	(2.3)	1.0	(0.7)
Llamas, alpacas	1.9	(1.9)	0.0	(—)	1.7	(1.7)	1.0	(0.7)
Bison	0.0	(—)	0.0	(—)	1.7	(1.7)	0.5	(0.5)
Other	5.8	(3.2)	2.2	(1.5)	0.0	(—)	2.5	(1.1)

Percentage of operations by type of animals in addition to dairy heifers on the operation during 2010, and percentage of operations by type of animals on adjacent operations (with possible fence-line contact)



Wild animals may carry diseases that can be transmitted to cattle. For example, deer and coyotes in parts of Michigan can be reservoirs for TB. BVD virus can also infect deer and potentially be transmitted to cattle. Elk and feral swine can be infected with brucellosis and potentially transmit the disease to cattle. Raccoons, although primarily recognized as potential sources of rabies, can also carry *Salmonella* and other pathogens. Foxes can harbor leptospirosis and *Neospora,* which are recognized cattle diseases.

Deer or coyotes, foxes, and raccoons were observed at least monthly on more than 50 percent of heifer-raising operations. Elk or moose or feral swine were never observed on more than 95 percent of operations. Other types of wild animals observed included birds, groundhogs, rabbits, skunks, turkeys, and wolves.

F.2.c. Percentage of operations by wild animals and/or signs of wild animals (scat, tracks) observed on the operation during 2010, and by frequency animals were observed:

	Percent Operations						
	Frequency						
	Never		Less than monthly		At least monthly		
Wild animal	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Total
Deer	20.7	(2.7)	25.1	(2.9)	54.2	(3.3)	100.0
Elk or moose	96.8	(1.2)	3.2	(1.2)	0.0	(—)	100.0
Coyotes, foxes, raccoons	10.1	(2.0)	33.9	(3.1)	55.9	(3.3)	100.0
Feral swine	99.1	(0.6)	0.4	(0.4)	0.4	(0.4)	100.0
Other	44.1	(3.7)	20.7	(3.0)	35.2	(3.6)	100.0

Coyotes, foxes, or raccoons were observed on 9 of 10 operations during 2010. Deer were observed on 8 of 10 operations, and other wild animals were observed on more than 5 of 10 operations. A higher percentage of small and medium operations observed deer or other wild animals compared with large operations.

F.2.d. Percentage of operations that observed (less than monthly or more frequently) wild animals and/or signs of wild animals (scat, tracks) on the operation during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Wild animal	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Deer	94.7	(3.0)	87.5	(3.3)	53.0	(6.2)	79.3	(2.7)
Elk or moose	7.3	(3.5)	3.0	(1.7)	0.0	(—)	3.2	(1.2)
Coyotes, foxes, raccoons	93.0	(3.4)	92.3	(2.6)	83.3	(4.6)	89.9	(2.0)
Feral swine	0.0	(—)	1.9	(1.4)	0.0	(—)	0.9	(0.6)
Other	74.4	(7.0)	64.0	(5.2)	29.6	(6.2)	55.9	(3.7)

Deer or “other” wild animals were observed on a higher percentage of operations in the East region than the West region.

F.2.e. Percentage of operations that observed (less than monthly or more frequently) wild animals and/or signs of wild animals (scat, tracks) on the operation during 2010, by region:

	Percent Operations			
	Region			
	West		East	
Wild animal	**Percent**	**Std. error**	**Percent**	**Std. error**
Deer	44.4	(7.4)	87.9	(2.4)
Elk or moose	2.2	(2.2)	3.4	(1.4)
Coyotes, foxes, raccoons	84.4	(5.4)	91.2	(2.1)
Feral swine	2.2	(2.2)	0.6	(0.6)
Other	22.0	(6.5)	65.9	(4.0)

Deer were observed in the heifer-calf housing areas, pastures, or lots at least monthly on 21.1 percent of operations and less than monthly on 24.1 percent of operations. Deer were observed at least monthly on a higher percentage of small operations (40.4 percent) compared with medium and large operations (17.3 and 10.4 percent, respectively). As herd size increased the percentage of operations that never observed deer in the heifer-calf housing areas, pastures, or lots increased.

F.2.f. Percentage of operations by frequency deer were observed in the heifer-calf housing areas, pastures, or lots during 2010, and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Never	22.8	(5.6)	54.8	(4.9)	82.1	(4.7)	54.8	(3.3)
Less than monthly	36.8	(6.4)	27.9	(4.4)	7.5	(3.2)	24.1	(2.8)
At least monthly	40.4	(6.5)	17.3	(3.7)	10.4	(3.7)	21.1	(2.7)
Total	100.0		100.0		100.0		100.0	

Deer were observed more frequently in heifer-calf housing areas, pastures, or lots in the East region than in the West region.

F.2.g. Percentage of operations by frequency deer were observed in the heifer-calf housing areas, pastures, or lots during 2010, and by region:

	Percent Operations			
	Region			
	West		East	
Frequency	**Percent**	**Std. error**	**Percent**	**Std. error**
Never	84.4	(5.4)	47.5	(3.7)
Less than monthly	6.7	(3.7)	28.4	(3.3)
At least monthly	8.9	(4.3)	24.0	(3.2)
Total	100.0		100.0	

3. Personnel contact

More than 90 percent of small and medium operations had from one to five people who fed or cared for heifers. More than 20 personnel with duties that included feeding or care of heifers were present on 15.2 percent of large operations.

F.3.a. Percentage of operations that had personnel (unpaid and paid labor) with duties that included feeding or care of heifers during 2010, by number of personnel and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Number personnel	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
1–5	92.7	(3.5)	94.0	(2.4)	34.8	(5.9)	76.0	(2.9)
6–10	7.3	(3.5)	6.0	(2.4)	28.8	(5.6)	13.1	(2.3)
11–20	0.0	(—)	0.0	(—)	21.2	(5.0)	6.3	(1.6)
More than 20	0.0	(—)	0.0	(—)	15.2	(4.4)	4.5	(1.4)
Total	100.0		100.0		100.0		100.0	

The number of personnel with duties that included feeding or care of heifers on heifer-raising operations reflected the differences in size between the regions. One to five personnel were present on 84.2 percent of operations in the East region and only 43.2 percent of operations in the West region.

F.3.b. Percentage of operations that had personnel (unpaid and paid labor) with duties that included feeding or care of heifers during 2010, by number of personnel and by region:

	Percent Operations			
	Region			
	West		East	
Number personnel	**Percent**	**Std. error**	**Percent**	**Std. error**
1–5	43.2	(7.5)	84.2	(2.7)
6–10	20.5	(6.1)	11.3	(2.4)
11–20	18.2	(5.8)	3.4	(1.4)
More than 20	18.2	(5.8)	1.1	(0.8)
Total	100.0		100.0	

The majority of operations (55.0 percent) had no personnel that had direct contact with cattle on another operation during 2010. More than 4 of 10 operations (42.8 percent) had 1 to 5 personnel that had contact with cattle on another operation during 2010.

F.3.c. Percentage of operations with personnel that had direct contact with cattle on another operation (including personnel that owned cattle housed at another location) during 2010, by number of personnel and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Number personnel	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0	64.3	(6.4)	52.0	(5.0)	51.5	(6.2)	55.0	(3.3)
1–5	33.9	(6.3)	48.0	(5.0)	42.4	(6.1)	42.8	(3.3)
6–10	1.8	(1.8)	0.0	(—)	1.5	(1.5)	0.9	(0.6)
11–20	0.0	(—)	0.0	(—)	1.5	(1.5)	0.5	(0.5)
More than 20	0.0	(—)	0.0	(—)	3.0	(2.1)	0.9	(0.6)
Total	100.0		100.0		100.0		100.0	

Properly managed footbaths can disinfect footwear that could carry disease agents between sources of cattle. Footbath use for heifer-raiser personnel that moved between dairy heifers from different sources was minimal, with only 6.2 percent of operations requiring a footbath. More than 1 of 10 large operations used a footbath compared with no small operations.

F.3.d. For the 75.9 percent of operations that had dairy heifers originating from more than one source, percentage of operations in which footbaths were used by personnel when moving between dairy heifers originating from different sources during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0.0	(—)	4.5	(2.5)	11.1	(4.3)	6.2	(2.0)

On more than 50 percent of operations, personnel fed and/or managed younger heifers before older heifers and managed healthy heifers before sick heifers. A lower percentage of small operations fed and/or managed younger heifers before older heifers compared with medium and large operations. Less than 1 percent of operations required personnel to be tested for TB.

F.3.e. Percentage of operations by biosecurity practices used by personnel, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Biosecurity practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Personnel fed younger heifers before feeding older heifers	35.7	(6.4)	65.7	(4.7)	65.2	(5.9)	58.0	(3.3)
Personnel treated/ managed younger heifers before older heifers	32.1	(6.3)	60.8	(4.8)	69.7	(5.7)	56.3	(3.3)
Personnel managed healthy heifers before treating sick heifers	66.7	(6.4)	81.2	(3.9)	81.8	(4.8)	77.8	(2.8)
Personnel required to be tested for TB	0.0	(—)	1.0	(1.0)	0.0	(—)	0.4	(0.4)

4. Consultants

Consultants are very important to the success of heifer-raising operations, but they can also be a source of disease introduction or spread. For example, consultants who do not disinfect footwear between operations could potentially spread disease to subsequent operations.

Veterinarians were used weekly or monthly by more than three-fourths of operations, but a lower percentage of small operations (50.9 percent) used veterinarians compared with medium or large operations (79.6 and 91.0 percent, respectively). Almost half of operations used an artificial insemination (AI) technician during 2010. More than 6 of 10 operations used a nutritionist on a routine basis, and as herd size increased the percentage of operations that used a nutritionist increased. University/extension personnel were used as consultants on 31.3 percent of large operations and 10.5 percent of small operations. Federal or State animal health officials were consulted by 47.8 percent of large operations compared with 18.4 and 8.8 percent of medium and small operations, respectively.

F.4.a. Percentage of operations that worked with or consulted the following consultants during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Consultant	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Veterinarian on a routine basis (e.g., weekly or monthly)	50.9	(6.6)	79.6	(4.0)	91.0	(3.5)	75.8	(2.9)
Artificial insemination (AI) technician	38.6	(6.5)	43.7	(4.9)	58.2	(6.0)	46.7	(3.3)
Nutritionist on a routine basis (e.g., weekly or monthly)	29.8	(6.1)	66.0	(4.7)	89.6	(3.7)	63.9	(3.2)
University/extension personnel	10.5	(4.1)	20.4	(4.0)	31.3	(5.7)	21.1	(2.7)
Federal or State animal health official	8.8	(3.8)	18.4	(3.8)	47.8	(6.1)	24.7	(2.9)

Veterinarians, nutritionists, and Federal or State animal health officials were used as consultants during 2010 on a higher percentage of operations in the West region than the East region.

F.4.b. Percentage of operations by type of consultants used during 2010, and by region:

	Percent Operations			
	Region			
	West		East	
Consultant	**Percent**	**Std. error**	**Percent**	**Std. error**
Veterinarian on a routine basis (e.g., weekly or monthly)	91.1	(4.3)	72.0	(3.3)
Artificial insemination (AI) technician	51.1	(7.5)	45.6	(3.7)
Nutritionist on a routine basis (e.g., weekly or monthly)	91.1	(4.3)	57.1	(3.7)
University/extension personnel	24.4	(6.4)	20.3	(3.0)
Federal or State animal health official	46.7	(7.5)	19.2	(2.9)

AI technicians were allowed in heifer-housing areas on a daily basis on 24.9 percent of operations during 2010. Veterinarians were allowed in heifer-housing areas on a weekly basis on 22.0 percent of operations and on a monthly basis on 34.4 percent. Nutritionists were allowed in heifer-housing areas on a monthly basis on 33.0 percent of operations. More than 75 percent of operations either did not have visits or never allowed university/ extension personnel or Federal or State animal health officials in heifer-housing areas during 2010.

F.4.c. Percentage of operations by type of consultants allowed in heifer-housing areas during 2010, and by frequency consultants were allowed in the areas:

Percent Operations

Frequency

	Daily		Weekly		Monthly		Less than monthly		Never		Not applicable		
Consultant	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Total**
Veterinarian	3.1	(1.1)	22.0	(2.8)	34.4	(3.2)	18.9	(2.6)	1.3	(0.8)	20.3	(2.7)	100.0
AI technician	24.9	(2.9)	9.3	(1.9)	7.6	(1.8)	3.6	(1.2)	2.7	(1.1)	52.0	(3.3)	100.0
Nutritionist	1.8	(0.9)	9.3	(1.9)	33.0	(3.1)	14.5	(2.3)	5.3	(1.5)	36.1	(3.2)	100.0
University/ extension personnel	0.4	(0.4)	0.4	(0.4)	1.8	(0.9)	13.2	(2.3)	7.0	(1.7)	77.1	(2.8)	100.0
Federal or State animal health official	0.0	(—)	1.8	(0.9)	3.1	(1.1)	19.4	(2.6)	4.8	(1.4)	70.9	(3.0)	100.0

Veterinarians allowed in heifer-housing areas during 2010 wore clean coveralls/boots on more than 90 percent of operations. “Other” biosecurity practices used by veterinarians included using clean gloves.

F.4.d. Of the 78.4 percent of operations that allowed a veterinarian in heifer-housing areas during 2010, percentage of operations by biosecurity practice used by veterinarians, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Biosecurity practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Footbath	33.3	(8.6)	11.6	(3.5)	16.1	(4.7)	16.9	(2.8)
Disposable boots	6.7	(4.6)	9.4	(3.2)	21.0	(5.2)	13.0	(2.5)
Clean coveralls/boots	93.8	(4.3)	96.6	(2.0)	92.1	(3.4)	94.5	(1.7)
Other	6.5	(4.4)	2.4	(1.6)	8.1	(3.5)	5.1	(1.6)
Any	100.0	(0.0)	97.7	(1.6)	92.1	(3.4)	96.2	(1.4)

Any biosecurity practices were used by AI technicians on 89.1 percent of operations in which AI technicians were allowed in the heifer-housing areas during 2010. Technicians wore clean coveralls/boots on 84.2 percent of operations. “Other” biosecurity practices used by AI technicians included using clean gloves.

F.4.e. Of the 45.3 percent of operations that allowed an AI technician in heifer-housing areas during 2010, percentage of operations by biosecurity practice used by AI technicians, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Biosecurity practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Footbath	27.3	(9.5)	14.6	(5.5)	8.3	(4.6)	15.2	(3.6)
Disposable boots	9.1	(6.1)	0.0	(—)	16.7	(6.2)	8.1	(2.7)
Clean coveralls/boots	81.8	(8.2)	90.2	(4.6)	78.9	(6.6)	84.2	(3.6)
Other	14.3	(7.7)	2.4	(2.4)	13.5	(5.6)	9.1	(2.9)
Any	95.5	(4.5)	92.7	(4.1)	81.6	(6.3)	89.1	(3.1)

5. Visitors

Visitors, in addition to operation personnel and paid consultants, are potential sources of disease. Visitors may have had contact with cattle or other animals on other operations, or they could be from a foreign country and potentially harbor a disease not known to occur in the United States. Since visitors are usually just observing the layout and management of the operation, they should not be allowed to enter heifer-housing areas or have direct contact with heifers.

More than 4 of 10 operations (41.4 percent) allowed visitors in heifer-housing areas during 2010.

F.5.a. Percentage of operations that allowed visitors (anyone who was not an employee of the operation or a paid consultant, e.g., tour groups) in heifer-housing areas during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
35.1	(6.3)	40.8	(4.9)	47.8	(6.1)	41.4	(3.3)

Almost 6 of 10 operations (59.3 percent) either had no visitors or never allowed visitors in heifer-housing areas. Visitors were allowed in heifer-housing areas on a monthly basis on 11.1 percent of operations and less than monthly on 27.9 percent of operations.

F.5.b. Percentage of operations by frequency visitors were allowed in heifer-housing areas during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Daily	3.5	(2.4)	0.0	(—)	0.0	(—)	0.9	(0.6)
Weekly	1.8	(1.7)	1.0	(1.0)	0.0	(—)	0.9	(0.6)
Monthly	10.5	(4.1)	7.8	(2.7)	16.4	(4.5)	11.1	(2.1)
Less than monthly	19.3	(5.2)	30.4	(4.6)	31.3	(5.7)	27.9	(3.0)
Never/no visitors	64.9	(6.3)	60.8	(4.8)	52.2	(6.1)	59.3	(3.3)
Total	100.0		100.0		100.0		100.0	

For operations that allowed visitors in the heifer housing areas, about three-fourths of operations (72.0 percent) used any biosecurity practices for visitors. Less than 40 percent of all operations had visitors wear disposable boots or clean coveralls/boots. Disposable boots were worn by visitors on a lower percentage of small operations (15.0 percent), than large operations (46.9 percent). Almost half of operations did not allow visitor vehicles in animal areas. “Other” biosecurity practices included not allowing visitors to have direct contact with animals.

F.5.c. For the 40.7 percent of operations that allowed visitors in heifer-housing areas, percentage of operations by biosecurity practices used for visitors during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Biosecurity practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Footbath	5.0	(4.9)	0.0	(—)	12.5	(5.9)	5.3	(2.3)
Disposable boots	15.0	(8.0)	33.3	(7.3)	46.9	(8.8)	34.0	(4.9)
Clean coveralls/boots	35.0	(10.7)	40.5	(7.6)	37.5	(8.6)	38.3	(5.0)
Visitors’ vehicles not allowed in animal areas	25.0	(9.7)	52.4	(7.7)	53.1	(8.8)	46.8	(5.2)
Other	10.0	(6.7)	9.8	(4.6)	0.0	(—)	6.5	(2.6)
Any	50.0	(11.2)	78.0	(6.5)	78.1	(7.3)	72.0	(4.7)

6. Vehicles and equipment

Vehicles used to transport heifers, especially preweaned heifers, should be washed and rinsed out between every shipment. Transport vehicles used to haul cattle from multiple operations in multiple shipments without being cleaned could pose a disease risk to heifers.

Transport vehicles were washed or rinsed out after every shipment on 26.1 percent of operations. A higher percentage of large operations (41.8 percent) than medium operations (19.4 percent) cleaned transport vehicles after every shipment. Cleaning was performed after two to three shipments on 5.4 percent of small operations and 23.9 percent of large operations. Operation vehicles were not used for transporting heifers on approximately one-third of small and medium operations and 13.4 percent of large operations. “Other” cleaning frequency included cleaning daily but after multiple shipments, shoveling out after each use, and cleaning annually.

F.6.a. Percentage of operations by frequency heifer transport vehicles owned, leased, or contracted by the operation were washed/rinsed out during 2010, and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
After every shipment	19.6	(5.3)	19.4	(3.9)	41.8	(6.0)	26.1	(2.9)
After 2–3 shipments	5.4	(3.0)	10.7	(3.0)	23.9	(5.2)	13.3	(2.3)
After 4–5 shipments	3.6	(2.5)	6.8	(2.5)	1.5	(1.5)	4.4	(1.4)
After more than 5 shipments	7.1	(3.4)	8.7	(2.8)	3.0	(2.1)	6.6	(1.7)
Other	3.6	(2.5)	9.7	(2.9)	9.0	(3.5)	8.0	(1.8)
Unknown	25.0	(5.8)	8.7	(2.8)	7.5	(3.2)	12.4	(2.2)
Operation vehicles not used for transportation	35.7	(6.4)	35.9	(4.7)	13.4	(4.2)	29.2	(3.0)
Total	100.0		100.0		100.0		100.0	

A disinfectant was used when washing or rinsing out transport vehicles on 13.5 percent of small operations, 16.5 percent of medium operations, and 45.3 percent of large operations. Vehicles were not used for transportation or an unknown cleaning procedure was used by a higher percentage of small and medium operations than large operations.

F.6.b. Percentage of operations that used a disinfectant when washing or rinsing out transport vehicles during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Disinfectant	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Yes	13.5	(4.7)	16.5	(3.8)	45.3	(6.2)	24.4	(2.9)
No	21.2	(5.7)	36.1	(4.9)	32.8	(5.9)	31.5	(3.2)
Vehicles not used for transportation, or unknown cleaning procedure	65.4	(6.6)	47.4	(5.1)	21.9	(5.2)	44.1	(3.4)
Total	100.0		100.0		100.0		100.0	

Vehicles used to transport dairy heifers were also used to transport other cattle by approximately one-third of operations (31.5 percent).

F.6.c. Percentage of operations that used vehicles to transport dairy heifers to transport other cattle during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
32.6	(6.9)	23.1	(4.4)	42.9	(6.2)	31.5	(3.3)

Vehicles not owned by the operation were allowed in heifer-raising areas on 32.2 percent of operations. Any type of vehicle was allowed in heifer-housing areas on a lower percentage of small operations than large operations (15.8 and 50.0 percent, respectively). Veterinarian and nutritionist vehicles were allowed in heifer-housing areas on a higher percentage of large operations than on medium and small operations. A higher percentage of large operations than small operations also allowed private/contract hauler vehicles, other dairy operation's vehicles, or employee vehicles in the heifer-housing areas. As herd size increased so did the percentage of operations that allowed rendering company vehicles in heifer-housing areas. "Other" visitors included cattle dealers, family/friends, and hoof trimmers.

F.6.d. Percentage of operations by type of vehicle allowed in dairy heifer-housing areas, and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Visitor/vehicle type	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Veterinarian	5.3	(3.0)	14.7	(3.5)	40.9	(6.1)	20.0	(2.7)
Nutritionist	3.5	(2.4)	7.8	(2.6)	33.3	(5.8)	14.2	(2.3)
AI technician	3.5	(2.4)	7.8	(2.7)	21.2	(5.0)	10.7	(2.1)
University/ extension personnel	1.8	(1.7)	2.0	(1.4)	4.5	(2.6)	2.7	(1.1)
Private/contract hauler	7.0	(3.4)	15.7	(3.6)	30.8	(5.7)	17.9	(2.6)
Other dairy operations	5.3	(3.0)	10.8	(3.1)	28.8	(5.6)	14.7	(2.4)
Rendering company	0.0	(—)	4.9	(2.1)	20.0	(5.0)	8.0	(1.8)
Employees	5.5	(3.1)	13.1	(3.4)	27.4	(5.7)	15.3	(2.5)
Other	7.3	(3.5)	8.5	(2.9)	3.7	(2.6)	6.9	(1.8)
Any	15.8	(4.8)	29.8	(4.5)	50.0	(6.2)	32.2	(3.1)

The percentages of operations that allowed the listed vehicle types entry to heifer-housing areas were higher in the West region than in the East region, with the exceptions of university/extension personnel and “other” vehicles:

F.6.e. Percentage of operations by type of vehicle allowed in dairy heifer-housing areas, and by region:

	Percent Operations			
	Region			
	West		East	
Visitor/vehicle type	**Percent**	**Std. error**	**Percent**	**Std. error**
Veterinarian	54.5	(7.5)	11.6	(2.4)
Nutritionist	43.2	(7.5)	7.1	(1.9)
AI technician	27.3	(6.7)	6.6	(1.9)
University/ extension personnel	6.8	(3.8)	1.7	(1.0)
Private/contract hauler	34.1	(7.2)	13.9	(2.6)
Other dairy operations	29.5	(6.9)	11.0	(2.3)
Rendering company	22.7	(6.3)	4.4	(1.5)
Employees	32.6	(7.2)	11.0	(2.4)
Other	5.1	(3.5)	7.3	(2.0)
Any	59.1	(7.4)	25.7	(3.2)

More than 4 of 10 operations (43.0 percent) never used the same equipment to handle manure and feed dairy heifers. More than 3 of 10 operations (31.8 percent) routinely used the same equipment to handle manure and feed dairy heifers.

F.6.f. Percentage of operations that used the same equipment* to handle manure and feed dairy heifers during 2010, by frequency and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Frequency	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Routinely (daily or weekly)	29.1	(6.1)	31.4	(4.6)	34.8	(5.9)	31.8	(3.1)
Rarely (less than once per month)	20.0	(5.4)	25.5	(4.3)	28.8	(5.6)	25.1	(2.9)
Never	50.9	(6.8)	43.1	(4.9)	36.4	(5.9)	43.0	(3.3)
Total	100.0		100.0		100.0		100.0	

*Using the same loader and changing buckets constitutes using the same equipment.

Photograph courtesy of Dr. Jason Lombard

For operations that used the same equipment to handle manure and feed dairy heifers during 2010, 29.5 percent of operations disinfected equipment between uses.

F.6.g. For the 57.0 percent of operations that used the same equipment to handle manure and feed dairy heifers during 2010, percentage of operations that disinfected the equipment between uses, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
35.7	(9.1)	18.3	(5.0)	41.5	(7.7)	29.5	(4.0)

Approximately 4 of 10 operations (39.4 percent) shared any equipment (e.g., tractors, feeding equipment, manure spreaders, trailers) with other livestock operations.

F.6.h. Percentage of operations that shared any equipment with other livestock operations or used a custom harvester or manure hauler, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
27.3	(6.0)	44.1	(4.9)	42.2	(6.2)	39.4	(3.3)

Less than 5 percent of operations disinfected shared equipment prior to use on the operation.

F.6.i. For the 39.4 percent of operations that shared any equipment with other livestock operations, percentage of operations that disinfected shared equipment prior to use on the operation, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
0.0	(—)	2.2	(2.2)	10.7	(5.9)	4.5	(2.2)

7. Breeding

Dairy heifers were bred on 75.3 percent of operations.

F.7.a. Percentage of operations that bred any dairy heifers during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
77.2	(5.6)	76.9	(4.1)	71.2	(5.6)	75.3	(2.9)

Half of operations that bred heifers (50.0 percent) used a combination of natural service and AI breeding, while about one-third (31.5 percent) used only AI breeding. In general, natural-service-only breeding decreased and the combination of natural service and AI breeding increased as herd size increased.

F.7.b. For the 75.3 percent of operations that bred heifers during 2010, percentage of operations by breeding method and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		Medium (100–999)		Large (1,000 or more)		All operations	
Breeding method	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Natural service only (bull bred)	38.6	(7.4)	14.3	(4.0)	6.4	(3.6)	18.5	(3.0)
AI only	43.2	(7.5)	32.5	(5.3)	19.1	(5.8)	31.5	(3.6)
Natural service and AI	18.2	(5.8)	53.2	(5.7)	74.5	(6.4)	50.0	(3.9)
Total	100.0		100.0		100.0		100.0	

A higher percentage of operations in the West region used a combination of natural service and AI breeding (84.4 percent) compared with operations in the East region (41.9 percent). Alternatively, a higher percentage of operations in the East region used AI breeding exclusively compared with operations in the West region (37.5 and 6.3 percent, respectively).

F.7.c. For the 75.3 percent of operations that bred heifers during 2010, percentage of operations by breeding method and by region:

	Percent Operations			
	Region			
	West		East	
Breeding method	Percent	Std. error	Percent	Std. error
Natural service only (bull bred)	9.4	(5.2)	20.6	(3.5)
AI only	6.3	(4.3)	37.5	(4.2)
Natural service and AI	84.4	(6.4)	41.9	(4.2)
Total	100.0		100.0	

Reproductive practices can result in disease transmission between animals. For example, BLV can be transmitted during breeding or pregnancy exams via blood on palpation sleeves. Natural breeding can also result in transmission of trichomoniasis or other diseases.

AI technicians changed palpation sleeves between heifers on 51.8 percent of operations that bred any heifers during 2010, and palpation sleeves were changed between heifers during pregnancy exams on 15.7 percent of operations. Bulls were used for breeding on 67.6 percent of operations that bred any heifers during 2010.

F.7.d. For the 75.3 percent of operations that bred heifers during 2010, percentage of operations by reproductive practice and by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Reproductive practice	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
AI technicians changed palpation sleeves between heifers	66.7	(9.1)	56.1	(6.1)	36.4	(7.3)	51.8	(4.3)
Palpation sleeves changed between heifers during pregnancy exams	16.7	(6.8)	13.0	(3.8)	19.6	(5.9)	15.7	(2.9)
Used any bulls for breeding	56.8	(7.5)	65.0	(5.3)	82.6	(5.6)	67.6	(3.6)

In the West region, bulls were used for breeding on more than 9 of 10 operations (93.8 percent) that bred heifers during 2010. In the East region, bulls were used for breeding on more than 6 of 10 operations (61.6 percent).

F.7.e. For the 75.3 percent of operations that bred heifers during 2010, percentage of operations by reproductive practice and by region:

	Percent Operations			
	Region			
	West		East	
Reproductive practice	**Percent**	**Std. error**	**Percent**	**Std. error**
AI technicians changed palpation sleeves between heifers	48.3	(9.3)	52.8	(4.8)
Palpation sleeves changed between heifers during pregnancy exams	12.5	(5.9)	16.5	(3.4)
Used any bulls for breeding	93.8	(4.3)	61.6	(4.1)

Bulls owned by the dairy of origin were used for breeding on 36.0 percent of operations, and bulls purchased directly from nonclient farms were used on 63.1 percent of operations. Two of 10 operations that used breeding bulls during 2010 purchased them directly from auction. Bull management practices related to health were performed by 15 to 37 percent of operations. As herd size increased so did the percentage of operations that performed breeding soundness exams on bulls, evaluated bulls for genital warts, or tested bulls for trichomoniasis. Bulls were tested for BVD, TB, or brucellosis on a higher percentage of large operations than small operations. Bulls were vaccinated against vibriosis on a lower percentage of small operations than medium or large operations.

F.7.f. For the 50.9 percent (75.3 x 67.6) of operations that used breeding bulls during 2010, percentage of operations by source of bulls, bull management practices, and herd size:

Percent Operations

Herd Size (number of dairy heifers)

Bull management practice	Small (20–99)		Medium (100–999)		Large (1,000 or more)		All operations	
	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Source of bulls								
Owned by dairy of origin	16.7	(7.6)	36.7	(6.9)	47.4	(8.1)	36.0	(4.6)
Purchased directly from nonclient farm	54.2	(10.2)	55.1	(7.1)	78.9	(6.6)	63.1	(4.6)
Purchased from auction	29.2	(9.3)	16.7	(5.4)	18.4	(6.3)	20.0	(3.8)
Management practices								
Underwent breeding soundness exams	4.2	(4.1)	33.3	(6.8)	63.9	(8.0)	37.0	(4.7)
Evaluated for genital warts	0.0	(—)	29.8	(6.7)	64.7	(8.2)	34.3	(4.6)
Tested for trichomoniasis	0.0	(—)	18.8	(5.6)	47.2	(8.3)	24.1	(4.1)
Tested for BVD	12.5	(6.8)	33.3	(6.8)	52.9	(8.6)	34.9	(4.6)
Tested for TB	8.0	(5.4)	17.4	(5.6)	35.3	(8.2)	21.0	(4.0)
Tested for brucellosis	4.2	(4.1)	8.7	(4.2)	31.4	(7.9)	15.2	(3.5)
Vaccinated against vibriosis	8.3	(5.7)	37.5	(7.0)	54.5	(8.7)	36.2	(4.7)

Bulls on a higher percentage of operations in the West region underwent breeding soundness exams, were evaluated for genital warts, or were tested for trichomoniasis compared with bulls on operations in the East region.

F.7.g. For the 50.9 percent of operations that used breeding bulls during 2010, percentage of operations by source of bulls, bull management practices, and region:

	Percent Operations			
	Region			
	West		East	
Bull management practice	**Percent**	**Std. error**	**Percent**	**Std. error**
Source of bulls				
Owned by dairy of origin of dairy heifers	53.3	(9.1)	29.6	(5.1)
Purchased directly from nonclient farm	70.0	(8.4)	60.5	(5.4)
Purchased from auction	10.0	(5.5)	23.8	(4.8)
Management practices				
Underwent breeding soundness exams	72.4	(8.3)	24.1	(4.8)
Evaluated for genital warts	75.0	(8.2)	19.5	(4.5)
Tested for trichomoniasis	53.3	(9.1)	12.8	(3.8)
Tested for BVD	42.9	(9.4)	32.1	(5.3)
Tested for TB	38.5	(9.6)	15.2	(4.0)
Tested for brucellosis	33.3	(9.1)	9.0	(3.2)
Vaccinated against vibriosis	57.7	(9.7)	29.1	(5.1)

G. Morbidity and Antibiotic Use

Note: In this section the terms antibiotic and antimicrobial are used synonymously (see Terms Used in This Report, p 3). Operations had the opportunity to list three primary antibiotics for each disease or disorder treated and for each heifer class.

1. Preweaned heifers

Digestive problems and pneumonia were the most common diseases or disorders affecting preweaned heifers, and 18.2 and 16.4 percent of preweaned heifers, respectively, were treated with antibiotics for these two disorders during 2010. Approximately 7 of 10 preweaned heifers affected with digestive problems or lameness/injury were treated with antibiotics. About 9 of 10 preweaned heifers affected with pneumonia or navel infection were treated with antibiotics during 2010.

G.1.a. Percentage of preweaned heifers affected by and treated with antibiotics for the following diseases or disorders, and percentage of affected preweaned heifers treated with antibiotics during 2010:

	Percent Preweaned Heifers					
	Affected		Treated		Percent of affected preweaned heifers treated	
Disease or disorder	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Diarrhea, bloat (digestive problem)	25.3	(8.3)	18.2	(5.9)	71.8	(11.1)
Pneumonia (respiratory)	18.1	(5.9)	16.4	(5.7)	90.2	(6.5)
Navel infection	1.5	(0.5)	1.3	(0.5)	87.4	(8.0)
Lameness/injury	0.7	(0.3)	0.5	(0.2)	74.0	(12.7)

Antibiotics were used to treat diarrhea in preweaned heifers on 85.7 percent of operations. Primary antibiotics used for treating diarrhea in preweaned heifers included noncephalosporin beta-lactams, cephalosporins, and “other” or unknown antibiotics, which were used on more than 2 of 10 operations. Almost 9 of 10 operations (88.6 percent) used antibiotics to treat respiratory disease. The three primary antibiotics used to treat respiratory disease were macrolides, florfenicol, and fluoroquinolones. Antibiotics were used to treat navel infections on 60.0 percent of operations, and 50.0 percent of operations used noncephalosporin beta-lactams to treat navel infections. Approximately 3 of 10 operations used antibiotics to treat lameness/injury in preweaned heifers. Primary antibiotics used for treating lameness/injury were noncephalosporin beta-lactams (14.3 percent of operations).

G.1.b. Percentage of operations (including those not reporting diseases or disorders) by primary antibiotics used to treat the majority of affected preweaned heifers during 2010, and by disease or disorder:

	Percent Operations							
	Disease/Disorder							
	Diarrhea[1]		Respiratory		Navel infection		Lameness/ injury	
Primary antibiotics used	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Aminocyclitol	4.3	(2.4)	2.9	(2.0)	0.0	(—)	0.0	(—)
Aminoglycoside	14.3	(4.2)	1.4	(1.4)	0.0	(—)	0.0	(—)
Noncephalosporin beta-lactam	22.9	(5.0)	4.3	(2.4)	50.0	(6.0)	14.3	(4.2)
Cephalosporin	21.4	(4.9)	12.9	(4.0)	4.3	(2.4)	4.3	(2.4)
Florfenicol	4.3	(2.4)	42.9	(5.9)	4.3	(2.4)	2.9	(2.0)
Lincosamide	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Macrolide	2.9	(2.0)	48.6	(6.0)	2.9	(2.0)	2.9	(2.0)
Sulfonamide	14.3	(4.2)	2.9	(2.0)	1.4	(1.4)	1.4	(1.4)
Tetracycline	5.7	(2.8)	12.9	(4.0)	4.3	(2.4)	5.7	(2.8)
Fluoroquinolone[2]			34.3	(5.7)				
Other/unknown	21.4	(4.9)	10.0	(3.6)	5.7	(2.8)	4.3	(2.4)
Any antibiotic	85.7	(4.2)	88.6	(3.8)	60.0	(5.9)	28.6	(5.4)
No treatment but disease	8.6	(3.4)	0.0	(—)	2.9	(2.0)	7.1	(3.1)
No disease or disorder	5.7	(2.8)	11.4	(3.8)	37.1	(5.8)	64.3	(5.7)
Total	100.0		100.0		100.0		100.0	

[1]Or other digestive problem.

[2]Fluoroquinolones are approved for the treatment of bovine respiratory disease (BRD) in female dairy cattle less than 20 months of age. Treatment of calves for diseases other than BRD is considered extra-label use and is prohibited by law.

2. Weaned heifers

Respiratory disease was the most common disorder affecting weaned heifers (11.2 percent of heifers). Approximately 9 of 10 affected weaned heifers were treated with antibiotics during 2010, regardless of disease or disorder.

G.2.a. Percentage of weaned heifers affected by and treated with antibiotics for the following diseases or disorders, and percentage of affected weaned heifers treated with antibiotics during 2010:

	Percent Weaned Heifers					
	Affected		Treated		Percent affected weaned heifers treated	
Disease or disorder	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Diarrhea, bloat (digestive problem)	0.8	(0.1)	0.7	(0.1)	88.0	(4.3)
Pneumonia (respiratory)	11.2	(2.5)	11.0	(2.4)	97.9	(1.7)
Navel infection	0.1	(0.1)	0.1	(0.1)	92.0	(6.3)
Lameness/injury	0.9	(0.3)	0.8	(0.3)	91.1	(3.3)

Antibiotics were used on 34.3 percent of operations to treat diarrhea in weaned heifers during 2010. More than 8 of 10 operations used antibiotics to treat respiratory disease in weaned heifers. Florfenicols and macrolides were used on more than 4 of 10 operations to treat respiratory disease in weaned heifers. Navel infection was treated with antibiotics on 10.4 percent of operations, and 5.0 percent of operations treated navel infections with noncephalosporin beta-lactams. Lameness/injury in weaned heifers was treated with antibiotics on 43.3 percent of operations, and the primary antibiotics used were tetracyclines and noncephalosporin beta lactams.

G.2.b. Percentage of operations (including those not reporting diseases or disorders) by primary antibiotics used to treat the majority of affected weaned heifers during 2010, and by disease or disorder:

	Percent Operations							
	Disease/Disorder							
	Diarrhea*		Respiratory		Navel infection		Lameness/ injury	
Primary antibiotics used	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Aminocyclitol	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Aminoglycoside	1.5	(0.9)	0.0	(—)	0.0	(—)	0.0	(—)
Noncephalosporin beta-lactam	7.5	(1.9)	7.5	(1.9)	5.0	(1.5)	14.4	(2.5)
Cephalosporin	3.0	(1.2)	10.9	(2.2)	0.0	(—)	2.5	(1.1)
Florfenicol	4.5	(1.5)	44.3	(3.5)	1.0	(0.7)	2.5	(1.1)
Lincosamide	0.0	(—)	0.0	(—)	0.0	(—)	0.5	(0.5)
Macrolide	2.0	(1.0)	44.3	(3.5)	0.5	(0.5)	1.5	(0.9)
Sulfonamide	5.5	(1.6)	5.0	(1.5)	0.0	(—)	4.0	(1.4)
Tetracycline	4.0	(1.4)	16.9	(2.7)	1.0	(0.7)	21.9	(2.9)
Fluoroquinolone			19.9	(2.8)				
Other/unknown	12.4	(2.3)	8.0	(1.9)	3.5	(1.3)	7.5	(1.9)
Any antibiotic	34.3	(3.4)	82.1	(2.7)	10.4	(2.2)	43.3	(3.5)
No treatment but disease	14.4	(2.5)	2.5	(1.1)	0.5	(0.5)	11.4	(2.3)
No disease or disorder	51.2	(3.5)	15.4	(2.6)	89.1	(2.2)	45.3	(3.5)
Total	100.0		100.0		100.0		100.0	

*Or other digestive problem.

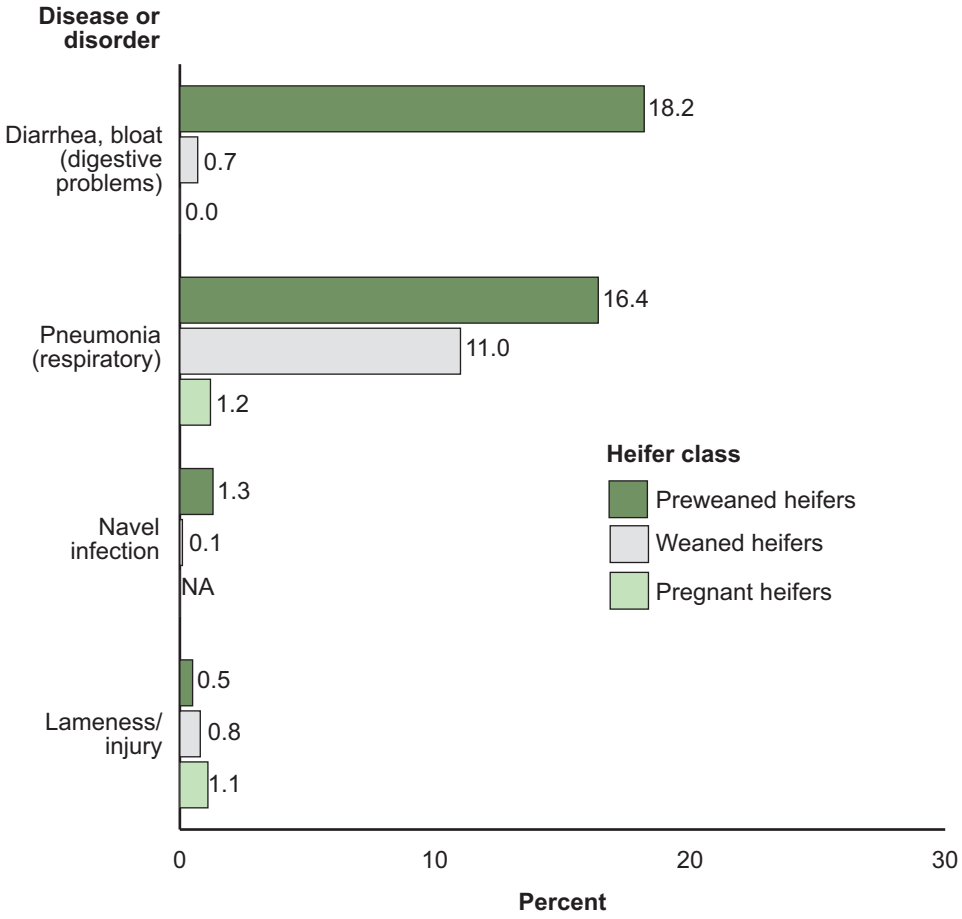
3. Pregnant heifers

Pregnant heifers were infrequently affected or treated for disease during 2010. Of affected pregnant heifers, almost all affected with pneumonia or mastitis were treated (99.8 and 97.0 percent, respectively).

G.3.a. Percentage of pregnant heifers affected by and treated with antibiotics for the following diseases or disorders, and percentage of affected pregnant heifers treated with antibiotics during 2010:

	Percent Pregnant Heifers					
	Affected		Treated		Percent affected pregnant heifers treated	
Disease or disorder	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Diarrhea, bloat (digestive problem)	0.1	(0.0)	0.0	(0.0)	54.9	(17.3)
Pneumonia (respiratory)	1.2	(0.4)	1.2	(0.4)	99.8	(0.2)
Lameness/injury	1.2	(0.3)	1.1	(0.3)	87.4	(5.8)
Mastitis	0.3	(0.1)	0.3	(0.1)	97.0	(1.6)

Percentage of heifers treated with antibiotics for the following diseases or disorders during 2010, by heifer class



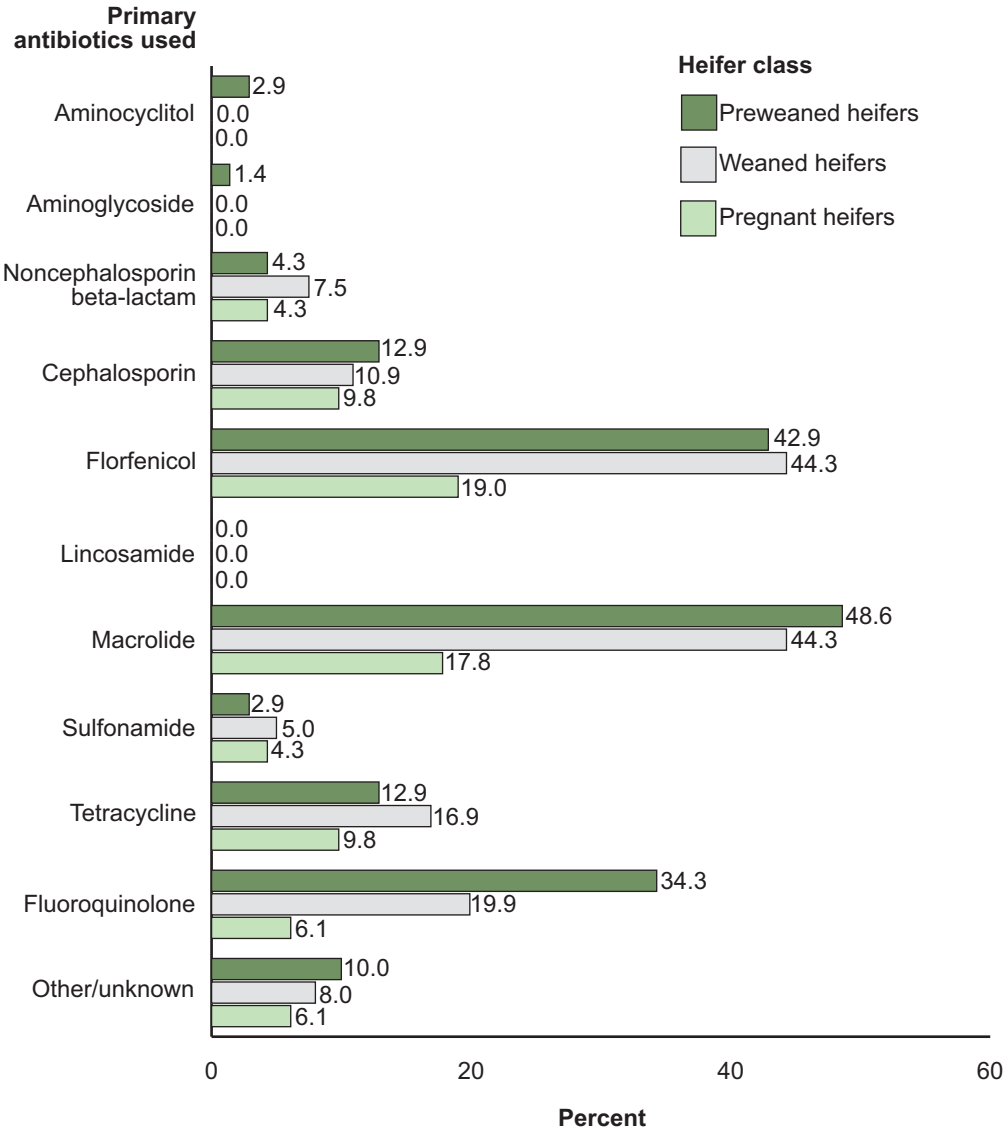
Antibiotics were used to treat diarrhea in pregnant heifers during 2010 on only 7.4 percent of operations. Antibiotics were used to treat respiratory disease, lameness/injury, or mastitis on 44.8, 50.3, and 31.3 percent of operations, respectively. Primary antibiotics used on operations to treat respiratory disease included florfenicol and macrolides (19.0 and 17.8 percent of operations, respectively). Tetracycline and noncephalosporin beta-lactams were the primary antibiotics used to treat lameness/injury in pregnant heifers, while cephalosporins and "other" were the primary antibiotics used to treat mastitis.

G.3.b. Percentage of operations (including those not reporting diseases or disorders) by primary antibiotics used to treat the majority of affected pregnant heifers during 2010, and by disease or disorder:

	Percent Operations							
	Disease/Disorder							
	Diarrhea*		Respiratory		Lameness/ injury		Mastitis	
Primary antibiotics used	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error
Aminocyclitol	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Aminoglycoside	0.6	(0.6)	0.0	(—)	0.0	(—)	0.0	(—)
Noncephalosporin beta-lactam	1.2	(0.9)	4.3	(1.6)	17.2	(3.0)	7.4	(2.0)
Cephalosporin	0.6	(0.6)	9.8	(2.3)	4.9	(1.7)	16.0	(2.9)
Florfenicol	1.2	(0.9)	19.0	(3.1)	2.5	(1.2)	0.6	(0.6)
Lincosamide	0.0	(—)	0.0	(—)	0.6	(0.6)	1.8	(1.1)
Macrolide	0.0	(—)	17.8	(3.0)	0.6	(0.6)	1.2	(0.9)
Sulfonamide	1.8	(1.1)	4.3	(1.6)	4.3	(1.6)	0.6	(0.6)
Tetracycline	0.6	(0.6)	9.8	(2.3)	27.0	(3.5)	4.3	(1.6)
Fluoroquinolone			6.1	(1.9)				
Other/unknown	2.5	(1.2)	6.1	(1.9)	5.5	(1.8)	11.0	(2.5)
Any antibiotic	7.4	(2.0)	44.8	(3.9)	50.3	(3.9)	31.3	(3.6)
No treatment but disease	6.7	(2.0)	0.6	(0.6)	14.1	(2.7)	2.5	(1.2)
No disease or disorder	85.9	(2.7)	54.6	(3.9)	35.6	(3.8)	66.3	(3.7)
Total	100.0		100.0		100.0		100.0	

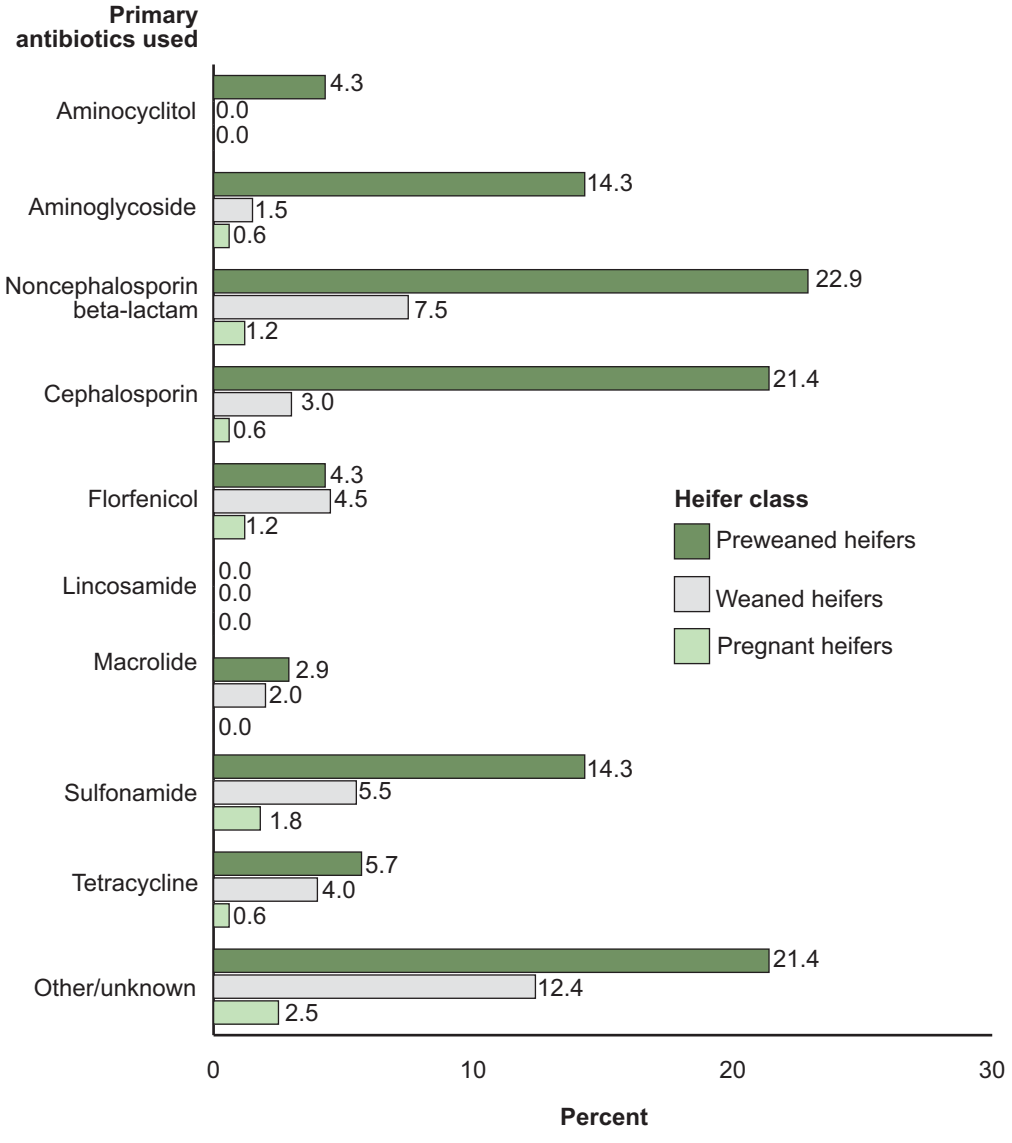
*Or other digestive problem.

Percentage of operations by primary antibiotics used to treat the majority of heifers affected by respiratory disease during 2010, and by heifer class



4.

Percentage of operations by primary antibiotics used to treat the majority of heifers affected with diarrhea* during 2010, and by heifer class



*Or other digestive problem.

4. Antibiotic selection

Selecting antibiotic therapies was primarily based on historical effectiveness (90.5 percent of operations) and veterinary recommendation, without laboratory workup (70.5 percent of operations). A lower percentage of small operations selected antibiotic therapies based on veterinary recommendation using previous laboratory results compared with medium and large operations. The percentage of operations that selected antibiotic therapies based on veterinary recommendation using current laboratory results increased as herd size increased.

G.4. Percentage of operations by criteria used to select antibiotic therapies for treated dairy heifers during 2010, and by herd size:

	Percent Operations							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Criteria	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Veterinary recommendation, without laboratory workup	72.3	(6.5)	69.4	(4.7)	70.8	(5.7)	70.5	(3.2)
Veterinary recommendation based on previous laboratory results (e.g., culture and sensitivity)	4.4	(3.1)	25.3	(4.5)	46.0	(6.3)	27.1	(3.1)
Veterinary recommendation based on current laboratory results	4.4	(3.1)	18.9	(4.0)	44.4	(6.3)	23.6	(3.0)
Historical effectiveness	83.0	(5.5)	90.8	(2.9)	95.4	(2.6)	90.5	(2.0)
Price of antibiotic	19.6	(5.9)	26.3	(4.5)	39.7	(6.2)	28.9	(3.2)

H. Mortality and Carcass Disposal

1. Causes of mortality

Preweaned, weaned, and pregnant heifer deaths were reported on 91.4, 72.4, and 43.8 percent of operations, respectively. A lower percentage of small operations had preweaned or weaned heifer deaths during 2010 compared with medium and large operations. A higher percentage of large operations had pregnant heifer deaths compared with small operations (77.6 and 13.8 percent, respectively).

H.1.a. Percentage of operations that had at least one death in the following heifer classes during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Heifer class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Preweaned	66.7	(11.1)	100.0	(0.0)	100.0	(0.0)	91.4	(3.4)
Weaned	25.0	(6.9)	80.0	(4.1)	93.0	(3.4)	72.4	(3.2)
Pregnant	13.8	(6.4)	31.8	(5.7)	77.6	(6.0)	43.8	(4.1)

A higher percentage of operations in the West region reported deaths in each heifer class compared with operations in the East region. These regional differences are likely due to differences in herd size.

H.1.b. Percentage of operations that had at least one death in the following heifer classes during 2010, by region:

Percent Operations

Region

	West		**East**	
Heifer class	**Percent**	**Std. error**	**Percent**	**Std. error**
Preweaned	100.0	(0.0)	90.0	(3.9)
Weaned	91.9	(4.5)	67.7	(3.8)
Pregnant	77.4	(7.5)	34.5	(4.5)

Overall, 4.2 percent of preweaned heifers, 1.6 percent of weaned heifers, and 0.2 percent of pregnant heifers died during 2010.

H.1.c. Percentage of heifers that died during 2010, by heifer class and by herd size:

Percent Heifers

Herd Size (number of dairy heifers)

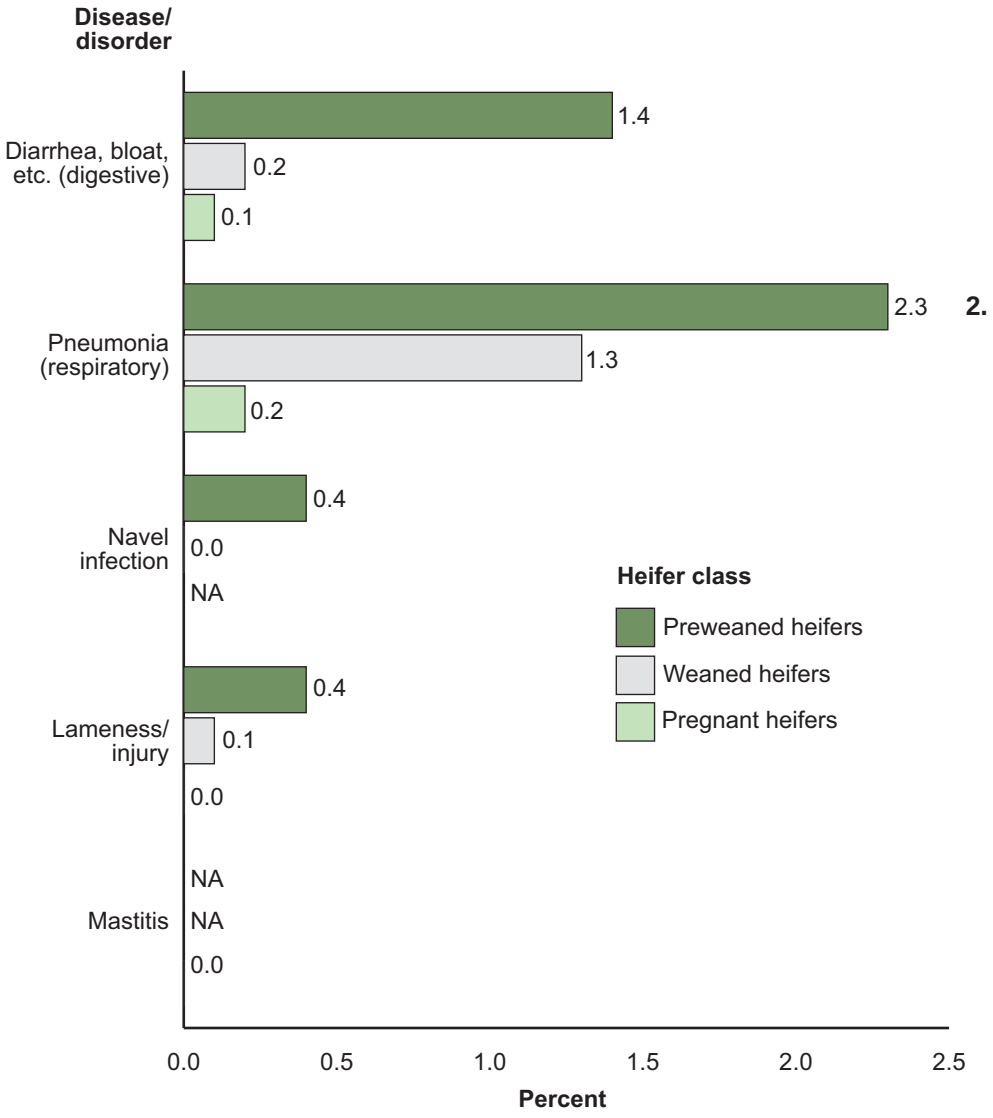
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Heifer class	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Preweaned	5.7	(1.8)	3.7	(0.6)	4.2	(1.2)	4.2	(1.2)
Weaned	0.8	(0.3)	1.0	(0.1)	1.6	(0.3)	1.6	(0.3)
Pregnant	0.3	(0.1)	0.2	(0.0)	0.2	(0.1)	0.2	(0.1)

Digestive disorders and pneumonia were responsible for the deaths of 1.4 and 2.3 percent of preweaned heifers, respectively. There were no differences by herd size in the percentages of preweaned heifers that died due to each disease or disorder. Pneumonia was the cause of death for 1.3 percent of weaned heifers and 0.2 percent of pregnant heifers.

H.1.d. Percentage of heifers that died as a result of the following disease/disorder during 2010, by heifer class and by herd size:

	Percent Heifers							
	Herd Size (number of dairy heifers)							
	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Disease/disorder	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Preweaned heifers								
Diarrhea, bloat (digestive)	2.5	(0.9)	2.5	(0.4)	1.3	(0.3)	1.4	(0.3)
Pneumonia (respiratory)	2.8	(1.0)	0.8	(0.2)	2.4	(0.9)	2.3	(0.9)
Navel infection	0.6	(0.5)	0.3	(0.2)	0.4	(0.3)	0.4	(0.3)
Lameness/injury	0.0	(—)	0.2	(0.1)	0.4	(0.2)	0.4	(0.2)
Weaned heifers								
Diarrhea, bloat (digestive)	0.2	(0.1)	0.3	(0.1)	0.2	(0.0)	0.2	(0.0)
Pneumonia (respiratory)	0.7	(0.3)	0.7	(0.1)	1.3	(0.3)	1.3	(0.3)
Navel infection	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)
Lameness/injury	0.0	(—)	0.1	(0.0)	0.1	(0.0)	0.1	(0.0)
Pregnant heifers								
Diarrhea, bloat (digestive)	0.0	(—)	0.0	(—)	0.1	(0.0)	0.1	(0.0)
Pneumonia (respiratory)	0.2	(0.1)	0.1	(0.0)	0.2	(0.1)	0.2	(0.1)
Lameness/injury	0.1	(0.1)	0.1	(0.0)	0.0	(—)	0.0	(—)
Mastitis	0.0	(—)	0.0	(—)	0.0	(—)	0.0	(—)

Percentage of heifers that died as a result of the following disease/disorder during 2010, by heifer class



2.

Necropsy

Necropsies are an important component for maintaining a healthy herd. Not only do necropsies allow a gross determination of cause of death, they also provide samples for histopathology, culture, and antibiotic-sensitivity testing, all of which usually help determine the cause of death and provide guidance on how further cases should be managed.

The percentage of operations that necropsied dairy heifers increased as the herd size increased. Overall, 50.0 percent of operations performed necropsies.

H.2.a. Percentage of operations that necropsied any dairy heifers during 2010 to determine the cause of death, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
6.7	(4.6)	47.5	(5.0)	73.1	(5.4)	50.0	(3.6)

Less than 2 of 10 heifer deaths (17.7 percent) were necropsied to determine cause of death during 2010.

H.2.b. Percentage of heifer deaths that were necropsied to determine cause of death, by herd size:

Percent Deaths Necropsied

Herd Size (number of dairy heifers)

Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Pct.	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
3.5	(2.3)	13.6	(4.3)	18.0	(7.3)	17.7	(6.8)

3. Carcass disposal

The three most common methods used to dispose of dead heifers were rendering, burying, and composting (29.9, 28.0 and 24.3 percent of operations, respectively). Rendering was the primary disposal method used by the highest percentage of large operations (50.7 percent), but was used by a lower percentage of small and medium operations (11.1 and 24.5 percent, respectively). Burial was used by almost 3 of 10 small operations (28.9 percent), 4 of 10 medium operations (40.2 percent), and less than 1 of 10 large operations (9.0 percent). Composting as a disposal method was used on a lower percentage of small operations, compared with medium and large operations. No heifer deaths were reported on 9.8 percent of operations, and the percentage of operations with no deaths decreased as herd size increased. “Other” forms of carcass disposal included a combination of those listed and natural decomposition/leaving for predators.

H.3.a. Percentage of operations by primary method used to dispose of dead dairy heifers during 2010, by herd size:

Percent Operations

Herd Size (number of dairy heifers)

	Small (20–99)		**Medium** (100–999)		**Large** (1,000 or more)		**All operations**	
Disposal method	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**	**Pct.**	**Std. error**
Render	11.1	(4.7)	24.5	(4.3)	50.7	(6.1)	29.9	(3.1)
Bury	28.9	(6.8)	40.2	(4.9)	9.0	(3.5)	28.0	(3.1)
Compost	6.7	(3.7)	24.5	(4.3)	35.8	(5.9)	24.3	(2.9)
Landfill	2.2	(2.2)	2.0	(1.4)	1.5	(1.5)	1.9	(0.9)
Burn/incinerate	0.0	(—)	2.0	(1.4)	0.0	(—)	0.9	(0.7)
Other	13.3	(5.1)	2.9	(1.7)	3.0	(2.1)	5.1	(1.5)
No deaths	37.8	(7.2)	3.9	(1.9)	0.0	(—)	9.8	(2.0)
Total	100.0		100.0		100.0		100.0	

Rendering was used by a higher percentage of operations in the West region than in the East region, while burying was used by a higher percentage of operations in the East region than in the West region. The percentage of operations reporting no deaths during 2010 was higher in the East region than in the West region.

H.3.b. Percentage of operations by primary method used to dispose of dead dairy heifers during 2010, by region:

	Percent Operations			
	Region			
	West		East	
Disposal method	**Percent**	**Std. error**	**Percent**	**Std. error**
Render	57.8	(7.4)	22.5	(3.2)
Bury	11.1	(4.7)	32.5	(3.6)
Compost	20.0	(6.0)	25.4	(3.4)
Landfill	4.4	(3.1)	1.2	(0.8)
Burn/incinerate	0.0	(—)	1.2	(0.8)
Other	4.4	(3.1)	5.3	(1.7)
No deaths	2.2	(2.2)	11.8	(2.5)
Total	100.0		100.0	

Section II: Methodology

A. Needs Assessment

Many of the dairy operations involved in recent TB outbreaks used heifer-raising facilities, although these facilities were not confirmed as the disease source. The potential risks for disease transmission that heifer-raising operations present have been recognized for many years, and in 2004 the U.S. Animal Health Association TB Strategic Planning Committee recommended that a descriptive analysis of the dairy-heifer-raising industry be conducted:

> "This information is critical if education efforts regarding risk factors and practices that promote spread of bovine tuberculosis and other disease are to be focused toward this segment of the industry." *U.S. Animal Health Association TB Strategic Planning Committee*

The DairyHeifer Raiser 2011 study was a collaborative effort between NAHMS, VS–TB staff, interested States, and the Dairy Calf and Heifer Association (DCHA). The needs assessment for the study was primarily conducted via teleconference with the interested States and the DCHA membership. In addition, extension personnel and dairy-heifer raisers provided valuable information and feedback on study methodology and questionnaire design.

The needs assessment phase of the study culminated in the formation of three study objectives:

1. Provide the first comprehensive information on animal health and management practices for heifer-raising operations;
2. Evaluate the biosecurity risks associated with heifer-raising operations (e.g., commingling cattle from multiple operations, exposing young cattle to Mexican cattle); and
3. Assist in the development of a biosecurity assessment that can be used to evaluate the risk of disease transmission (e.g., TB, BVD).

B. Sampling and Estimation

1. State selection

States for this study were selected based on interest from individual States and the number of members for States from the DCHA membership list. The States were: Arizona, California, Colorado, Idaho, Indiana, Iowa, Kansas, Kentucky, Michigan, Minnesota, Missouri, New Mexico, New York, North Dakota, Ohio, Pennsylvania, Texas, Vermont, Virginia, Washington, and Wisconsin.

A memo identifying these 21 States was provided 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. All States agreed to participate. The Regional Directors were given the option of coordinating

the study via Federal personnel, State personnel, or a combination of both. Twenty States chose to have a Federal coordinator and one State (WI) chose to have a State coordinator.

2. Operation selection

Since a complete list of heifer-raising operations does not exist, a variety of methods was used to identify eligible heifer-raising operations. The starting point for most States was the DCHA membership list for the respective State. Other methods used to identify operations included previous interaction with the operation, a listing of operations within the respective State, and word of mouth. Media promotion of the study resulted in additional participants.

C. Data Collection

Questionnaires were completed from April 1 to September 30, 2011. Federal and State veterinary medical officers and/or animal health technicians collected the data from producers during an interview that lasted approximately 1 hour.

D. Data Analysis

After completing the heifer-raiser questionnaire, data collectors sent the results 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

A total of 380 operations were contacted that fit the definition of a heifer-raising operation. Of these operations, 228 (60.0 percent) completed the questionnaire.

Appendix I: Sample Profile

1. Number and percentage of responding operations, by herd size and region:

	Region					
	West		East		Total	
Herd size	**No.**	**Pct.**	**No.**	**Pct.**	**No.**	**Pct.**
Small	1	2.2	56	30.6	57	25.0
Medium	9	20.0	95	51.9	104	48.6
Large	35	77.8	32	17.5	67	29.4
Total	45	100.0	183	100.0	228	100.0

2. Total number of dairy heifers raised by responding operations during 2010, by heifer class and by herd size:

	Number Heifers			
	Herd Size (number of dairy heifers)			
Heifer class	**Small** (20–99)	**Medium** (100–999)	**Large** (1,000 or more)	**All operations**
Preweaned	676	10,265	216,060	227,001
Weaned	1,432	26,994	174,287	202,713
Pregnant	558	5,203	41,708	47,469

3. Total number of dairy heifers raised by responding operations during 2010, by heifer class and by region:

	Number Heifers	
	Region	
Heifer class	**West**	**East**
Preweaned	166,097	60,904
Weaned	141,704	61,009
Pregnant	20,885	26,584

Appendix II: Antibiotic/Antimicrobial Class

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
Noncephalosporin 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
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)
	ToMORROW® Intramammary Infusion	Cephapirin (sodium)

Antimicrobial class	Product name	Active ingredient
Florfenicol	Nuflor® Injectable Solution	Florfenicol
	Resflor GOLD	Florfenicol
Fluorquinolones	Baytril® 100 injection	Enrofloxacin
Lincosamide	Pirsue® Intramammary Infusion	Pirlimycin
	Lincomycin	
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
	Bactrim® tablets	Trimethoprim sulfamethoxazole
	CORID 20% Soluble Powder	Amprolium
	CORID 9.6% Oral Solution	Amprolium
	Deccox-M	Decoquinate
	Linco-Spectin® Sterile Solution	Lincomycin / Spectinomycin
	QuarterMaster	Penicillin G (Procaine)/ Dihydrostreptomycin
	Tribrissin® tablets	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

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
	Noromycin™ 300 LA	Oxytetracycline

Dairy Heifer Raiser, 2011

Table of Contents