CHAPTER 5

CHAPTER 5

Monitoring and Surveillance for Animal Diseases

One of the goals of the National Animal Health Surveillance System is monitoring and surveillance for diseases with a major impact on animal production and marketing. This chapter describes some of the national studies coordinated by the National Animal Health Monitoring System (NAHMS) program unit. In addition, the chapter looks at vaccination practices in several industries in the United States—beef cow-calf, beef feedlot, dairy, equine, poultry, sheep, and swine.

National Animal Health Monitoring System Studies

NAHMS studies have focused on food animals as well as on equids. National studies on swine, dairy, and poultry commodities are produced about every 5 years or more, and on other commodities depending on information needs of commodity stakeholders.

Approximately 2 years prior to designing a study, NAHMS involves the targeted industry, government, and related groups in identifying critical information gaps. The study is then designed to optimize collection of data through questionnaires and biologic samples. The States selected for a NAHMS study typically represent at least 70 percent of the targeted animal population and a similar percentage of operations at the national level.

Beef 2007–08

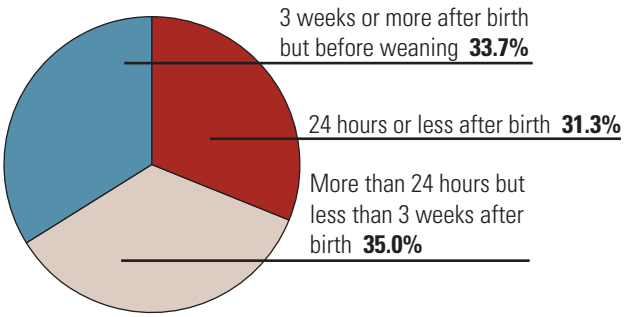
The two beef studies prior to the Beef 2007–08 study collected data on health and health management of cows and calves on beef operations throughout the United States. In addition, samples were collected to evaluate the prevalence of potential food-safety pathogens such as *Salmonella*. Food and water samples were also evaluated to characterize the trace mineral status of animals (zinc and selenium) and the quality of water being provided. The Beef 2007–08 objectives were developed to continue characterizing health and health management on cow-calf operations and, in addition, to collect data on management practices to support product quality assurance efforts; characterize control strategies for bovine viral diarrhea virus (BVDV) on operations, as well as the prevalence and distribution of animals persistently infected with BVDV; and describe the prevalence of potential food-safety pathogens for these operations.

A total of 24 States,[10] representing 79.6 percent of U.S. cow-calf operations and 87.8 percent of U.S. beef cows, participated in the study. Following are a few examples of the types of information available from this study.

Overall, 3.6 percent of beef calves that were born alive died prior to weaning. The risk of death was similar across herd sizes and regions. Approximately one-third of the unweaned calf losses occurred in each of these periods: birth to 24 hours, 24 hours to 3 weeks, and 3 weeks to weaning (fig. 5.1). Over one-half (51.3 percent) of the losses among calves less than 3 weeks of age were due to calving-related problems or weather-related causes. For calves from 3 weeks of age to weaning, 54.0 percent of the losses were attributed to digestive problems or respiratory problems (22.6 and 31.4 percent, respectively).

[10] Alabama, Arkansas, California, Colorado, Florida, Georgia, Idaho, Iowa, Kansas, Kentucky, Louisiana, Mississippi, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Tennessee, Texas, Virginia, and Wyoming.

Figure 5.1: For operations with unweaned calves that died or were lost in 2007, percentage of losses by age



Culling of cows in 2007 for purposes other than breeding occurred on 65.5 percent of operations. The proportion of operations doing some culling of cows was strongly related to herd size, with 92.7 percent of herds with 200 or more cows culling some cows, while 57.4 percent of operations with 1 to 49 cows culled some. Overall, 11.8 percent of beef cows were culled for purposes other than breeding in 2007. The leading reasons for culling cows for purposes other than breeding were age or bad teeth. These reasons accounted for 55.7 percent of operations that culled cattle for purposes other than breeding and 32.1 percent of cows culled for purposes other than breeding. The next leading reason was pregnancy status, which accounted for 41.8 percent of operations that culled cattle for purposes other than breeding and 33.0 percent of cows culled for purposes other than breeding.

Goat 2009

In its first study of the U.S. goat industry, NAHMS will obtain baseline information about the U.S. goat population, focusing on health and management practices.

The NAHMS Goat 2009 study will address priority issues of the U.S. goat industry and other stakeholders. Twenty-one of the major goat-producing States will participate in Goat 2009.[11] These States represent 75.5 percent of U.S. goat operations and 82.2 percent of U.S. goats.

The Goat 2009 study will address the following objectives:

- Provide a baseline description of animal health, nutrition, and management practices in the U.S. goat industry;
- Determine producer awareness of VS program diseases;
- Describe producer-reported occurrence of infectious diseases (including brucellosis, scrapie, caprine arthritis encephalitis, Johne's disease, and caseous lymphadenitis) and the management and biosecurity practices important for controlling them;
- Describe practices important for controlling internal parasites and reducing anthelmintic resistance; and
- Determine producer awareness of sore mouth (contagious ecthyma) and practices to prevent its transmission.

Vaccination Practices

Livestock producers have many options for preventing or controlling infectious diseases, including reducing the likelihood of exposure to infectious agents and optimizing resistance to disease when exposed. Resistance to infectious diseases can be enhanced nonspecifically through attention to good nutrition and parasite control. Vaccination can enhance the resistance of animals to specific pathogens and therefore reduce the likelihood of disease in exposed animals. If exposure to infectious disease agents occurs, the degree of immunity, amount of exposure, and virulence of the disease agent all play roles in the outcome. The choice of vaccines is based on multiple factors, including the age and use of the animal, the likelihood of exposure to the causative agent, the consequences of the disease if infection occurs after exposure, the cost and efficacy of the vaccine, and the safety of the vaccine. For some sectors of the livestock industry (e.g., horses), veterinary associations have made

[11] Alabama, California, Colorado, Florida, Georgia, Indiana, Iowa, Kentucky, Michigan, Missouri, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Tennessee, Texas, Virginia, Washington, and Wisconsin.

recommendations regarding core vaccines versus risk-based vaccines, taking into account the quality and efficacy of the vaccine.

NAHMS has developed information on vaccination practices in several industries in the United States—beef cow-calf, beef feedlot, dairy, equine, poultry, sheep, and swine.

Beef Cow–Calf

In the NAHMS Beef 2007–08 study, data were collected on biosecurity practices, including vaccination, for cow-calf operations.

Overall, 69.4 percent of cow-calf operations vaccinated some of their beef cattle or calves in 2007. Among those operations vaccinating, the most common vaccines used for cows were for the control of *Leptospira*, bovine viral diarrhea (BVD), and infectious bovine rhinotracheitis (IBR) (45.7, 40.1, and 35.4 percent of operations respectively). The most commonly used vaccines for calves from 22 days of age through weaning were for control of *Clostridium* spp. (excluding *Cl. perfringens* and *Cl. tetani*), BVD, IBR, and parainfluenza Type 3 (PI3) (83.2, 45.8, 42.7, and 38.3 percent of vaccinating operations respectively) (table 5.1).

Postweaning respiratory disease in calves can severely impact morbidity and mortality among beef calves. Vaccines are available to control a number of viruses and bacteria that cause respiratory disease in cattle. Optimal vaccination strategies make use of preweaning vaccination to decrease the risk of postweaning respiratory disease events. While 42.1 percent of producers did not vaccinate calves for control of respiratory disease prior to sale, approximately one-fourth (24.9 percent) vaccinated calves once and 29.0 percent vaccinated calves twice before sale.

Producers make decisions about vaccinating animals based on many criteria, including perceived risk of exposure to the disease agent, perceptions of vaccine efficacy, ease of implementation, and cost. The data from Beef 2007–08 suggest that there are no uniform vaccination strategies on cow-calf operations in the United States.

TABLE 5.1: For operations that vaccinated any beef cattle or calves in 2007, percentage of cow-calf operations that used the following vaccines in 2007, by age group

	Percent operations	
	Calves 22 days through weaning	Cows
GENERAL (respiratory and/or reproductive)		
Infectious bovine rhinotracheitis (IBR, also known as rednose)	42.7	35.4
Bovine viral diarrhea (BVD)	45.8	40.1
Histophilus somni	24.0	11.4
RESPIRATORY		
Parainfluenza 3 virus (PI3)	38.3	32.6
Bovine respiratory syncytial virus (BRSV)	36.6	30.4
Pasteurella/Mannheimia	18.2	6.4
REPRODUCTIVE		
Brucella abortus	9.2	1.4
Leptospira	15.1	45.7
Campylobacter (vibrio)	NA	27.4
Tritrichomonas	NA	1.5
Neospora	NA	0.4
CLOSTRIDIAL		
Clostridium chauvoei (blackleg) and/or *Cl. septicum* (malignant edema) and/or *Cl. novyi* and/or *Cl. sordellii* (2- or 4-way)	83.2	20.9
Cl. perfringens C and D (enterotoxemia, overeating)	48.6	16.7
Cl. tetani (tetanus)	25.4	8.2
DIGESTIVE		
Rota/Corona	0.3	7.6
E. coli	1.0	8.0
Salmonella	0.0	0.5
OTHER		
Anaplasma	0.0	0.4
Johne's	0.0	NA
Moraxella bovis (pinkeye)	15.4	6.7
Wart virus	0.0	0.3

Beef Feedlot

NAHMS collected data on health and management of feedlot cattle in 1999. The Feedlot '99 study included those facilities with at least 1,000-head capacity in the 12 leading cattle feeding States. Questionnaires were administered by personal interview to a stratified random sample of feedlot operators. These operations represented 84.3 percent of the feedlots with a 1,000-head or more capacity in the United States, and 95.8 percent of the U.S. cattle on feed inventory on those feedlots as of January 1, 1999 (or 77.3 percent of all cattle on feed in the United States).

All feedlots with 8,000-head capacity and more, and 95.7 percent of those with 1,000- to 7,999-head capacity, vaccinated some cattle for IBR. The next most commonly used vaccine was for control of BVDV (94.4 percent of all feedlots with at least 1,000-head capacity). The net effect of these vaccination efforts was that 96.9 percent of cattle placed on feedlots with 1,000-head capacity or more were vaccinated for control of IBR, and 87.7 percent of cattle were vaccinated for control of BVDV (table 5.2).

Overall 73.3 percent of cattle placed in feedlots were vaccinated for control of clostridial disease one or more times, while 32.2 percent of cattle were vaccinated for control of leptosprirosis.

The data from the Feedlot '99 study suggest that vaccination of feedlot cattle with some antigens (such as IBR and BVD) is routine. This is likely due to their central role in the occurrence of the bovine respiratory disease complex, which is the major source of animal morbidity and mortality in U.S. cattle feedlots.

Dairy Cattle

The Dairy 2007 study was NAHMS' fourth national study of dairy operations. The study was conducted in 17 of the Nation's major dairy States and provided participants, stakeholders, and the industry as a whole with valuable information representing 79.5 percent of U.S. dairy operations and 82.5 percent of U.S. dairy cows.

More than 60 percent of dairy operations vaccinated heifers or cows against BVD, IBR, PI3, bovine respiratory syncytial virus (BRSV), and leptospirosis (table 5.3). These vaccines are commonly marketed as a single combination vaccine requiring only one injection, and this may explain why the percentages within a cattle class are similar. Although a majority of dairy producers vaccinate their animals against the most common viral diseases, use of other efficacious vaccines, such as those against *E. coli* mastitis, were not commonly used. Vaccine use on an individual operation is commonly predicated on the disease history of the herd, or recommendations from vaccine manufacturers and/or the operation's herd veterinarian.

Equids

The Equine 2005 study was NAHMS' second study of the U.S. equine industry. It was designed to gather information on the Nation's equine population to serve as a basis for education, service, and research related to equine infectious disease control.

As defined by the American Veterinary Medical Association, a core vaccine is one "that protects from

TABLE 5.2: Percentage of beef cattle given the following injectable vaccines, by feedlot capacity

	Feedlot capacity (number head)					
	1,000–7,999		8,000 or greater		All feedlots	
Pathogen	% Operations	% Cattle	% Operations	% Cattle	% Operations	% Cattle
BVDV	93.5	89.5	96.8	87.3	94.4	87.7
IBR	95.7	95.1	100.0	97.3	96.9	96.9
PI3	86.2	79.8	86.6	72.3	86.3	73.5
BRSV	87.3	87.3	87.6	67.8	87.4	70.9
Haemophilus somnus	65.1	49.7	54.1	30.7	62.1	33.8
Pasteurella spp.	52.9	34.9	54.3	26.1	53.3	27.5

TABLE 5.3: Dairy 2007 study—Percentage of dairy operations that normally vaccinated dairy heifers and cows against the following diseases

	Percent operations	
Disease	**Heifers**	**Cows**
Bovine viral diarrhea (BVD)	73.7	75.0
Infectious bovine rhinotracheitis (IBR)	70.4	71.3
Parainfluenza type 3 (PI3)	61.0	61.9
Bovine respiratory syncytial virus (BRSV)	64.9	65.0
Haemophilus somnus	34.2	33.6
Leptospirosis	67.7	70.0
Salmonella	21.5	23.0
E. coli mastitis	24.1	33.5
Clostridia	34.6	27.7
Brucellosis	41.6	NA
Mycobacterium avium subspecies *paratuberculosis* (Johne's disease)	5.0	NA
Neospora	6.3	5.9
Other	6.8	7.4
Any disease	83.0	82.2

diseases that are endemic to a region, those with potential public health significance, required by law, virulent/highly infectious, and/or those posing a risk of severe disease. Core vaccines have clearly demonstrated efficacy and safety, and thus exhibit a high enough level of patient benefit and low enough level of risk to justify their use in the majority of animals." The American Association of Equine Practitioners (AAEP) released updated guidelines on vaccination for horses in 2007 suggesting that core vaccines were tetanus toxoid, Eastern and Western equine encephalitis (EEE/WEE) vaccine, West Nile virus (WNV) vaccine, and rabies vaccine.

Based on the NAHMS Equine 2005 study, the most commonly administered vaccines by operations with 5 or more equids in the 28 States in the study were the core vaccines identified by the AAEP, with the exception of the rabies vaccine.

Overall, 94.4 percent of operations that administered one or more vaccines to resident[12] horses during the previous 12 months knew which vaccines were given. Of these operations, 44.5 percent vaccinated one or more resident horses against rabies, 72.5 percent against influenza, 75.6 percent against EEE/WEE, 81.3 percent against tetanus, and 85.3 percent against WNV (table 5.4). There were regional differences for several diseases. For example, 48.6 percent of operations in the Northeast region, 38.0 percent in the South region, 28.8 percent in the Central region, and 18.4 percent in the West region vaccinated one or more resident horses against rabies. The data from the Equine 2005 study suggested that education of equine owners regarding the risk versus benefit of rabies vaccination is needed if it is to become one of the more commonly used vaccines in equids in the United States.

Based on the Equine 2005 study, 75.9 percent of operations gave some type of vaccine to resident equids during the previous 12 months. Operations with a primary function of farm/ranch (67.8 percent) or residences with equids for personal use (74.9 percent) were less likely to administer one or more vaccines to equids than operations with a primary function of boarding and/or training (96.8 percent) and breeding farms (89.7 percent).

Poultry

Vaccination strategies used by the poultry industry differ depending on use of the bird (e.g., broilers versus layers) as well as disease status of the farm or local area. In 1999, NAHMS conducted a study of the U.S. table egg layer industry. Operations with 30,000 or more layers in 15 States representing 82 percent of U.S. table egg layers in 1997 were eligible to participate in the study. Producers were asked about booster vaccinations given to layers 20 weeks of age and older. Overall, 40.9 percent of farm sites vaccinated against Newcastle disease and 41.0 percent vaccinated against infectious bronchitis. It is important to note that this study was conducted 10 years ago, prior to the 2002 exotic Newcastle disease (END) outbreak that occurred in Southern California. Vaccination practices may have changed since then, based on that END outbreak.

[12] An equid that spent or was expected to spend more time at the operation than at any other operation; the operation was its home base.

TABLE 5.4: Equine 2005 study—For equine operations that vaccinated and knew which diseases their horses were vaccinated against during the previous 12 months, and that had resident horses of the specified age class/type, percentage of operations that vaccinated all or some resident horses against the following diseases, by age class/type

Disease	Percent operations			
	Age class/type			
	Resident horses less than 1 year	Broodmares	Other resident horses over 1 year	Any resident horse
Flu (influenza)	58.2	77.3	72.3	72.5
Strangles *(Streptococcus equi)*	26.7	35.6	35.7	36.1
Rhinopneumonitis (herpesvirus)	51.2	69.7	61.5	63.7
Rabies	33.0	41.6	44.6	44.5
West Nile virus	65.5	83.1	85.6	85.3
Eastern and Western equine encephalitis (sleeping sickness)	59.0	79.2	76.0	75.6
Tetanus	73.7	83.0	79.6	81.3
Equine viral arteritis	12.0	16.6	15.7	16.0
Venezuelan equine encephalitis	21.5	26.2	24.8	24.5
Clostridium perfringens (C and D)	3.8	4.0	3.3	3.5
Potomac horse fever	10.6	12.9	14.3	14.5
Rotavirus	4.1	6.7	5.4	5.8
Anthrax	2.6	2.5	2.3	2.4
Equine protozoal myelitis	3.4	4.7	4.7	4.9
Other	0.8	0.9	0.5	0.7

More recently, in 2004 NAHMS conducted a study of backyard flocks and gamefowl breeders. Backyard flocks having fewer than 1,000 birds located within 1 mile of a commercial poultry operation in 18 States comprised the inference population. These 18 States accounted for 80 percent of the Nation's broilers produced, 74 percent of egg production, and 84 percent of turkeys raised. Additionally, a questionnaire was mailed to the entire membership of the United Gamefowl Breeder Association (UGBA) as well as State associations not affiliated with UGBA (totaling approximately 10,000 names between the UGBA and non-affiliated State associations). This study found that only 2.8 percent of backyard flock owners vaccinated any birds during the previous 12 months, while at least some birds in over one-half (58.6 percent) of gamefowl breeder flocks were vaccinated. The percentage of gamefowl breeder flocks that received vaccines increased with flock size; 78.3 percent of flocks with 500 or more birds received vaccines. The most common vaccinations given were for control of pox, Newcastle disease, and infectious bronchitis (49.8, 28.5, and 19.1 percent of flocks respectively).

In summary, backyard flock owners rarely vaccinate chickens. As small hobby poultry flocks are increasing in popularity in the United States, this population of producers would benefit from educational campaigns regarding infectious disease prevention, including vaccination and other biosecurity practices.

Sheep

In 2001, NAHMS conducted a study of the U.S. sheep industry in 22 States, which represented 87.4 percent of sheep and 72.3 percent of sheep operations. Data were collected on sheep health and management practices. In addition, for larger operations (those with more than 20 sheep), detailed data were collected on vaccination and other biosecurity practices for ewes, nursing lambs, breeding rams, and feeder lambs. Preventive management practices, which reduce the incidence of disease in a flock and promote good biosecurity, include animal

vaccination strategies. The vaccination of weaned animals intended for market promotes the shipment and arrival of healthy animals at feedlots, auctions, and markets. Overall, 50.5 percent of operations with feeder lambs gave at least one type of vaccine to their lambs after they were weaned.

While vaccines can reduce the occurrence and severity of infections, using the same needle for more than one animal can transmit pathogens between animals. Overall, 81.7 percent of operations used the same needle on more than one animal when giving injections or vaccinations during 2000.

The three types of vaccine given by the largest percentage of producers to sheep on their operations were *Clostridium perfringens* C and D toxoid; tetanus toxoid; and Clostridia 7- or 8-way vaccines.[13] The most commonly administered vaccine across all sheep (lambs, ewes, rams) was for control of *Clostridium perfringens* types C and D. Overall, 48.4 percent of operations gave this vaccine to replacement ewes, 66.9 percent to nursing lambs, 36.0 percent to breeding rams, and 44.8 percent to their feeder lambs intended for market. *Clostridium perfringens* is a normal inhabitant of the ruminant gut, but under certain circumstances can proliferate, produce large amounts of toxins, and cause disease and rapid death. These circumstances often include a change in diet to more high-energy feeds.

Campylobacter is an infectious disease of sheep and a common cause of abortion in pregnant ewes. Control of abortion can be accomplished by vaccination of ewes, rams, and replacement breeding stock. Overall, 15.5 percent of operations gave the vibrio (*Campylobacter*) vaccine to their breeding or replacement ewes.

Vaccination is only one of the important health management strategies used to improve biosecurity. The efficacy and side effects of a vaccine, along with the risk of occurrence of disease and associated costs of disease prevention versus occurrence of disease, need to be considered when developing a vaccination program for any livestock population.

Swine

The fourth swine commodity study by NAHMS, Swine 2006, focused on many aspects of biosecurity measures used by swine producers. Swine producers use many management methods to maintain herd biosecurity, one of which is controlling disease pathology in the herd by vaccination.

One of the greatest economic losses via disease that the swine industry endures comes from porcine reproductive and respiratory syndrome (PRRS). PRRS can affect all management stages of pigs when present on a farm. In nursery and grower/finisher pigs, the effect of PRRS in a herd naïve to the virus can be associated with a high mortality rate, as well as morbidity in surviving pigs that fail to eat and grow due to respiratory disease. Reduced feed intake and growth rates in these pigs are also common in herds where PRRS is endemic.

TABLE 5.5: Swine 2006 study—Percentage of swine sites that usually vaccinated nursery pigs against the following diseases, by size of site

	Percent sites			
	Size of site (total inventory)			
Vaccination	Small (fewer than 2,000)	Medium (2,000–4,999)	Large (5,000 or more)	All sites
Mycoplasma	46.3	62.2	81.2	52.6
PRRS	7.9	9.8	13.6	8.8
Swine influenza H1N1	6.7	22.1	20.0	10.4
Swine influenza H3N2	6.0	19.7	20.0	9.6
Both H1N1 and H3N2	6.0	17.5	20.0	9.2
Either H1N1 or H3N2	6.7	24.4	20.0	10.8

[13] Clostridia 7- or 8-way vaccines usually contain a combination of *Cl. chauvoei, Cl. septicum, Cl. novyi, Cl. sordellii, Cl. perfringens* types C and D, and *Cl. hemolyticum.*

TABLE 5.6: Percentage of swine sites that usually vaccinated breeding females against porcine reproductive and respiratory syndrome, by size of site

Percent sites			
Size of site (total inventory)			
Small (fewer than 2,000)	**Medium** (2,000–4,999)	**Large** (5,000 or more)	**All sites**
24.4	28.6	34.0	27.3

TABLE 5.7: Percentage of sites that usually vaccinated pigs against the following diseases while in the grower/finisher phase, by size of site

	Percent sites			
	Size of site (total inventory)			
Vaccination	**Small** (fewer than 2,000)	**Medium** (2,000–4,999)	**Large** (5,000 or more)	**All sites**
Mycoplasma	2.9	6.3	7.8	4.1
PRRS	0.0	0.0	0.0	0.0
Swine influenza H1N1	1.7	6.1	15.1	4.2
Swine influenza H3N2	1.9	4.2	15.1	3.9
Both H1N1 and H3N2	1.7	4.2	15.1	3.8
Either H1N1 or H3N2	1.9	6.1	15.1	4.3

The effects of the PRRS virus can be amplified in herds co-infected with other infectious agents, particularly *Mycoplasma hyopneumoniae* and swine influenza. Swine influenza infection in pigs is generally due to two serotypes—H1N1 and H3N2.

In the NAHMS Swine 2006 study, over one-half of all sites with nursery pigs (52.6 percent) vaccinated these pigs against *Mycoplasma*, ranging from 46.3 percent of small sites (fewer than 2,000 pigs) to 81.2 percent of large sites (5,000 pigs or more). On average, sites first vaccinated nursery pigs against *Mycoplasma* pneumonia at 4.4 weeks of age in 2006. Fewer than 1 in 10 sites (8.8 percent) vaccinated nursery pigs against PRRS (table 5.5). Approximately 1 in 10 sites vaccinated against both swine influenza H1N1 and H3N2. Sites first vaccinated nursery pigs against swine influenza at about 6 weeks of age.

About 27 percent of sites with breeding females usually vaccinated them against PRRS, ranging from 24.4 percent of small sites to 34.0 percent of large sites (table 5.6).

About 4 percent of all sites with grower/finisher pigs vaccinated them against *Mycoplasma* pneumonia, ranging from 2.9 percent of small sites to 7.8 percent of large sites (table 5.7). A lower percentage of sites with a grower/finisher phase vaccinated pigs against *Mycoplasma*, PRRS, and swine influenza H1N1 and H3N2 than sites with a nursery phase (table 5.5).

In spite of the impact of PRRS on swine operations, few producers vaccinate for PRRS in weaned market pigs. This lack of vaccine use may be due to producers' use of management techniques such as multi-site production or personnel entry restrictions to combat this disease. Alternatively, operators may be choosing to vaccinate for *Mycoplasma* to decrease that disease's role in worsening PRRS infection.

Summary

Vaccination can be used as an aid in infection control. Vaccination programs within a livestock population and across livestock commodities will vary based on risk of disease exposure and consequences of disease occurrence, as well as cost and efficacy of the vaccine available to control the disease. Trends in vaccine use can also be determined through sequential NAHMS studies for a given livestock commodity. These data are useful for risk assessment, targeting producer and veterinarian education, and evaluating trends over time, such as in response to education programs. NAHMS collects other information across livestock commodities related to biosecurity. Additional information is available at *http://nahms.aphis.usda.gov*.