FIRST RESPONDERS IN ANIMAL HEALTH EMERGENCIES: DEFINING VETERINARIANS' AWARENESS AND TRAINING NEEDS

By

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CHAPTER 1

INTRODUCTION

Background and Setting

The superior man, when resting in safety, does not forget that danger may come. When in a state of security, he does not forget the possibility of ruin. When all is orderly, he does not forget that disorder may come. Thus his person is not endangered, and his states and all their clans are preserved. – Confucius

Dangers threatening the agricultural industry in the United States are ever-present and constantly evolving, from natural events to intentional attacks intended to wreak havoc on the American economy and sense of security (Wohl & Nusbaum, 2007). Responding to these dangers has been an emphasis of homeland security and emergency preparedness efforts in the United States for nearly a decade, with increasing consideration of the vulnerability of agricultural infrastructure occurring after the terrorist attacks on September 11 (Crutchley, Rodgers, Whiteside, Vanier, & Terndrup, 2007; Moats, 2008). As plans have been made for responding to emergencies that impact agriculture, the shared biological dimensions of natural disasters and bioterrorism (Wohl & Nusbaum) have allowed for development of all-hazards response plans, which have been identified as efficient alternatives for disaster preparedness (DeOtte, 2007; Geering, Roeder, & Obi, 1999).

Local emergencies could produce global “ripple effects” due to the mobility and interdependence of agriculture, reinforcing the need for a consistent, nationwide framework for responding to emergencies (Moats, 2008, p. 7) and public-private partnerships to enhance agricultural infrastructure protection (Monke, 2007). Since 2002, six reports produced by the Government Accountability Office have identified gaps in federal protection of agriculture and food (Monke). The first step toward addressing these gaps was the Public Health Security and Bioterrorism Preparedness Response Act of 2002, which was intended to increase the ability of the United States to respond to bioterrorist threats and other public health emergencies (Spellman, 2008).

The structure for responses to agriculture-related events has been further developed through multiple documents, including Homeland Security Presidential Directives; the National Response Plan, which is now known as the National Response Framework; the Animal Emergency Response Organization; and the National Animal Health Emergency Response Plan (Moats, 2008). Local and/or state responses serve as the foundation for the emergency responses outlined in these documents, with federal support provided as needed (Moats). All response plans are based on the same assumptions: the National Incident Management System will be used to initiate and conduct response activities; the Department of Justice will be involved in coordination of responses to actual or potential terrorism incidents; and funding assigned to federal departments and agencies will be used to provide support for homeland security missions (Moats).

The Homeland Security Presidential Directives, National Response Framework, and animal health emergency plans specifically refer to veterinarians and their roles in

incident responses (Garris, 2006; Moats, 2008; Wenzel, 2007). Identified roles for veterinarians include first responders (Moats; Wenzel; Wenzel & Wright, 2007), communicators (Brown, 2003), epidemiologists (Brown; Geering et al., 1999; Ortega et al., 2007), and consultants and technical specialists (Brown; Moats). Veterinarians' qualifications for filling these roles are rooted in their broad training in biomedical sciences; population medicine; and multispecies, comparative approaches to disease prevention and control (Amass, Blossom, Ash, McCay, & Mattix, 2008; Wohl & Nusbaum, 2007), as well as their leadership skills (Hendrix, McClelland, & Thompson, 2006). However, despite the need for veterinarians to fulfill the roles of first responder, food supply protector, and animal health care provider, "… our nation is faced with the educational problem of efficiently and rapidly increasing capacity in veterinary homeland security to serve our country" (Amass et al., p. 235).

Increasing the capacity for veterinary response to homeland security challenges will require at least awareness-level training and resources for veterinarians in areas ranging from surveillance to the incident command system (Hendrix et al., 2006; Wenzel & Wright, 2007). Veterinarians must be able to detect and control biological agents quickly (Amass et al., 2008; Kelly, 2005), as well as plan and prepare for the consequences of biological attacks or natural disasters (Amass et al.). In addition, Homeland Security Presidential Directive-5 requires the use of the National Incident Management System in response to emergencies, which means veterinarians should understand the elements of the incident command system to effectively fill their identified roles during emergencies (Wenzel & Wright). Essentially, veterinarians need

relevant information about biodefense and emergency response to meet the social responsibility they pledge to their profession (Baker et al., 2003).

Meeting this need for information and resources may occur through continuing education, changes to veterinary medicine curricula, and coordination of veterinary education (Baker et al., 2003). The “best short-term and intermediate-term solution for getting the profession geared up to better help” is continuing education for practicing veterinarians (Baker et al., p. 165). In addition, curricula may be improved and the increasing demands on veterinary homeland security may be met by providing more options for training in public service careers (Hendrix et al., 2006).

Ultimately, the importance of veterinarians of all types in responding to emergencies that impact agriculture and that could affect humans rests on the potential for animals to serve as sentinels for diseases and other disasters (Shaffer et al., 2007). Many veterinarians, however, have limited experience with many diseases due to successful disease control and eradication programs (Monke, 2007). The value of emergency response educational programs and resources has been recognized throughout the field of veterinary medicine, as “Leaders in the field … have cited the urgent need to enhance veterinarians’ ability to respond effectively to bioterrorism events and other public-health disasters” (Katz et al., 2006, p. 612).

Statement of the Problem

Veterinarians have been identified by Oklahoma beef producers (Ashlock, 2006) and Kansas beef feedlot managers (Riley, 2007) as preferred sources of information during animal-related agroterrorism events. In addition, practitioners of veterinary medicine have identified emergency response and management as an important issue

facing veterinarians during the 21st century. Within the veterinary profession, calls have been made for increased levels of awareness, preparedness, and involvement in emergency management and public health responses (Amass et al., 2008; Baker et al., 2003; Brown, 2003; Hendrix et al., 2006; Kelly, 2005; Thurmond & Brown, 2002; Wenzel & Wright, 2007; Wohl & Nusbaum, 2007).

During emergencies that impact animals, veterinarians likely will be the first responders in containing potential or actual crises through their roles in diagnosing, treating, and reporting animal and/or herd health status (Moats, 2008). Veterinarians also serve, intentionally and unintentionally, as sources of information for clients, community members who are not clients, the media, government officials, and other audiences. Following appropriate emergency response procedures and effectively disseminating information to multiple audiences during emergencies that involve animals is vital to attaining high levels of resiliency within the agricultural industry. Veterinarians must be knowledgeable about emergency response and management, as well as possess adequate skills for communicating with the public, media, and government officials during animal-related emergencies.

However, despite the calls for increasing the contribution of veterinarians in emergency situations, minimal information has been collected and/or reported regarding veterinarians' perceptions of and preparedness for their roles in emergency responses. Available information also has not been used in identifying areas for training through continuing education and/or veterinary school courses.

Significance of the Study

The results of this study benefit the veterinary profession, the U.S. livestock industry and entire agricultural industry, and entities responsible for implementing emergency response and management procedures in the U.S. by providing insights into how to better prepare first responders for emergencies that impact animals. This study provides a foundation for testable hypotheses about how to improve veterinarians' skills as first responders and communicators during animal disease outbreaks. These hypotheses could serve as a framework for courses to be included in veterinary school curricula and for continuing education opportunities for practicing veterinarians. Providing such opportunities for veterinarians to improve their skills as first responders and communicators will be one avenue for meeting calls within the veterinary profession for increased levels of awareness, preparedness, and involvement in emergency management and public health responses.

Purpose

The purpose of this study was to determine veterinarians' self-reported perceptions of susceptibility to and preparedness for responding to emergency events, determining veterinarians' self-reported knowledge of emergency response and management procedures and communication skills, and identifying areas in which training should be provided to better prepare veterinarians for contributing to emergency management and public health responses.

Objectives

Specific objectives in meeting the purpose of this study were to:

1. Determine veterinarians' self-reported prior experiences and training in emergency response and management on the local, state, and national levels; recognition and reporting of selected animal diseases; and communication skills.
2. Determine veterinarians' perceptions of the vulnerability of animal populations on the local, state, and national levels to natural or man-made outbreaks of selected animal diseases.
3. Determine veterinarians' perceptions of the potential severity of natural or man-made outbreaks of selected animal diseases on the local, state, and national levels.
4. Determine veterinarians' perceptions of readiness to respond to natural and man-made outbreaks of selected animal diseases on the national, state, and local levels.
5. Determine veterinarians' self-reported knowledge of and abilities in the areas of emergency response and management on the state, local, and national levels; recognition and reporting of selected animal diseases; and communication skills.
6. Determine the influence of cost on veterinarians' interest in training about emergency response and management, disease recognition and reporting, and communication skills.
7. Determine veterinarians' intentions to participate in training about emergency responses and management on the local, state, and national

levels; recognition and reporting of selected animal diseases; and communication skills.

8. Describe relationships among veterinarians' self-reported prior experiences and training, perceptions of vulnerability to disease outbreaks, perceptions of potential severity of disease outbreaks, perceptions of readiness to respond to disease outbreaks, self-reported knowledge and abilities, influence of cost on training, and intentions to participate in training.

Scope of the Study

This study included all veterinarians licensed with the Oklahoma Board of Veterinary Medical Examiners as of March 19, 2009, who provided physical practice addresses in Oklahoma, Kansas, Missouri, Texas, and Arkansas, and who were accessible via e-mail or fax.

Assumptions

This study was conducted under the following assumptions:

1. Veterinarians will report honestly and accurately their prior experiences with and perceptions about emergency response and management on the state, local, and national levels; recognition and reporting of selected animal diseases; and communication skills.
2. Protection motivation theory can be used to describe veterinarians' intentions to participate in training about emergency response and

management on the local, state, and national levels; recognition and reporting of selected animal diseases; and communication skills.

Limitations

The following limitations were identified for this study:

1. The results of this study cannot be generalized beyond the population of veterinarians included in the study.
2. This study does not reflect all the variables that influence veterinarians' skills as first responders during disease outbreaks that impact animals.

Definition of Terms

The following terms were defined as follows for use in this study:

Agriculture: Activities essential to the production of food, feed, and fiber, including all techniques for raising and processing livestock (Spellman, 2008).

Agricultural infrastructure: "Physical production and distribution systems critical to supporting national security and economic well-being, including all activities essential to food, feed, and fiber production" (Spellman, 2008, p. 8)

Animal health emergency: Incursions of foreign animal diseases, natural disasters, emerging disease incidents, and agroterrorism incidents that have socioeconomic consequences (Geering et al., 1999; USDA, 2008).

Dangerous animal disease threats: Animal diseases identified to be part of the National Veterinary Stockpile by 2011, including highly pathogenic avian influenza, foot-and-mouth disease, Rift Valley fever, exotic Newcastle disease, nipah and hendra

virus, classical swine fever, African swine fever, bovine spongiform encephalopathy, rinderpest, and Japanese encephalitis (Garris, 2006).

Emergency: "Any natural or human-caused situation that results in or may result in substantial injury or harm to the population or substantial damage to or loss of property" (Moats, 2008, p. 182).

First responder: "Local police, fire, and emergency medical personnel who first arrives on the scene of an incident and take action to save lives, protect property, and meet basic human needs. First responders may include federal, state, or local responders" (Moats, 2008, p. 183).

Hazard: Potentially dangerous or harmful thing that can be the cause of one or more unwanted outcomes (Moats, 2008).

Incident: A natural phenomena or human-caused occurrence requiring action by emergency service personnel to prevent or minimize loss of life or damage to property and/or natural resources (Moats, 2008).

Local: Geographic area included in a county, municipality, city, town, township, local public authority, school district, special district, intrastate district, council of governments, regional or interstate government entity, Indian tribe or authorized tribal organization, Alaska Native village or Alaska regional Native corporation, rural community, unincorporated town or village, or other public entity (Moats, 2008).

Man-made outbreak: Human-caused occurrence of a dangerous animal disease (Geering et al., 1999).

National Animal Health Emergency Response Plan: Framework, including authorities, policies, situation, planning assumptions, concept of operations, and federal

agency resources, for an integrated local-state-federal response to an outbreak of a highly contagious disease in the United States (Moats, 2008).

National Response Framework: Comprehensive approach to managing domestic incidents in the United States that establishes incident management protocols to protect against natural and man-made hazards; to save lives; to protect public health, safety, property, and the environment; and to reduce psychological consequences and disruptions to life (Moats, 2008).

National Veterinary Stockpile: Store of supplies, vaccines, equipment, and other critical veterinary resources available for deployment in large quantities within 24 hours in response to an outbreak of any of the 17 worst animal diseases within the continental United States (Garris, 2006).

Natural outbreak: Occurrence of a dangerous animal disease resulting from sources in nature rather than humans (Geering et al., 1999).

Preparedness: Actions, including procedures to share information and disseminate timely notifications, warning, and alerts, to enhance readiness and the ability to respond quickly and effectively to an incident (Moats, 2008).

Response: Activities to address "immediate and short-term actions to preserve life; property; the environment; and the social, economic, and political structure of the community" (Moats, 2008, p. 188).

Severity: How serious an individual believes a threat is. (Milne, 2000).

State: "Any state of the United States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, the Commonwealth of the Northern Mariana Islands, and any possession of the United States

(As defined in section 2 (14) of the Homeland Security Act of 2002, Pub. L. 107-296, 116 Stat. 2135, et seq., 2002)" (Moats, 2008, p. 189).

Threat: An indication that a harmful incident could or may have occurred (Spellman, 2008).

United States: The states, the District of Columbia, the Commonwealth of Puerto Rico, the Northern Mariana Islands, Guam, American Samoa, the United States Virgin Islands, and the Pacific Island Governments (Moats, 2008).

Vulnerability: How susceptible an individual feels to a potential or communicated threat (Milne, 2000).

Worst animal diseases: Animal diseases included in the National Veterinary Stockpile, including highly pathogenic avian influenza, foot-and-mouth disease, Rift Valley fever, exotic Newcastle disease, nipah and hendra virus, classical swine fever, African swine fever, bovine spongiform encephalopathy, rinderpest, Japanese encephalitis, African horse sickness, Venezuelan equine encephalitis, contagious bovine pleuropneumonia, ehrlichia ruminantium, eastern equine encephalitis, Coxiella burnetii, and Akabane virus (Garris, 2006).

Zoonotic: Pathogens that originate in animals and can be passed to humans (Ablah et al., 2008).

Chapter Summary

The 21st century veterinarian is facing increasing demands to serve multiple roles in emergencies impacting agriculture and public-health emergencies. These roles include first responders, communicators, epidemiologists, and technical specialists and consultants. Structure and support for emergency responses to agriculture has been

created on the federal level, although responses to all agricultural emergencies will be initiated on the local and/or state levels.

Meeting the demand for local responses to emergencies will require increased opportunities for continuing education and curricular expansion in veterinary medicine. The purpose of this study was to provide information to be used in improving veterinarians' skills as first responders and community representatives during emergencies impacting animal and public health.

CHAPTER 2

REVIEW OF LITERATURE

Threats to American Agriculture

American agricultural workers produce food and fiber in an environment of ongoing threats to production from natural disasters and agroterrorism (Brown, 2003; DeOtte, 2007; Dorman, 2006-2007; Lutz & Greenfield, 2003; Moats, 2008; Spellman, 2008), and awareness of those threats and the need for preparedness to respond to them has been increasing since the terrorist attacks of 2001 (Crutchley et al., 2007; DeOtte; Kelly, 2005). Awareness and understanding of the nature of various threats are vital to implementing effective responses when possibility becomes reality (DeOtte).

Vulnerabilities to disasters in agriculture may be classified as infrastructural, geographical, demographic, sociocultural, and economic (Caruson & MacManus, 2008). Animal and plant disease outbreaks have the potential to cut across each of these categories, at least in part because distinguishing among deliberate, accidental, and natural outbreaks of diseases is difficult (Miller, Israelsen, & Jensen , 2008; Seebeck, 2007). Animal diseases in particular pose unique problems, as many foreign, emerging, and re-emerging animal diseases are zoonotic (Kelly, 2005) and pose significant ongoing threats to U.S. animal and human health (USDA, 2008).

Although modern livestock and poultry management practices have reduced the potential for natural accidental epidemics of animal diseases, high-consequence

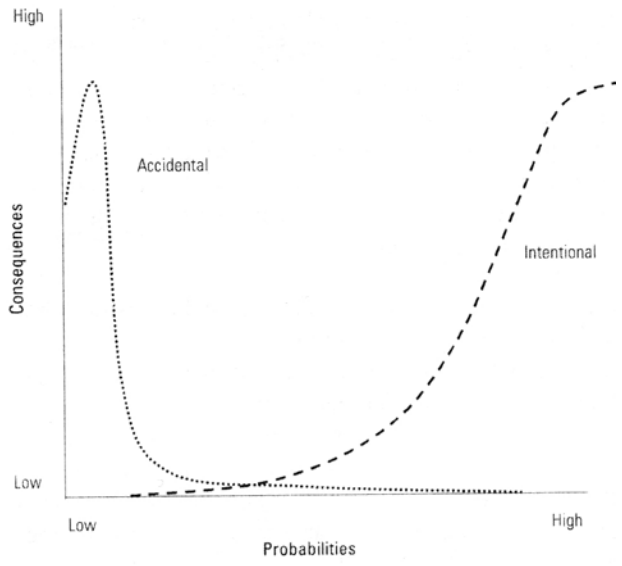

Figure 1. Potential for and consequences of accidental and intentional animal disease outbreaks. (Hugh-Jones & Brown, 2006)

intentional disease outbreaks are possible (see Figure 1) (Hugh-Jones & Brown, 2006). Despite disease control measures, however, natural accidental outbreaks are more common than intentional outbreaks, and preparedness for all disease outbreak situations is warranted (Hugh-Jones & Brown). Demand for prevention and control measures for accidental disease introductions has been intensified as the importance of global agricultural trade and frequency of international travel have increased (Brandt, Sanderson, DeGroot, Thomson, & Hollis, 2008).

Preparing the food supply system, particularly livestock and poultry production, for an attack by terrorists also has been given increasing priority since 2001 as agriculture has been identified as one of America's critical infrastructures (Spellman, 2008). The discovery of al-Qa'ida terrorist network materials identifying agriculture as a target further increased agricultural defense needs (Crutchley et al., 2007; Kosal & Anderson, 2004), and many agricultural and security professionals agree that biological or chemical

aggression against agriculture is a question of "when" not "if" (Brown, 2003; DeOtte, 2007; Hugh-Jones & Brown, 2006; Lutz & Greenfield, 2003; Moats, 2008; Spellman). Agriculture may not be a first-choice target for terrorists because of the lack of "shock factor" of an attack (Monke, 2007, p. 1), but the potential for damage by animal diseases makes it an attractive option for domestic and foreign terrorists who want to create disruption of the American food supply that could significantly affect social order (Brown; Lutz & Greenfield; Moats; Monke; Spellman).

Vulnerabilities in Food Production and Supply

The scale and diversity of food production and supply in the U.S. help and hinder agricultural defense and emergency response efforts (Lutz & Greenfield, 2003; Zink, 2004). Numerous points of attack are poorly monitored (Zink), although the multitude of products and production locations provides inherent protection (Lutz & Greenfield) that makes American agriculture as a whole "difficult to cripple with an attack" (Zink, p. 47). The basis for this inherent protection also provides for resiliency and responsiveness to emerging threats (Zink), even though centralized decision making about security and emergency response efforts is not possible with a decentralized industry such as agriculture (Hennessy, 2007).

Vulnerabilities to natural disasters and terrorist attacks that do exist within agriculture are caused by unique characteristics of the entire industry and specific sectors, including livestock and poultry production, such as:

- large number and geographic spread of unsecured farms (Buttars, Young, & Bailey, 2006; Chalk, 2004; Crutchley et al., 2007; Hugh-Jones & Brown, 2006; Miller et al., 2008; Moats, 2008; Monke, 2007);

- concentrated and intensive farming practices (Buttars et al., 2006; Chalk, 2004; Crutchley et al., 2007; Hugh-Jones & Brown, 2006; Moats, 2008; Monke, 2007);
- rapid and routine transport and commingling of live animals, grain, and processed food products (Buttars et al., 2006; Crutchley et al., 2007; Monke, 2007);
- international trade tied to disease-free status (Hugh-Jones & Brown, 2006; Monke, 2007);
- availability of more lethal and contagious biological pathogens for plants and animals than for humans (Monke, 2007);
- increased susceptibility of livestock to disease (Chalk, 2004; Crutchley et al., 2007);
- limited genetic diversity (Hugh-Jones & Brown, 2006);
- inefficient disease-reporting systems (Chalk, 2004; Crutchley et al., 2007);
- focus on aggregate livestock statistics rather than individual statistics (Chalk, 2004; Crutchley et al., 2007);
- lack of experience and training with diagnosis, control, and eradication of foreign diseases (Chalk, 2004; Crutchley et al., 2007; Hugh-Jones & Brown, 2006; Moats, 2008; Monke, 2007; Spellman, 2008);
- importance of agriculture to the U.S. (Buttars et al., 2006; Monke, 2007);
- and the mindset of Americans that preparing for terrorism events in the rural sector is not a priority (Crutchley et al., 2007).

Livestock and poultry diseases are of particular concern due to globalization of trade in animal products; increased trade volume of animal products; and increased movement of people, animals, and pathogens (USDA, 2008). Opportunities for pathogens

to spread long distances before clinical signs of diseases are evident in animals have been created as animal agriculture has moved beyond localized production models: “U.S. animal agriculture has been described as a particularly easy target for economic attack as well as an assault on U.S. citizens. Part of this vulnerability derives from the industrial model of animal agriculture itself” (Greger, 2007, p. 303). Transport of animals facilitates not only the spread of pathogens affecting animals but also the spread of pathogens with the potential to cause human disease (Fike, 2006; Greger)

Deficiencies in federal protection of agriculture and food in the U.S. have been described in six reports from the Government Accountability Office since 2002 (Monke, 2007). In 2002, a lack of guidance for border inspectors and an “overwhelming” volume of passengers and cargo to be inspected were identified as problems with agricultural defense (Monke, p. 19). A second 2002 report also found insufficient documentation of imports and enforcement of federal feed ingredient bans, followed by a 2003 report that federal agencies, especially the Food and Drug Administration, could not impose requirements or assess security defects at food processing companies. Also in 2003, security system flaws were found at the Plum Island Animal Disease Center in New York, where secure areas were accessible to people without appropriate background checks and security personnel had limited authority. Two years later, multiple issues with preparedness and response plans were identified: numerous vulnerability assessments were being conducted and multiple working groups were being prepared to prioritize and oversee activities; interagency coordination of activities was lacking; a shortfall in veterinarians trained to diagnose, treat, and respond to foreign animal diseases existed; rapid diagnostic tools for foreign animal diseases were not readily available; and rapid

vaccine deployment and protocols for diseases did not exist. By 2006, agricultural specialists and regular border protection officers had been appropriately trained, agricultural specialists had been given access to classified data, and agricultural liaisons had been created by the Department of Homeland Security. The 2006 report also found, however, that problems persisted in inspection coordination and performance and in financial management of border protection (Monke).

Each of the six reports demonstrated increasing awareness and support of importance and vulnerability of the complex U.S. agricultural and food handling system (Monke, 2007). Sufficient government support for protection to address the multitude of vulnerabilities in agriculture will not be available, however, until public awareness and comprehension of threats to agriculture are increased (Kelly, 2005).

Combating the Impacts of Threats to Agriculture

The impacts of threats to agriculture that become reality would be varied and widespread, including disruption of markets, diminished availability of the food supply, loss of income and jobs, human casualties, and political consequences (Crutchley et al., 2007; Hugh-Jones & Brown, 2006). In addition, fear generated by natural disasters or terrorist attacks on agriculture could decrease consumer confidence in the agricultural industry similar to losses in confidence that occurred in the airline and tourist industries after September 11 (Crutchley et al.) and the outbreak of foot-and-mouth disease in the United Kingdom (Yeoman, Lennon, & Black, 2005). Ultimately, the severity of an emergency and its repercussions depends less on cause than on the efficiency of control before, during, and after an incident (Hugh-Jones & Brown).

As natural disasters only can be mitigated through preparedness and response rather than prevention, most impact scenarios for agricultural emergencies have focused on agroterrorism events (DeOtte, 2007). Agroterrorism can be fought on four levels: organism, through animal or plant disease resistance; farm, through facility management to prevent disease introduction and transmission; agricultural sector, through procedures for disease detection and response; and national, through policies to minimize social and economic costs of disease outbreaks (Kohnen, 2000). Policies play a vital role in deterring agroterrorism events, as the major impacts of agroterrorism events would be economic rather than widespread water and food supply disruption (Clark, 2008). Economic impacts of attacks would be tied to significant political events that could undermine public trust in governments (Crutchley et al., 2007), and impacts directly related to the food supply would occur, including reductions of some products, possible increases in demands for substitute foods, and plant and animal health losses (Monke, 2007).

Recent efforts to strengthen agroterrorism preparedness have come from the homeland security staff members within the U.S. Department of Agriculture. These efforts have focused on food supply and agricultural production, USDA facilities, and USDA staff and emergency preparedness (Monke, 2007). However, particularly with animal diseases, policies supporting the preparedness of other first responders and industry participants are vital to avoiding the potential economic and social consequences of intentional animal disease outbreaks that would outweigh media highlights for many terrorist groups (Cupp, Walker, & Hillison, 2004; Hugh-Jones & Brown, 2006; Moats, 2008; Spellman, 2008). Although creating hunger in the U.S. would require an attack on

a large target with a pathogen that leads to mass slaughter and international trade embargoes (Breeze, 2004), consequences of animal disease outbreaks would include economic losses from costs to contain and eradicate diseases, disposal of contaminated products, disruptions in the supply chain, trade restrictions, and depressed domestic markets (Monke). These losses would affect farmers, input suppliers, food processors, transportation, retailers, and food service providers (Monke). The USDA estimated that one attack on livestock production with a highly infectious agent could cost the U.S. economy $10 billion to $30 billion (Crutchley et al., 2007), and an outbreak in the U.S. of foot-and-mouth disease similar to the 2001 outbreak in the United Kingdom would result in the loss of all livestock in New York, Pennsylvania, Ohio, West Virginia, Virginia, Maryland, Delaware, and New Jersey, as well as the downfall of tourism in the eight middle Atlantic states and losses in exports (Kelly, 2005).

Creation of national policies for preparedness and response should be based on inclusion of a broad group of policymakers who provide input to help minimize the effects of agroterrorism and other disasters impacting agriculture (Breeze, 2004; NRC, 2003). Inappropriate responses to such events will produce lasting damage to the rural economy and public confidence in governments at all levels, in addition to enormous costs to taxpayers (Breeze; Hennessy, 2007). To avoid these effects and to successfully combat the impacts of threats to agriculture, scientists from all disciplines need to participate in agricultural defense efforts, including social scientists who can provide insights into the educational and communication dimensions of agricultural emergencies (NRC).

Animal Health Emergencies and Veterinarians

Animal health emergencies include "incursions" (p. 1) of foreign animal diseases, natural disasters, emerging disease incidents, and agroterrorism events (USDA, 2008) that have socio-economic consequences (Geering et al., 1999). Animal health crises will occur (Buss, Osburn, Willis, & Walsh, 2006) and have major impacts on the U.S. agricultural infrastructure, animal and public health, food safety, the economy, and export markets (USDA). Increasing awareness within the field of veterinary medicine of the local and global impacts of natural disasters and other animal health emergencies is vital to resiliency from animal health emergencies (Buss et al.).

Animals are highly vulnerable to disease outbreaks because they are difficult to rid of disease, difficult to keep stationary, and are relatively unprotected and unmonitored for disease (Hennessy, 2007; Spellman, 2008). Diseases that are highly infectious and spread rapidly throughout herds and flocks are of most concern in agricultural defense (Brown, 2003), particularly in confinement production situations (Hennessy) and live animal transport situations (Greger, 2007). Foreign animal diseases, or "transmissible livestock and poultry disease[s] believed to be absent from the United States and its territories that [have] a potential for significant U.S. health and economic impacts" (USDA, 2008, p. 11), have been the focus of biosecurity and emergency response efforts because of their potential to be tools in man-made animal health emergencies (Geering et al., 1999; Moats, 2008).

Outbreaks of foreign animal diseases are closely monitored on a global scale. A list of "notifiable" diseases was created in 2006 and is maintained by the World Organisation for Animal Health (Kerwick, Meers, & Phillips, 2008). In addition, the U.S.

Centers for Disease Control maintain lists of disease agents that threaten animals and humans. Many of these pathogens are zoonotic (Amass et al., 2008), which means the pathogens originate in animals and can be passed to humans (Ablah et al., 2008). About 60% of pathogens that are infectious in humans are zoonotic, and about 75% of emerging and re-emerging diseases are zoonotic (Ablah et al.; Amass et al.). With the potentially significant impact of zoonotic diseases on human and animal health, veterinarians need to be able to serve as sources of information for animal owners about potential risks (Ablah et al.).

In addition, veterinarians play an important role in recognizing and reporting zoonotic and foreign animal diseases, as animals often serve as sentinels for natural and intentional outbreaks of biological agents (Hsu et al., 2008). Private veterinary practitioners and livestock producers report most cases of suspected foreign animal diseases in the U.S. (USDA, 2008), although one of the most important issues in animal-related biosecurity is whether adequate veterinary personnel are available to respond to security failures (Hennessy, 2007). With fewer than 10,000 private veterinary practitioners significantly involved in animal agriculture (Hennessy, 2007), consistently applying emergency preparedness and planning principles to all types of animal health emergencies may be a difficult goal to accomplish (Geering et al., 1999; Hennessy).

Preparedness for and Response to Animal Health Emergencies

Deficits in the national emergency response system identified in the wake of Hurricane Katrina in 2005 have had and will continue to have important implications for agricultural security and defense, particularly the roles of education and communication (Crutchley et al., 2007). Areas of need included improvements in the unified management

of response; integrated use of military capabilities; streamlined communication; logistics and evacuations; search and rescue; public safety and security; public health and medical support; human services; mass care and housing; public communications; critical infrastructure and impact assessment; environmental hazards and debris removal; foreign assistance; nongovernmental aid; use of training, exercises, and lessons learned; homeland security professional development and education; and citizen and community preparedness (Crutchley et al.).

In agriculture, the benefits of animal disease emergency preparedness planning have been recognized internationally for more than a decade, with one of the key benefits being the increased chance of disease eradication if new diseases are recognized quickly on a local level, followed by quick actions for containment and elimination (Geering et al., 1999). Accomplishing rapid responses to animal disease outbreaks requires contingency planning and implementation of emergency management procedures, and those responsibilities often lie with national animal health services (Geering et al.; Pozza et al., 2008). No response system will be 100% effective (Crutchley et al., 2007), but the lessons learned from Hurricane Katrina can be implemented to improve responses to animal health emergencies in the U.S. Systems for responding to animal health emergencies involving diseases are essential for safeguarding American animal production and the associated social, economic, and environmental values of that production (Deveney & Scott, 2008).

Although U.S. policies for responding to biological threats have been described as "largely reactive, compartmentalized, and susceptible to impulsive congressional actions" (Greger, 2007, p. 303), the larger problem with emergency response plans in animal

agriculture may be a lack of awareness in many sectors about activities in other sectors (DeOtte, 2007). In the U.S., responses to animal disease outbreaks differ from responses to other emergencies because state and federal government agencies are involved from the beginning to the end of the incident (Dorman, 2006-2007). During animal health emergencies, the lead agency for prevention and mitigation is the USDA Animal and Plant Health Inspection Service (USDA, 2008). However, many national policies for responses are maintained in draft form and are not easily accessible, although clear guidelines for responses are provided when policies are available (DeOtte).

The All-hazards Approach

Prior to September 11 and Hurricane Katrina, the U.S. approach to preparing for emergencies included separate contingencies for natural and man-made disasters. However, following Hurricane Katrina, an "all-hazards" approach to preparedness and response has emerged (Caruson & MacManus, 2008, p. 287).

Integrated approaches to preparedness for natural disasters and animal health emergencies have been widely recommended for several years (DeOtte, 2007; Geering et al., 1999; Hugh-Jones & Brown, 2006). Although national disaster plans typically include emergencies such as fires, floods, hurricanes, earthquakes, and volcanic eruptions, disease emergencies are similar to natural disasters in that they often occur unexpectedly, threaten socioeconomic disruption and food security, could endanger human life, and require rapid national responses (Geering et al.). Similar demands for prevention, management, mitigation, and recovery resources also are created by disease emergencies (Geering et al.; Hugh-Jones & Brown).

Within agriculture, the costs of preparing for all types of agroterrorism events prevent some goals from being accomplished, making all-hazards approaches viable alternatives to focusing on strengthening potential terrorist targets while ignoring disaster preparedness (DeOtte, 2007). Effective agricultural security procedures will prevent and/or minimize the impact of natural and intentional disasters (DeOtte). Clear operating procedures for implementing all-hazards approaches during animal health emergencies are needed (Geering et al., 1999), although the best emergency response protocols will be applicable during all types of emergencies (DeOtte).

Structure for Responses to Animal Health Emergencies

In the U.S., responses to all types of emergencies, including animal health emergencies, are intended to begin on the local level with support provided through state and federal resources as needed (DeOtte, 2007; Moats, 2008). “Almost any event imaginable will require those closest and most prepared to react first” (DeOtte, p. 93), although lack of availability of policies can interfere with local and regional emergency response preparations (DeOtte). In addition, strong lines of communication and increased coordination are needed between state and federal agencies and local responders and industry (Crutchley et al., 2007; DeOtte).

The current U.S. policies for responding to all types of emergencies as well as agriculture- and animal-specific emergencies are based on key pieces of legislation, with additional structure provided by Homeland Security Presidential Directives, the National Response Framework, the National Animal Health Emergency Response Plan, and additional response plans, resources, and partnership programs (Garris, 2006; Moats, 2008; Monke, 2007; Spellman, 2008).

Important Legislative Acts

After September 11, the first legislative act that had implications for protecting agriculture was the Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Monke, 2007; Spellman, 2008). The act built on the Public Health Threats and Emergencies Act of 2000 to increase the nation's ability to respond effectively to bioterrorist threats and other public health emergencies (Spellman). Provisions of the act specifically related to agriculture included expansion of FDA authority over food manufacturing and imports, tightening of the control of biological agents under rules of USDA-APHIS and the CDC, expansion of agricultural security activities and security upgrades at USDA facilities, and definition of criminal penalties for terrorism against animal enterprises and violation of select biological agent rules (Monke; Spellman).

Two additional acts also provided increased protection for American agriculture. The Homeland Security Act of 2002 implemented changes to the facilities and functions of the USDA, including movement of personnel and responsibility for agricultural border inspections to the Department of Homeland Security and transition of possession of the Plum Island Animal Disease Center to the Department of Homeland Security (Monke, 2007). In 2006, the Animal Enterprise Terrorism Act further expanded the consequences for damaging or interfering with operations of an animal enterprise, including activities related to bioterrorism and eco-terrorism (Monke).

Homeland Security Presidential Directives

Homeland Security Presidential Directives are documents that provide policy-level guidance from the president to federal government departments and agencies (Moats, 2008). National response plans for agriculture have been based on or influenced

by multiple directives, including HSPD-3, communication of risk and allocation of resources; HSPD-4, National Strategy to Combat Weapons of Mass Destruction; HSPD-5, management of domestic incidents; HSPD-7, critical infrastructure, prioritization and protection; HSPD-8, all-hazards preparedness; HSPD-9, food and agricultural defense; and HSPD-10, biodefense for the 21st century. The most important directives in agriculture and animal disease emergency response have been HSPD-5, HSPD-7, HSPD-8, and HSPD-9.

HSPD-5 focused on management of domestic incidents (DeOtte, 2007; Moats, 2008) and led to the development of the comprehensive National Incident Management System and National Response Plan (Moats). HSPD-5 unified consequence and crisis management into a single system. Through the directive, the secretary for homeland security is assigned to be the principal federal official for domestic incident management, and the U.S. attorney general is the official responsible for criminal investigation of terrorist acts or threats. Under the system created, all federal departments and agencies must cooperate with the Department of Homeland Security during an incident. In addition, local and state government had to adopt the NIMS as the structure for emergency response plans to continue receiving federal funding after October 2006 (Moats).

Through HSPD-7, critical infrastructure, prioritization and protection initiatives were identified (DeOtte, 2007; Moats, 2008). HSPD-7 established policy for federal departments and agencies to identify and prioritize key infrastructures and resources and to protect them from terrorist attacks under the direction of the secretary for homeland security. This directive also established the USDA as the lead federal agency for

protecting agriculture, although the USDA must work within the parameters defined by the secretary of homeland security and must collaborate with other federal agencies, private industry, and state and local governments (Moats).

HSPD-8 focused on national preparedness efforts for threatened or actual terrorist incidents and other disasters with the intention of developing an all-hazards preparedness goal and strengthening preparedness capabilities at the federal, state, and local levels (DeOtte, 2007; Moats, 2008). The goals of HSPD-8 included federal provision of timely and effective assistance to local and state governments and improved training and preparedness for first responders (DeOtte; Moats), which in animal agriculture would include workers at concentrated animal feeding operations, managers, veterinarians, consulting veterinarians, state and federal foreign animal disease diagnosticians (DeOtte). Among the requirements were exercise and training programs developed by the USDA and Department of Homeland Security, as well as encouragement of citizen participation in volunteer organizations such as the National Animal Health Emergency Response Corps. The NAHERC is a reserve of animal health technicians and veterinarians who can assist with response to outbreaks of livestock and poultry diseases (Moats).

HSPD-9 included guidelines for defense of U.S. food and agriculture through identification and prioritization of critical infrastructure and key resources related to agriculture (DeOtte, 2007; Moats, 2008). Specific tasks included developing awareness and early warning capabilities, mitigating vulnerabilities, enhancing screening of domestic and imported products, and enhancing response and recovery procedures (Moats). The directive also created the National Veterinary Stockpile (Garris, 2006;

Moats; USDA, 2008) and addressed needs for higher education programs, research programs, and information sharing (Moats).

National Veterinary Stockpile. The National Veterinary Stockpile was established to supplement local and state resources for responding to animal disease outbreaks. The goal of the national stockpile is deployment within 24 hours of "sufficient amounts of animal vaccine, antiviral, or therapeutic products to appropriately respond to the most damaging animal diseases affecting human health and the economy" (Garris, 2006, n.p.). Materials needed to respond to outbreaks of 17 animal diseases eventually will be included in the stockpile (Garris).

Resources from the stockpile would arrive organized and labeled to facilitate responders' abilities to find items quickly, and enough supplies would be provided to support responses for 10 days. In addition, the stockpile would establish contracts with industry to provide a reliable, steady source of materials that can support responses for more than 10 days. By 2011, materials will be available for highly pathogenic avian influenza, foot-and-mouth disease, Rift Valley fever, exotic Newcastle disease, Nipah and Hendra virus, classical swine fever, African swine fever, bovine spongiform encephalopathy, rinderpest, and Japanese encephalitis. Materials will be available by 2016 for African horse sickness, Venezuelan equine encephalitis, contagious bovine pleuropneumonia, ehrlichia ruminantium (Heartwater), eastern equine encephalitis, coxiella burnetii, and Akabane virus (Garris, 2006).

National Response Framework

The first draft of the National Response Plan, currently known as the National Response Framework, was released in December 2004 (Monke, 2007). The framework

describes a variety of responses involving federal resources in cooperation with state, tribal, and local governments and private and nongovernmental organizations (Moats, 2008). Food and agricultural responses are addressed in annexes to the framework (Monke).

The framework is an all-hazards approach to domestic incident management and contains components covering prevention, preparedness, response, and recovery (Moats, 2008). Its elements include a basic plan, appendices, emergency support function annexes, support annexes, and hazard-specific annexes (Moats). Using NIMS, the framework directs responses to be managed at the "lowest possible geographic, organizational, and jurisdictional level" (Moats, p. 122), following the principle that response to any incident will expand and contract according to the size and scope of the incident (Wenzel, 2007). In annex ESF-11, veterinarians are identified as having an important role in responses because the USDA is instructed to detect and respond to dangerous diseases in animals (Wenzel).

National Animal Health Emergency Response Plan

The National Animal Health Emergency Response Plan is an interagency document that describes procedures for responding to highly infectious diseases within the National Response Framework (Moats, 2008). The plan specifies that standard emergency response procedures will be employed in responses to highly contagious animal diseases, although they are considered to be unique disasters. As major outbreaks will require resources beyond those available to state authorities, federal resources will be immediately available to respond to outbreaks (Moats).

Under the response plan, APHIS likely would be the lead agency for most disease outbreaks, and the USDA would cooperate with the Department of Justice to investigate any potential criminal acts. The initial response to a highly infectious disease would follow specific, unique steps (see Figure 2). These steps, however, are not necessarily reflective of the incident command system and National Response Framework, which could create challenges in responding effectively. The plan is a living document, and progressive drafts should bring it more in line with the requirements of NIMS (Moats, 2008).

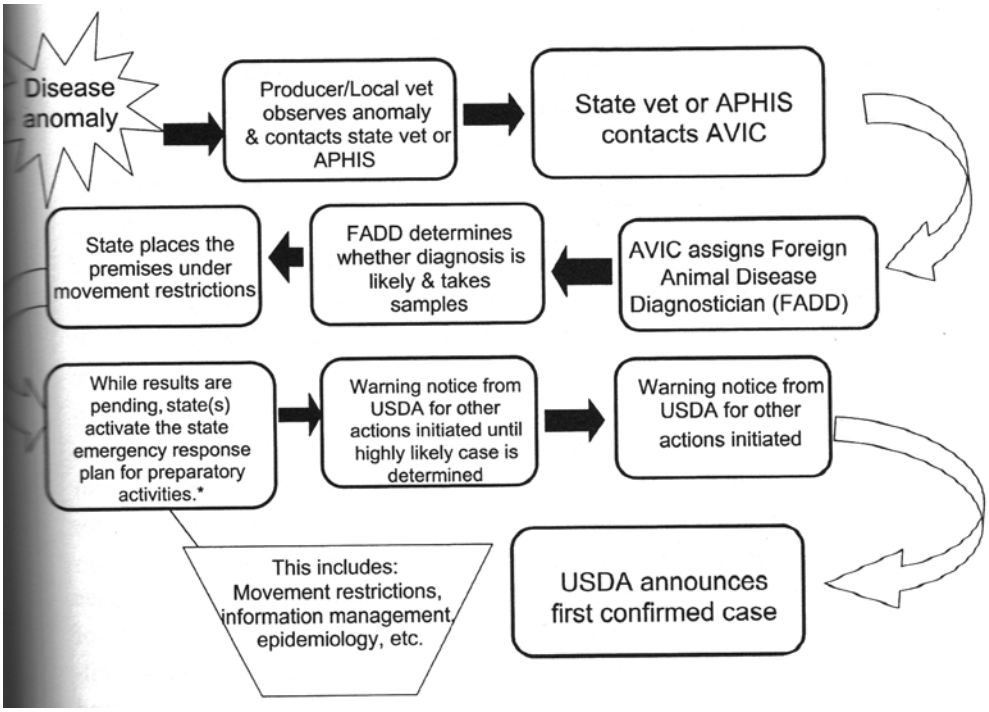

Figure 2. Initial response process of the National Animal Health Emergency Response Plan. (Moats, 2008)

Animal Emergency Response Organization

An additional document providing structure for responding to animal health emergencies is the Animal Emergency Response Organization, which covers field resources for emergency response activities at local, regional, and national levels. The AERO provides recommendations about response procedures using many principles of the NIMS, although its nomenclature and style need to be more closely aligned with the NIMS and the National Response Framework. It has been used in responses to exotic Newcastle disease in southern California, Nevada, and Arizona, but many AERO guidelines may create bottlenecks in the flow of information during a response (Moats, 2008).

Veterinarians' Roles in Animal Health Emergencies

For more than a decade, calls have been made within the veterinary profession to shift the image of veterinarians away from the "James Herriot" persona (Hendrix et al., 2006, p. 506) to reflect the roles of veterinarians in protecting human health, national security, and emergency preparedness and response capabilities (Thurmond & Brown, 2002; Pappaioanou, Allen, DeHaven, & Kelly, 2008). Veterinarians play vital roles in all-hazards emergency preparedness (Katz et al., 2006; Moritsugu, 2008), as future challenges for veterinary medicine and public health will include natural introductions of animal and zoonotic diseases, endemic diseases that interfere with animal production, emerging diseases, and intentional introduction of animal diseases (Hsu et al., 2008; Hugh-Jones & Brown, 2006).

With a contemporary education in livestock and poultry health, public health, infectious disease, food safety and security, food-system management, waterborne

> diseases, diagnostic medicine, environmental quality, and ecosystem health, veterinarians should be better prepared than any other profession to take the lead in food safety for all foods, whether of animal or plant origin." (Buss et al., 2006, p. 483)

These continually emerging roles are reflected in the veterinarian's oath, through which veterinarians agree to contribute to "public health, livestock conservation, and advancing medical knowledge" (Thurmond & Brown, 2002, p. 1). As the most qualified professionals to plan for and respond to animal health emergencies (Amass et al., 2008), veterinarians can rely on their oath to guide their decisions about participating in emergency responses (Nusbaum et al., 2007).

Veterinarians as First Responders

Veterinarians have been recognized as first responders in international guidelines for management of animal health emergencies (Geering et al., 1999; Pozza et al., 2008), U.S. initiatives and policies directing emergency response (NRC, 2003; Wenzel & Wright, 2007), and within agriculture and the veterinary profession (Kelly, 2005; Kosal & Anderson, 2004; Moats, 2008; Nusbaum et al., 2007; Pappaioanou et al., 2008; Wohl & Nusbaum, 2007).

Veterinarians are mentioned specifically in multiple Homeland Security Presidential Directives, as they are expected to be first responders in some disasters (Wenzel & Wright, 2007). In addition to the creation of the National Veterinary Stockpile in HSPD-9, four other directives relate directly to veterinarians' roles in animal health emergencies. In HSPD-5, the American Red Cross is directed to refer concerns about animal health, welfare, and safety to American Veterinary Medical Association contacts.

In addition, HSPD-5 serves as the basis for requesting assistance from Veterinary Medical Assistance Teams. Agencies in which veterinarians should be employed are specified in HSPD-7. HSPD-8 "defines first responders as those who, early in an incident, are responsible for protecting and preserving life, property, evidence, and the environment, including public health, clinical care, and other skilled support personnel" (Wenzel & Wright, p. 1310), indicating a prime role for veterinarians. Through HSPD-10, which primarily targets human risks, roles for veterinarians can be identified because most potential bioweapons are zoonotic agents (Wenzel & Wright, 2007).

Within agriculture, veterinarians' official roles as first responders are reinforced by producers' preferences for veterinarians and veterinary associations as sources of information about animal disease outbreaks (EDEN, 2002). Veterinarians are part of the first line of defense against foreign animal diseases (Kerwick et al., 2008) due to their daily contact with animals that can serve as sentinels for disease outbreaks (Amass et al., 2008; Hoet et al., 2008). Surveillance by veterinarians is essential in early detection and control of highly infectious diseases (Kelly, 2005), and livestock veterinarians likely would be first responders in agroterrorism events targeting animals (Kosal & Anderson, 2004). However, involvement of large and small animal practitioners in emergency response has been an issue (Nusbaum et al., 2007). Small animal practitioners in particular are an "untapped source of first-responder capacity," as they have training and skills that are adaptable to emergency response needs (Wohl & Nusbaum, 2007, p. 496). Regardless of type of practice, "… veterinarians serve as guardians of our nation's food supply, and they will be the first medical professionals to diagnose and contain diseases in animals that may spread to humans" (Pappaioanou et al., 2008, p. 444).

Training as First Responders

The need for training opportunities about responding to agricultural emergencies includes not only traditional first responders but also veterinarians (Moats, 2008), although most emergency training opportunities currently available focus on human incidents despite needs for training of veterinarians in rural areas (Hsu et al., 2008). The emphasis on training veterinarians as first responders will continue to increase as the number of veterinarians who are adequately trained in recognizing and treating foreign animal diseases declines (Chalk, 2004; Kelly, 2005). Veterinarians, particularly private practitioners, are encouraged by government authorities to continually update their knowledge about foreign animal diseases (Kerwick et al., 2008), and awareness of these needs is supported by proposed continuing education for reaccreditation (Wenzel, Nusbaum, Wright, & Hall, 2008). As veterinarians become more competent in taking actions to identify, report, and control diseases (Kerwick et al.) and in acting as first responders (Ablah et al., 2008), the profile of veterinarians in emergency preparedness and response should increase (Ablah et al.; Kerwick et al.).

Many dimensions of the need for first responder training in veterinary medicine must be addressed to increase the effectiveness of the veterinary workforce in responding to animal health and public health emergencies, including the number of veterinarians available (Crutchley et al., 2007; Wohl & Nusbaum, 2007), gaps in curricula (Wenzel & Wright, 2007), and funding for educational opportunities (Cupp et al., 2004). During the last 25 years, more veterinary school graduates have elected to pursue small animal practice, resulting in a shortage of food supply, regulatory, and public health practitioners (Wohl & Nusbaum). This reduction in veterinarians specializing in livestock medicine is

due in part to lack of educational support and career financial incentives, which in turn have led to a decreased emphasis on foreign animal disease education in favor of diseases endemic to the U.S. that affect pets (Crutchley et al.).

Gaps in curricula related to foreign animal diseases were identified in all but 7 of the 28 colleges and schools of veterinary medicine in the U.S. (Wenzel & Wright, 2007), and curricula do not adequately serve students who want to pursue public service careers (Baker et al., 2003; Hendrix et al., 2006). Continuing education opportunities for practitioners to hone their skills related to disease recognition and reporting and emergency response also are lacking (Baker et al.). Educational initiatives are needed to address these skills in students and practitioners (Amass et al., 2008), as well as develop communication skills; skills, ability, and willingness to influence policy and events; media training; and proactive approaches to involvement in responses (Baker et al.; Hendrix et al.).

Benefits and Effects of Training Opportunities

As educational initiatives are prepared and pursued, knowing whether veterinarians benefit from and are willing to participate in training will help determine the content and structure of future educational opportunities. However, few needs assessments, evaluations, or other studies have been conducted and published for use in developing training that meets veterinarians' needs (Katz et al., 2006). Available results are recent and focus on bioterrorism preparedness training in relatively small geographic areas (Katz et al.), resulting in a limited pool of information related to the training about the broader scope of animal health emergencies.

Veterinarians in Hawaii. Nearly one-half of veterinarians in Hawaii who responded to a survey (n = 125, N = 212) about bioterrorism training and response participation perceived themselves as being able to recognize a bioterrorism event in animal populations. Of the respondents, 12% had received prior bioterrorism-preparedness training and 16% perceived themselves as being able to respond effectively to a bioterrorism attack. More than 90% of respondents were willing to assist with bioterrorism response and control efforts. Veterinarians who had received prior training in bioterrorism preparedness performed better on knowledge-based questions, although differences were not significant (Katz et al., 2006).

Veterinarians in Texas. Veterinarians in 37 counties in Texas who responded to a survey about bioterrorism training experiences and needs indicated that training opportunities were more likely to include emergency preparedness and risk communication information than content related to diagnosis and treatment of diseases. The survey response rate was 34.5%. Nearly 40% of respondents were willing to assist with bioterrorism diagnosis and treatment, while 40.5% were willing to participate in bioterrorism response plans. However, 35.5% of respondents were not confident in their abilities to diagnose and treat a disease. Nearly 70% of respondents wanted to receive additional information about bioterrorism and wanted to be informed about future training opportunities (Hsu et al., 2008).

Veterinarians in New York. Veterinarians in New York who completed a survey after participating in a continuing education session about zoonotic diseases and outbreak response indicated they would like more information about diseases, case studies with situational analysis, the National Incident Management System, and the Incident

Command System. Forty-two percent of workshop participants responded to the survey. Prior to attending the training, 69% of respondents had not attended emergency response training since the terrorism events of 2001. About 94% of respondents indicated they would like additional training about emergency preparedness (Ablah et al., 2008).

Theoretical Framework

In this study, two theories lay the foundation for gathering information about veterinarians' perceptions of and preparedness for their roles as first responders in disasters and using that information to identify areas in which training could be provided for veterinarians to increase their roles in public health responses and disaster management. The first theory is the diffusion of innovations, as described by E.M. Rogers (2003). The second theory is protection motivation, originated by R.W. Rogers (1983).

Diffusion of Innovations

In the field of disaster management, diffusion of innovations has occurred and is occurring on two levels: organizational, pertaining to the formation and adoption of disaster response plans, and individual, pertaining to veterinarians' participation in educational opportunities. In addition, veterinarians' participation in future educational opportunities about disaster management may be modeled as protection motivation, or their intentions to participate in future training.

In explaining the diffusion of innovations in organizations, Rogers (2003) described innovations as spreading among companies in an industry similar to how innovations diffuse among individuals in other systems. Innovation is a fundamental process in organizations that is conducted through four types of innovation decisions:

optional, in which choices to adopt or reject an innovation are made independently by an individual; collective, in which choices to adopt or reject an innovation are made by consensus; authority, in which choices to adopt or reject an innovation are made by relatively few individuals with power, high social status, or technical expertise; and contingent, in which choices to adopt or reject an innovation are made after a prior innovation decision (Rogers, 2003).

Innovation decisions in organizations are made in five stages with two subprocesses (see Figure 3) (Rogers, 2003). The first subprocess is initiation, including the stages of agenda-setting and matching. The second subprocess is implementation, including the stages of redefining/restructuring, clarifying, and routinizing.

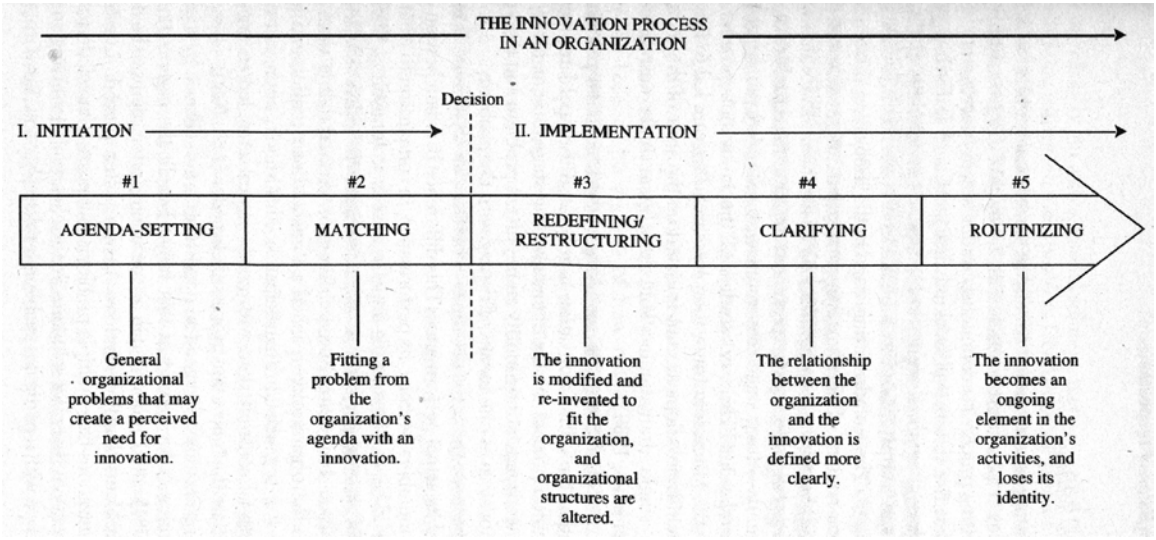

Figure 3. Innovation-decision process in an organization. (Rogers, 2003)

In the agenda-setting stage, a "general organizational problem is defined that creates a perceived need for an innovation" (Rogers, 2003, p. 422). Agenda-setting, which occurs constantly in organizational systems, includes identifying needs and

problems and searching for innovations that can provide solutions to identified problems (Rogers, 2003). However, knowledge of an innovation, rather than a specific problem or need, may initiate the innovation process (Rogers, 2003). Regardless of how the innovation is brought to the organization, the agenda-setting stage begins the sequence of the innovation process (Rogers, 2003).

As the agenda-setting stage of the organizational innovation process is completed, conceptual matching of a problem with an innovation is conducted to establish fit (Rogers, 2003). During matching, the feasibility of using the innovation is determined through anticipation of the benefits and problems presented by the innovation (Rogers, 2003). If the innovation and problem are mismatched, the innovation process is terminated (Rogers, 2003). If the innovation and problem fit, the matching process is concluded. The end of the matching process marks the division between the initiation and implementation subprocesses (Rogers, 2003).

Moving into the implementation subprocess of the organizational innovation process begins as the innovation begins to lose its "foreign character" (Rogers, 2003, p. 424). In the redefining/restructuring stage, the innovation is "re-invented so as to accommodate the organization's needs and structure more closely" and the organization's structure is "modified to fit with the innovation" (Rogers, 2003, p. 424). This brief period of mutual adaptation occurs because the compatibility between the innovation and organization is almost never perfect (Rogers, 2003).

Organizations enter the clarifying stage of the innovation process as the innovation is used more frequently and its meaning becomes clearer to members of the organization (Rogers, 2003). Rapid implementation of the innovation should be avoided

in this stage (Rogers, 2003), as misunderstandings and unwanted side effects could occur (Rogers, 2003). As the process of social construction of use for the innovation continues, typical questions from members of the organization include how does it work, what does it do, who will be affected by it, and will it affect me (Rogers, 2003).

Once organizational members' questions are answered, the innovation begins to lose its identity as separate from the organization. The routinizing stage is initiated as this occurs, once the innovation has been incorporated into everyday activities (Rogers, 2003). Routinzing indicates the end of the innovation process, although use of an innovation still may be discontinued (Rogers, 2003). The sustainability of the innovation, or the degree to which it continues to be used after initial adoption efforts are completed (Rogers, 2003) is influenced by members' participation in the innovation process, the type of innovation decision made, the degree of re-invention, fit, and the involvement of innovation champions (Rogers, 2003).

Rogers (2003) indicated individuals often "cannot adopt a new idea until an organization has previously adopted it" (p. 402). Similar to organizations, individuals progress through the innovation-decision process in sequential stages (see Figure 4) (Rogers, 2003), including knowledge, persuasion, decision, implementation, and confirmation. These stages are influenced by a variety of factors, many of which are reflected by the factors that influence the innovation process in organizations (Rogers, 2003).

In the knowledge stage, individuals become aware of an innovation and how it functions (Rogers, 2003). How an individual becomes aware of an innovation is influenced by his or socioeconomic characteristics, personality variables, and

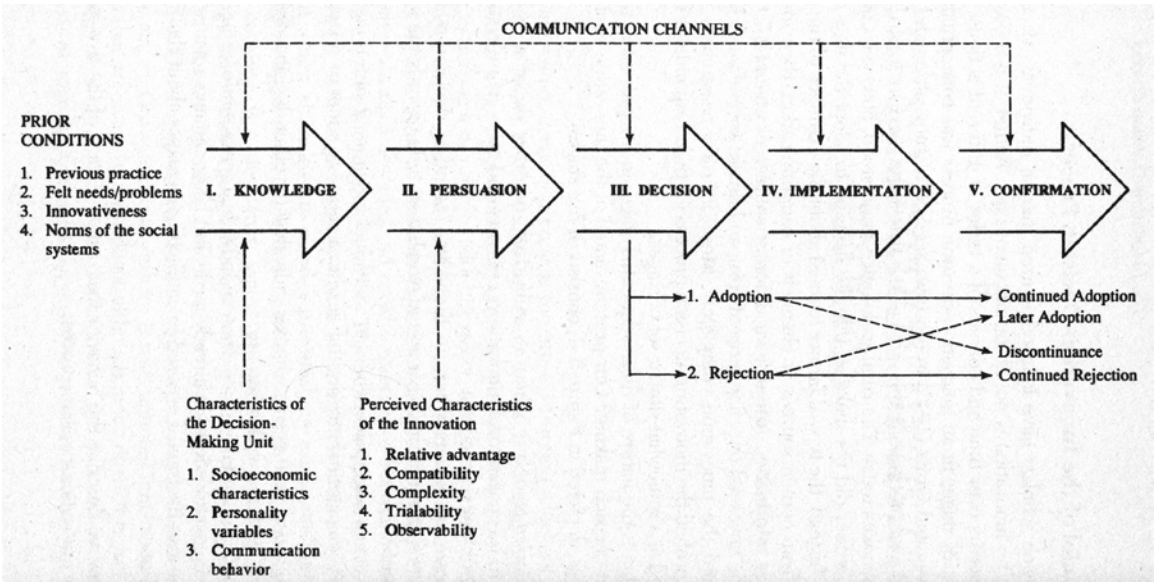

Figure 4. Individual innovation-decision process. (Rogers, 2003)

communication behavior (Rogers, 2003). The primary channels through which individuals gather information about an innovation are the mass media. Individuals also gain three types of knowledge in the knowledge stage: awareness-knowledge, which describes that the innovation exists; how-to knowledge, which provides background for using the innovation properly; and principles-knowledge, which provides a basis for understanding how the innovation works (Rogers, 2003).

The types of knowledge gained in the knowledge stage provide a foundation for an individual to form attitudes, either favorable or unfavorable, about an innovation (Rogers, 2003). These attitudes are formed during the persuasion stage. The attitudes formed by an individual are influenced by characteristics of the innovation, including relative advantage, compatibility, complexity, trialability, and observability. During this stage, individuals become more psychologically involved in the innovation process, as

they become active in seeking information about innovations, typically through interpersonal communication channels (Rogers, 2003).

The information gathered by individuals through the first two stages of the innovation-decision process is used during the decision stage to choose adoption or rejection of the innovation (Rogers, 2003). The decision typically is preceded by a trial of the innovation, and the rate of adoption of an innovation may be influenced by its availability for experimentation (Rogers, 2003). If individuals choose to reject the innovation, they may use active rejection, which follows a trial or the innovation, or passive rejection, in which adoption of the innovation is never really considered (Rogers, 2003). In addition, individuals may choose initially to adopt an innovation, and then discontinue using it (Rogers, 2003).

After an individual's decision about the innovation is made, the implementation stage begins. During implementation, individuals demonstrate a change in behavior by using the adopted innovation (Rogers, 2003). Individuals may still feel uncertain about the innovation, which leads to more active information seeking and possibly re-invention (Rogers, 2003). For individuals, the process of implementation often is simpler than the implementation process for organizations (Rogers, 2003).

Individuals enter the confirmation stage of innovation adoption after the innovation has been implemented (Rogers, 2003). During this stage, individuals seek reinforcement for their innovation decisions. Decisions may be continued or reversed during confirmation, as individuals try to avoid and/or reduce a state of dissonance about their decisions (Rogers, 2003).

Protection Motivation Theory

Members of an organization may be required to accept an innovation because the organization adopts and routinizes it; however, individuals may not be required to participate in training that will hone their skills in using the innovation. Protection motivation, which is an "intervening variable that … arouses, sustains, and directs activity" (Rogers, 1983, p. 158), arises from the "cognitive appraisal of a depicted event as noxious and likely to occur, together with the belief that a recommended coping response can effectively prevent the threatened event from occurring" (Rogers, 1983, p. 158). Protection motivation serves as an index of behavioral intention, which is considered to be a predictor of behavior (Neuwirth, Dunwoody, & Griffin, 2000).

In Rogers' (1983) theory of protection motivation, sources of information and cognitive mediating processes combine to produce protection motivation, which produces coping modes (see Figure 5). Information may be obtained from environmental sources, including personality variables and prior experience (Rogers, 1983). The sources of information initiate the cognitive mediating processes (Rogers, 1983).

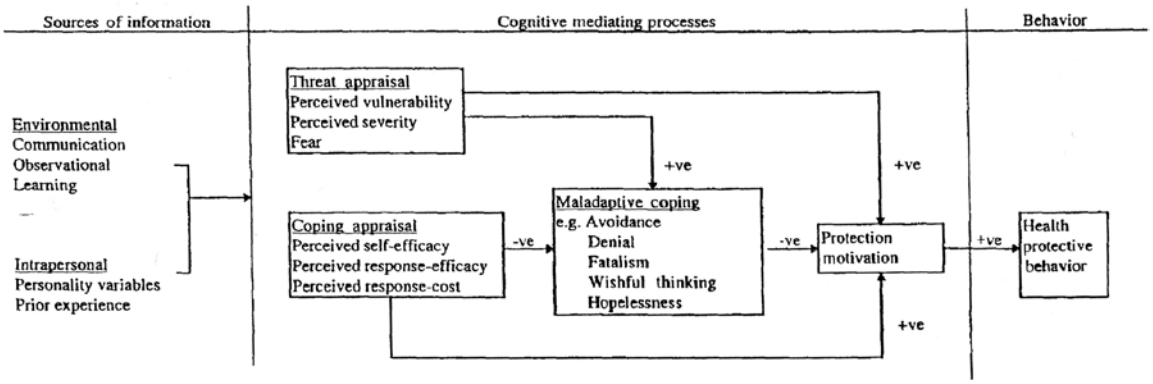

Figure 5. Protection motivation model. (Rogers, 1983)

Any source of information can lead to any cognitive mediating process (Rogers, 1983). The cognitive mediating processes include threat appraisal and coping appraisal, through which assessments of potential responses and variables associated with those responses are assessed (Rogers, 1983). During threat appraisal, an individual evaluates the components of a fear appeal that are relevant to his or her perceptions of "how threatened he or she feels" (Milne, 2000, p. 108). Factors in the process of threat appraisal include intrinsic and extrinsic rewards, the severity of the threat, and the expectancy of being exposed to the threat (Rogers, 1983). During coping appraisal, an individual evaluates his or her ability to cope with and avert the threatened danger (Rogers, 1983). Coping appraisal is influenced by the individual's beliefs about the effectiveness of the recommended coping response, his or her ability to perform the response successfully, and the costs associated with the response (Rogers, 1983).

The amount of protection motivation produced is a function of threat appraisal and coping appraisal (Rogers, 1983). Protection motivation leads to coping modes, which may include a single act, repeated acts, multiple acts, or repeated multiple acts (Rogers, 1983). The actions performed may involve direct action or the inhibition of action (Rogers, 1983).

Protection motivation theory has been tested experimentally (Floyd, 2000; Milne, 2000; Neuwirth et al., 2000), and the relationships depicted by the model have been upheld. However, the theory is subject to assumptions and conditions that must be met to elicit protection motivation and coping behavior. Protection motivation is assumed to be a positive linear function of four beliefs: 1) the threat is severe; 2) the individual is vulnerable to the threat; 3) the individual has the ability to perform the coping response;

and 4) the coping response will be effective in averting the threat (Rogers, 1983). Protection motivation also is assumed to be a negative linear function of reinforcements associated with the maladaptive response and response costs (Rogers, 1983).

Based on the assumptions, six conditions must be fulfilled: 1) the threat is severe; 2) the individual is vulnerable to the threat; 3) the individual can perform the coping response; 4) the coping response is effective; 5) the rewards associated with the maladaptive response are outweighed by factors that decrease the probability of the maladaptive response; and 6) the costs of the adaptive response are outweighed by factors that increase the probability of the adaptive response (Rogers, 1983). In addition, the model of protection motivation does not assume the decision maker is rational, and each process is understood to be influenced by "heuristic judgments" and the "vividness of the sources of information" (Rogers, 1983, p. 171).

Chapter Summary

Animal health emergencies are one of many threats facing modern American agriculture. Veterinarians have been identified as important first responders for such emergencies, although curricula and continuing education opportunities for training in disease recognition and emergency preparedness and response are deficient. In addition, information about the benefits of training and veterinarians' desire for additional information and training is limited.

The diffusion of innovations theory and protection motivation model were used in this study as a framework for examining Oklahoma veterinarians' perceptions about animal health emergencies, self-perceived knowledge, and interest in training about

disease recognition and reporting, emergency response procedures, and communication skills.

CHAPTER 3

METHODOLOGY

Veterinarians in the 21st century need to have increased levels of awareness, preparedness, and involvement in emergency management and public health responses (Amass et al., 2008; Baker et al., 2003; Brown, 2003; Hendrix et al., 2006; Kelly, 2005; Thurmond & Brown, 2002; Wenzel & Wright, 2007; Wohl & Nusbaum, 2007), as they likely will serve as first responders during potential and actual emergencies that impact animals (Moats, 2008). To be effective first responders and to help the agricultural industry be resilient to crises, veterinarians must be knowledgeable about emergency response and management and possess adequate communication skills. This study measured veterinarians' perceptions of and preparedness for their roles in emergency responses and identified areas in which continuing education should be provided.

Institutional Review Board

According to Oklahoma State University policy and federal regulations, all research studies involving human subjects must be approved before investigators can begin research studies. Reviews are conducted by the Oklahoma State University Office of University Research Compliance to protect the rights and welfare of human subjects involved in behavioral and biomedical research. In compliance with these policies, the Institutional Review Board reviewed this study and granted permission for it to proceed under the number AG0915 (see Appendix A).

Purpose

The purpose of this study was to determine veterinarians' self-reported perceptions of susceptibility to and preparedness for responding to emergency events, determining veterinarians' self-reported knowledge of emergency response and management procedures and communication skills, and identifying areas in which training should be provided to better prepare veterinarians for contributing to emergency management and public health responses.

Objectives

Specific objectives in meeting the purpose of this study were to:

1. Determine veterinarians' self-reported prior experiences and training in emergency response and management on the local, state, and national levels; recognition and reporting of selected animal diseases; and communication skills.
2. Determine veterinarians' perceptions of the vulnerability of animal populations on the local, state, and national levels to natural or man-made outbreaks of selected animal diseases.
3. Determine veterinarians' perceptions of the potential severity of natural or man-made outbreaks of selected animal diseases on the local, state, and national levels.
4. Determine veterinarians' perceptions of readiness to respond to natural and man-made outbreaks of selected animal diseases on the national, state, and local levels.

5. Determine veterinarians' self-reported knowledge of and abilities in the areas of emergency response and management on the state, local, and national levels; recognition and reporting of selected animal diseases; and communication skills.
6. Determine the influence of cost on veterinarians' interest in training about emergency response and management, disease recognition and reporting, and communication skills.
7. Determine veterinarians' intentions to participate in training about emergency responses and management on the local, state, and national levels; recognition and reporting of selected animal diseases; and communication skills.
8. Describe relationships among veterinarians' self-reported prior experiences and training, perceptions of vulnerability to disease outbreaks, perceptions of potential severity of disease outbreaks, perceptions of readiness to respond to disease outbreaks, self-reported knowledge and abilities, influence of cost on training, and intentions to participate in training.

Research Design

Quantitative survey methodology was used to determine veterinarians' perceptions of, knowledge about, and preferences for training about emergency response and management on the local, state, and national levels; recognition and reporting of selected animal diseases; and communication skills. Data was collected using an online

questionnaire according to the principles of the Tailored Design Method (Dillman, Smyth, & Christian, 2009).

Survey Instrument Design

Data used to determine veterinarians' perceptions of, knowledge about, and preferences for training about emergency response and management on the local, state, and national levels; recognition and reporting of selected animal diseases; and communication skills were collected via an online questionnaire created by the researcher (see Appendix E). Item content was based on a review of pertinent literature (Garris, 2006; Moats, 2008) and opinions of experts in the field of veterinary medicine, as an instrument was not available from previous studies. The questionnaire contained 54 questions, including 262 scaled items and 14 demographic questions.

The survey instrument was divided into nine dimensions: local emergency response, state emergency response, national emergency response, local disease recognition and reporting, state disease recognition and reporting, national disease recognition and reporting, local communication skills, state communication skills, and national communication skills. Each dimension consisted of seven constructs measured by multiple questions. The questions under all constructs were answered using a five-point Likert scale labeled 1, very low; 2, low; 3, neutral; 4, high; and 5, very high. Mean responses for all scaled items were interpreted as 1.00 to 1.44, very low; 1.45 to 2.44, low; 2.45 to 3.44, neutral; 3.45 to 4.44, high; and 4.45 to 5.00, very high.

SurveyMonkey.com, an online survey service, was used to create the questionnaire and collect responses.

Validity

The survey instrument was examined by a panel of experts (see Appendix B) for face and content validity. The panel of experts included a member of the Extension Disaster Education Network Agrosecurity Committee with expertise in communications; a faculty member who teaches communications at the Texas A&M University College of Integrative Biosciences; the veterinarian who coordinates emergency programs within the Oklahoma Department of Agriculture, Food, and Forestry; the veterinarian who directs the veterinary technology program at Murray State College; the veterinarian who serves as emergency response and preparedness coordinator with the Oklahoma Veterinary Medical Association; a private veterinary practitioner from Indiana; and a veterinary technology instructor at Murray State College. Feedback from the panel of experts was used to clarify wording of the questions prior to pilot testing.

Reliability

The survey instrument was pilot tested to establish reliability following the panel of experts review (see Appendix C). The target population for the pilot test was licensed veterinary technicians in Oklahoma who were accessible via e-mail. The pilot test was conducted over a four-week period following procedures similar to those outlined for this study.

Veterinary technicians were sent an e-mail introduction to the survey on March 26, 2009. Beginning April 2, 2009, three reminder e-mails were sent on a weekly basis to all veterinary technicians who had not responded to the survey. The second reminder was sent on April 9, 2009, and the final reminder was sent on April 16, 2009. The pilot survey was closed on April 23, 2009.

The Cronbach's alpha coefficient often is used to estimate the internal consistency of attitude scales. Pilot test data were used to calculate a Cronbach's alpha coefficient for the 40 scaled items on the questionnaire. The coefficient for the pilot test was 0.99.

Population

The target population for this study was all veterinarians licensed in Oklahoma who provided physical practice addresses in Oklahoma, Kansas, Missouri, Texas, and Arkansas, and who were accessible via e-mail or fax. The frame for this population initially was obtained from the Oklahoma Board of Veterinary Medical Examiners. E-mail addresses were obtained from state licensing records and the directory of the Oklahoma Veterinary Medical Association, and through phone calls to veterinarians without individual e-mail addresses listed in state licensing records or in the association directory.

Duplicate license listings and duplicate e-mail addresses in the frame were identified via visual examination. Duplicate license listings were defined as multiple listings per individual license numbers that occurred when more than one practice location was listed for individual veterinarians. The first record for veterinarians with multiple listings was retained in the frame; additional listings were removed to provide an accurate count of individual veterinarians licensed in Oklahoma. Duplicate e-mail addresses were removed if part of multiple listings for individual veterinarians. Duplicate e-mail addresses resulting from being listed under multiple veterinarians with discrete records were replaced with individual e-mails obtained by calling the veterinarians.

The final population size was 1,173 veterinarians. The capabilities of the online survey tools allowed a census to be conducted.

Data Collection

Collection of survey responses was conducted during a seven-week period, beginning April 6, 2009, and ending May 21, 2009. Printed versions of e-mail and online materials were distributed to veterinarians who requested to complete the questionnaire in an alternate format.

The online survey was conducted using SurveyMonkey.com. The e-mail tracking tool available through SurveyMonkey.com was used to track respondents and nonrespondents. A personalized e-mail introduction (see Appendix D) containing a link to the questionnaire (see Appendix E) was sent to all veterinarians in the population on April 6, 2009. Personalized e-mail reminders (see Appendix F) were sent weekly for two weeks to all veterinarians who had not responded to the survey. The reminders were sent April 13, 2009, and April 20, 2009.

At the conclusion of the primary data collection period (April 27, 2009), veterinarians who had not submitted survey responses were classified as nonrespondents. Follow-up contact with nonrespondents began May 7, 2009. An e-mail reminder (see Appendix G) was sent to nonrespondents, followed by a second e-mail reminder (see Appendix G) on May 14, 2009. The survey was closed May 21, 2009.

Response Rate

Responses were obtained from 219 veterinarians during the initial data collection period and from 72 nonrespondents during the follow-up period for a total of 291 respondents. The overall response rate for this study was 24.8%. Sixty-four veterinarians opted out of the survey.

Data Analysis

Quantitative survey responses were analyzed using the Statistical Package for the Social Sciences 15.0 for Windows and were described and interpreted using descriptive statistics, confirmatory factor analysis, and the Borich needs assessment model. Descriptive statistics included means, standard deviations, frequencies, modes, ranges, medians, cross-tabs, and correlations.

For questions 1 through 40, the scaled items, means were used to indicate veterinarians' perceptions of levels of vulnerability, severity, preparedness, knowledge, experiences, and intentions. Lower means represented the very low and low points and higher means represented the high and very high points on the five-point Likert scale. Standard deviations indicated variations within the response, and modes and percentages were used to establish the most common levels selected by veterinarians who responded to the survey.

For questions 41 through 54, the demographic items, means, ranges, and medians were used to describe the number of veterinarians employed in practices, funding available for continuing education, and veterinarians' years of experience. Standard deviations were used to demonstrate variation within responses. Modes, frequencies, and percentages were used to describe the veterinarians' types of practice, roles in their practices, association memberships, gender, academic backgrounds, experiences in agriculture, and experiences as first responders. Cross-tabs and correlations were used to describe relationships among demographic items.

Confirmatory factor analysis was used to confirm relationships among constructs that could provide a basis for training veterinarians as first responders and community

representatives during animal health emergencies. A modified Borich needs assessment model (Borich, 1980; Waters & Haskell, 1989) was used to identify discrepancies among selected means that could serve as indicators of specific areas in which educational resources are needed. Discrepancy scores were calculated for each respondent by subtracting knowledge scores from interest scores. Each discrepancy score was multiplied by mean value for interest to produce a weighted discrepancy score. The weighted discrepancy scores were added, and the sum was divided by the number of respondents who answered both items to produce a mean weighted discrepancy score for the area of need (Borich, 1980; Waters & Haskell, 1989).

Prior to pooling all responses for analysis and interpretation, t-tests were conducted between subgroups in the target population to determine if differences existed in responses based on subgroup membership. Nonresponse error was controlled through statistical comparison of responses obtained from respondents and nonrespondents (Lindner & Wingenbach, 2002). Comparisons of online and alternate instrumentation, and respondents and nonrespondents demonstrated no significant differences in responses based on subgroup membership.

Chapter Summary

Quantitative survey methodology was used to determine veterinarians' perceptions of, knowledge about, and preferences for training about emergency response and management on the local, state, and national levels; recognition and reporting of selected animal diseases; and communication skills. The survey instrument was based on a review of appropriate literature and suggestions from veterinary medical professionals. Following validity confirmation by a panel of experts and pilot testing for reliability, data

was collected via online and fax versions of the instrument using the methods outlined by Dillman et al. (2009). Data were analyzed through descriptive statistics, confirmatory factor analysis, and the Borich needs assessment model (Borich, 1980; Waters & Haskell, 1989).

CHAPTER 4

FINDINGS

In response to dangers facing American agriculture during the 21st century, veterinarians need to increase their levels of awareness, preparedness, and involvement in emergency management and public health responses, including natural and man-made disease outbreaks (Amass et al., 2008; Baker et al., 2003; Brown, 2003; Hendrix et al., 2006; Kelly, 2005; Thurmond & Brown, 2002; Wenzel & Wright, 2007; Wohl & Nusbaum, 2007). This study examined veterinarians' self-perceived skills as first responders and community representatives during animal health emergencies, specifically outbreaks of 10 of the most dangerous animal diseases identified to be part of the National Veterinary Stockpile by 2011.

The theories of diffusion of innovations (Rogers, 2003) and protection motivation (Rogers, 1983) were used as the framework for gathering information from practicing veterinarians. Diffusion of innovations has occurred in disaster management on the organizational and individual levels, with adoption of disaster plans occurring in organizations and educational opportunities about those disaster plans offered to individuals. Veterinarians' participation in educational opportunities may be estimated through their intentions to participate in future training using protection motivation as a model.

In this study, all veterinarians in the population were surveyed using an online instrument (see Appendix E) to gather their self-reported prior experiences and training in

aspects of disease outbreak responses; perceptions of vulnerability to, severity of, and readiness to respond to disease outbreaks; knowledge and abilities related to aspects of disease outbreak responses; influence of cost on potential participation in training; and their intentions to participate in training about aspects of diseases responses. The questionnaire was based on a review of available literature and suggestions from experts in veterinary medicine. Validity and reliability of the instrument were determined by a panel of experts (see Appendix B) and a pilot test (see Appendix C), respectively.

Responses were collected from veterinarians during a seven-week period using SurveyMonkey.com. Printed versions of e-mails and online materials were provided to veterinarians upon request. Following the procedures of Dillman et al. (2009), a personalized e-mail introduction (see Appendix D) was followed by two personalized reminders (see Appendix F) sent on a weekly basis to all veterinarians who had not responded. One week after the second reminder, veterinarians who had not submitted responses to the survey were classified as nonrespondents. Follow-up contact (see Appendix G) with nonrespondents began 10 days after the initial data collection period ended and continued for two weeks. The overall response rate for this study was 24.8%.

Purpose

The purpose of this study was to determine veterinarians' self-reported perceptions of susceptibility to and preparedness for responding to emergency events, determining veterinarians' self-reported knowledge of emergency response and management procedures and communication skills, and identifying areas in which training should be provided to better prepare veterinarians for contributing to emergency management and public health responses.

Objectives

1. Determine veterinarians' self-reported prior experiences and training in emergency response and management on the local, state, and national levels; recognition and reporting of selected animal diseases; and communication skills.
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4. Determine veterinarians' perceptions of readiness to respond to natural and man-made outbreaks of selected animal diseases on the national, state, and local levels.
5. Determine veterinarians' self-reported knowledge of and abilities in the areas of emergency response and management on the state, local, and national levels; recognition and reporting of selected animal diseases; and communication skills.
6. Determine the influence of cost on veterinarians' interest in training about emergency response and management, disease recognition and reporting, and communication skills.
7. Determine veterinarians' intentions to participate in training about emergency responses and management on the local, state, and national levels; recognition and reporting of selected animal diseases; and communication skills.
8. Describe relationships among veterinarians' self-reported prior experiences and training, perceptions of vulnerability to disease outbreaks, perceptions of potential severity of disease outbreaks, perceptions of readiness to respond to disease

outbreaks, self-reported knowledge and abilities, influence of cost on training, and intentions to participate in training.

Population

The target population for this study included all veterinarians licensed in Oklahoma who provided physical practice addresses in Oklahoma, Kansas, Missouri, Texas, and Arkansas, and who were accessible via e-mail or fax. The frame for this population initially was obtained from the Oklahoma Board of Veterinary Medical Examiners. Duplicate license listings and duplicate e-mail addresses in the frame were identified via visual examination, and the first record for veterinarians with multiple listings was kept in the frame. Duplicate e-mail addresses resulting from being listed under multiple veterinarians with discrete records were replaced with individual e-mails obtained by calling the veterinarians. The final population included 1,173 veterinarians.

Findings Related to Demographic Characteristics of the Population

Of the survey respondents who reported gender (n = 224), 29% were female and 71% were male. The average age reported by respondents (n = 223) was 49.21 years (SD = 11.67), with a range of 27 to 82 years and median of 50 years.

All licensed veterinarians in Oklahoma are required to have earned a doctor of veterinary medicine degree (Oklahoma Board of Veterinary Medical Examiners, 2009). Respondents also have earned other academic degrees as follows: associate's, n = 33; bachelor's, n = 170; master's, n = 40; and doctor of philosophy, n = 6.

Respondents were asked to report experiences they have had in agriculture other than being a veterinarian (see Table 1). The most common agricultural experiences

Table 1

Veterinarians' Experiences in Agriculture

Type of Experience	*n*	%	Order
Live(d) in a rural area	151	51.9	1
Work(ed) on a farm	145	49.8	2
College agricultural course	138	47.4	3
Work(ed) in a rural area	133	45.7	4
Live(d) on a farm	128	44.0	5
Paid work experience	121	41.6	6
Own(ed) a farm	100	34.4	7
Unpaid work experience	84	28.9	8
High school agricultural course	79	27.1	9
Work(ed) for an agricultural business	71	24.4	10
Extension workshops in agriculture	66	22.7	11
Own(ed) an agricultural business	53	18.2	12
None	28	9.6	13
Other	7	2.4	14

included living or having lived in a rural area, working or having worked on a farm, college agricultural courses, working or having worked in a rural area, and living or having lived on a farm. Twenty-eight respondents reported having no additional agricultural experience. Seven respondents listed other agricultural experiences, including working as a consultant for an agricultural foundation, working for pharmaceutical

company, working for a zoo, working in a veterinary research laboratory prior to veterinary school, maintaining an apiary, spending time on family farms, and working in a racetrack test barn.

Respondents also reported experiences as first responders other than as a veterinarian. The majority (*n* = 194, 66.7%) of respondents did not have any experience as first responders. Twenty respondents (6.9%) had experience as emergency medical personnel, 7 respondents (2.4%) had experience as fire personnel, and 2 respondents (0.7%) had experience as law enforcement personnel

The zip codes in which respondents reported having their primary practices included all Oklahoma Homeland Security Regions, Kansas, Missouri, Arkansas, and Texas. The majority (*n* = 164, 56.4%) of respondents reported primary practice locations in Oklahoma, followed by Texas (*n* = 18, 6.2%), Kansas (*n* = 17, 5.8%), Arkansas (*n* = 12, 4.1%), and Missouri (*n* = 4, 1.4%). Of the respondents reporting whether they were private practitioners (*n* = 225), 72.4% indicated they were in private practice. The primary types of practice reported by private practitioners (*n* = 176) included all types of practice listed, with the most practitioners involved in companion animal – exclusive practices and the least practitioners involved in food animal – predominant, equine – exclusive, and equine – predominant practices (see Table 2).

The majority (98.4%) of respondents who reported the length of their careers (*n* = 189) as veterinarians had been veterinarians for more than one year. Respondents who reported being veterinarians for more than one year (*n* = 217) reported being veterinarians for an average of 23.2 years (*SD* = 12.1), with a range of 2 to 56 years and median of 24 years. Nearly half (48.3%) of veterinarians who reported their roles in their

Table 2

Private Practitioners' Primary Types of Practice (*N* = 176)

Type of Practice	*n*	%
Companion animal, exclusive	57	32.4
Mixed animal	40	22.7
Companion animal, predominant	33	18.8
Other	12	6.8
Food animal, exclusive	10	5.7
Food animal, predominant	8	4.5
Equine, exclusive	8	4.5
Equine, predominant	8	4.5

current practices (*n* = 201) were sole owners, while 21.9% were "other," 18.4% were associates, and 11.4% were partners.

The majority (92.6%) of respondents who indicated length of employment at their current practices (*n* = 176) had been at their current practices more than one year. Respondents reported employment at their current practices ranging from 0 to 42 years, with a mean of 14.34 (*SD* = 11.0) and median of 10 years. The number of full-time veterinarians employed by respondents' practices (*n* = 186) averaged 3.25 (*SD* = 6.5), with a range of 0 to 50 and median of 1. The number of part-time veterinarians employed by respondents' practices (*n* = 146) averaged 0.50 (*SD* = 0.963), with a range of 0 to 5.

Respondents held memberships in 69 associations (see Table 3). A majority of respondents were members of the American Veterinary Medical Association (64.9%) and

Table 3

Veterinarians' Association Memberships

Association	*n*	%
American Veterinary Medical Association	189	64.9
State veterinary medical association	177	60.8
American Association of Bovine Practitioners	33	11.3
American Association of Equine Practitioners	28	9.6
Society for Theriogenology	21	7.2
Other agricultural industry group	21	7.2
American Animal Hospital Association	14	4.8
American Association of Small Ruminant Practitioners	9	3.1
American Association of Swine Veterinarians	8	2.7
None	7	2.4
National Association of Federal Veterinarians	7	2.4
American Association of Corporate and Public Practice Veterinarians	5	1.7
American Association of Feline Practitioners	4	1.4
Uniformed Services of the United States	4	1.4
Association of Avian Practitioners	3	1.0
American Society of Laboratory Animal Practitioners	2	0.7
American Association of Food Hygiene Veterinarians	0	0

state veterinary medical associations (60.8%), including associations in Oklahoma, Kansas, Missouri, Texas and Arkansas. None of the respondents were members of the American Association of Food Hygiene Veterinarians. A complete listing of associations of which respondents' are members is in Appendix H.

Respondents (n = 162) reported the amount of the funding available in their practices for continuing education. The average funding available was $2,418.09 ($SD$ = $3,350.74), with a range of $0 to $20,000 and median of $1,000.

Relationships among Demographic Characteristics

The majority of respondents who reported whether they were in private practice (n = 221) in age categories 20-29, 30-39, 40-49, 50-59, 60-69, and 80-89 reported being private practitioners. The majority of respondents ages 70-79 were not private practitioners. Nearly one-third (32.8%) of respondents who reported type of practice (n = 174) were 50-59 years of age, and more than one-half (58.7%) of respondents who reported type of practice were 40-59 years of age (see Table 4). The largest number of veterinarians in all age brackets was employed in companion animal – exclusive and companion animal – predominant practice, and the primary type of practice reported least in each age bracket varied.

Of the respondents who reported their roles in their current practices (n = 199), the largest number of veterinarians ages 40-49, 50-59, 60-69, and 80-89 reported being sole owners (see Table 4). For respondents ages 20-29, most filled the roles of associate or "other" in their current practices. The majority (75%) of respondents ages 70-79 also filled "other" roles in their current practices.

Table 4

Veterinarians' Types of Practice and Roles in Practice by Age

	Age, in years (*n*)						
Variable	20-29	30-39	40-49	50-59	60-69	70-79	80-89
Type of Practice (*N* = 174)							
Companion animal, exclusive	3	11	16	20	7	0	0
Companion animal, predominant	0	7	10	5	8	1	1
Food animal, exclusive	0	4	2	3	0	1	0
Food animal, predominant	1	0	1	3	3	0	0
Equine, exclusive	1	1	4	2	0	0	0
Equine, predominant	1	1	3	2	1	0	0
Mixed animal	2	8	7	17	4	1	0
Other	0	2	2	5	1	2	0
Role in Practice (*N* = 199)							
Sole owner	2	10	30	34	17	1	1
Partner	1	4	6	6	4	0	0
Associate	4	17	6	6	4	0	0
Other	4	8	8	16	5	3	0

Nearly all (98.4%) respondents reporting length of career (*n* = 186) had been veterinarians for more than one year, regardless of age. All (*n* = 3) respondents who reported being veterinarians for less than one year were ages 20-29. Of respondents

reporting length at current practice (n = 173), the majority of all respondents in all age categories had been at their current practices for more than one year.

Most respondents in all age categories did not report having experiences as first responders (see Table 5). All respondents ages 20-29 reported having no experience as first responders. Experiences as emergency medical personnel were most common across all other age categories.

Respondents who reported being veterinarians for less than one year primarily were members of the American Veterinary Medical Association and a state veterinary medical association (see Table 6). One respondent who reported being a veterinarian for less than one year was a member of the American Association of Equine Practitioners. Respondents who reported being veterinarians for more than one year were members of multiple associations.

Of the respondents reporting type of practice and funding available for continuing education (n = 149), the majority (84.6%) involved in all types of practices had $1 to $9,999 available for continuing education (see Table 7). Respondents in companion animal – exclusive (n = 4), companion animal – predominant (n = 2), food animal – exclusive (n = 1), mixed animal (n = 2), and other (n = 1) practices reported having no funding available for continuing education. Respondents in companion animal – predominant (n = 2), equine – exclusive (n = 2), equine – predominant (n = 1), mixed animal (n = 1), and other (n = 2) practices reported having $10,000 to $14,999 available for continuing education. Four respondents reported having $15,000 to $20,000 available for continuing education, including respondents in companion animal – exclusive (n = 1), food animal – exclusive (n = 2), and equine – exclusive (n = 1) practices. The majority

Table 5

Veterinarians' Experiences as First Responders by Age

	Age, in years (*n*)						
Experience	20-29	30-39	40-49	50-59	60-69	70-79	80-89
First responder experience							
Fire personnel	0	2	1	1	3	0	0
Law enforcement personnel	0	0	0	2	0	0	0
Emergency medical personnel	0	3	3	6	7	1	0
None	11	37	48	65	25	6	0

(51.0%) of respondents who reported funding available and type of practice were involved in companion animal – exclusive and companion animal – predominant practices, followed by 23.5% who were in mixed animal practices, 6% in food animal – exclusive practices, 6% in other practices, 4.7% in equine – exclusive practices, 4.7% in equine – predominant practices, and 4.0% in food animal – predominant practices.

More than one-half (55.6%) of respondents who reported their types of practice and roles in their current practices were sole owners (see Table 8). The most sole owners were in mixed animal practices (n = 29), companion animal – exclusive practices (n = 26), and companion animal – predominant practices (n = 21). The number of associates also was higher than the number of partners for mixed animal practices, companion animal – exclusive practices, and companion animal – predominant practices.

Of the respondents who reported length of career and role in current practices (n = 174), nearly all (98.3%) had been veterinarians for more than one year. All respondents

Table 6

Veterinarians' Association Memberships by Length of Career

	Length of Career (*n*)	
Association	Less than 1 Year	More than 1 Year
None	0	5
American Veterinary Medical Association	3	157
State veterinary medical association	2	150
Association of Avian Practitioners	0	2
American Association of Bovine Practitioners	0	30
American Association of Equine Practitioners	1	23
American Association of Feline Practitioners	0	4
American Association of Food Hygiene Veterinarians	0	0
American Association of Small Ruminant Practitioners	0	7
American Association of Swine Veterinarians	0	7
Society for Theriogenology	0	16
American Society of Laboratory Animal Practitioners	0	2
American Animal Hospital Association	0	12
American Association of Corporate and Public Practice Veterinarians	0	4
National Association of Federal Veterinarians	0	5
Uniformed Services of The United States	0	3
Other agricultural industry groups	0	18

Table 7

Funding Available for Continuing Education by Type of Practice (*N* = 150)

	Funding Available (*n*)		
Type of Practice	$1-999	$1,000-4,999	$5,000-$9,999
Companion animal, exclusive	10	32	2
Companion animal, predominant	12	11	0
Food animal, exclusive	2	2	2
Food animal, predominant	1	4	1
Equine, exclusive	0	2	1
Equine, predominant	3	3	0
Mixed animal	10	19	3
Other	1	3	2

reporting to be sole owners or partners in their practices had been veterinarians for more than one year. One respondent who had been a veterinarian for less than one year reported being an associate, and two respondents who had been veterinarians for less than one year filled other roles in their practices.

Findings Related to Objective 1: Veterinarians' Experiences and Prior Training in Emergency Response, Disease Recognition and Reporting, and Communication Skills

Veterinarians' Experiences and Training in Emergency Response

Veterinarians were asked to report their prior levels of experience as first responders; levels of training received about local, state, and national emergency

Table 8

Veterinarians' Type of Practice by Role in Practice (*N* = 171)

	Role in Practice (*n*)			
Type of Practice	Sole owner	Partner	Associate	Other
Mixed animal	29	2	7	1
Companion animal, exclusive	26	10	17	4
Companion animal, predominant	21	3	7	1
Food animal, exclusive	1	3	2	3
Food animal, predominant	6	0	1	0
Equine, exclusive	4	2	1	1
Equine, predominant	6	2	0	0
Other	2	0	0	9

response plans; and levels of participation in local, state, and national response drills/scenarios. The number of respondents varied for each item.

Experiences as First Responders

Respondents were asked to report their prior levels of experience acting as first responders during animal health emergencies. Respondents reported low levels of experience as first responders in the role of veterinarian (*n* = 240, *M* = 2.44, *SD* = 1.24) and in any role other than as a veterinarian (*n* = 237, *M* = 2.22, *SD* = 1.11). The median level of experience for both roles was low (see Table 9).

Table 9

Veterinarians' Levels of Experience and Training in Emergency Response

Variable	*n*	*M*	*SD*	*Mdn*
Level of Experience as a First Responder				
As a veterinarian	240	2.44	1.24	2.00
Any role other than as a veterinarian	237	2.22	1.11	2.00
Level of Training about Emergency Response Plans				
Local emergency response plan	231	2.06	1.08	2.00
State emergency response plan	231	2.28	1.24	2.00
NAHERP	229	2.10	1.15	2.00
National Response Framework	226	2.03	1.11	2.00
Level of Participation in Response Drills/Scenarios				
Local	231	1.76	1.08	1.00
State	231	1.83	1.18	1.00
National	231	1.68	1.04	1.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Slightly more than one-half of respondents indicated very low (29.6%) or low (25.4%) levels of experience as first responders in the role of veterinarian, while less than one-quarter of respondents indicated high (16.3%) or very high (6.3%) levels of experience as first responders in the role of veterinarian. Nearly one-third of respondents reported very low (33.8%) or low (27.8%) levels of experience as first responders in any role other than as a veterinarian, while 12.7% reported high and 2.1% reported very high

levels of experience as first responders in any role other than as a veterinarian (see Table I1).

Local, State, and National Emergency Response Training

Veterinarians responding to the survey were asked to report the levels of training they had received about emergency response procedures on the local, state, and national levels.

Local Emergency Response Training. Respondents reported receiving low levels (n = 231, M = 2.06, SD = 1.08, Mdn = 2.00) of training about local emergency response plans (see Table 9). More than one-third of respondents indicated having very low (39.4%) or low (29.9%) levels of training, while 12.1% reported having high and 1.3% reported having very high levels of training about local emergency response plans (see Table I1).

Respondents reported having low levels (n = 231, M = 1.76, SD = 1.08, Mdn = 1.00) of experience as participants in response drills/scenarios on the local level (see Table 9). About three-fourths of respondents reported having very low (59.3%) and low (16.5%) levels or experience as participants in response drills/scenarios, while less than 10% had high (6.1%) and very high (2.6%) levels of experience as participants in response drills/scenarios (see Table I1).

State Emergency Response Training. On the state level, respondents reported having low levels (n = 231, M = 2.28, SD = 1.24, Mdn = 2.00) of training about state emergency response plans (see Table 9). Slightly more than one-third (35.9%) of respondents indicated having very low and 25.1% indicated having low levels of training about state emergency response plans. One-fifth of respondents reported having high

(15.6%) and very high (4.8%) levels of training about state emergency response plans (see Table I1).

Respondents reported having low levels (n = 231, M = 1.83, SD = 1.18, Mdn = 1.00) of participation in response drills/scenarios (see Table 9). Three-fourths of respondents had very low (58.4%) and low (17.3%) levels of experience as participants in response drills/scenarios, while 10.4% had high and 3.5% had very high levels of experience as participants in response drills/scenarios (see Table I1).

National Emergency Response Training. Veterinarians who responded to the survey reported having received low levels of training about the National Animal Health Emergency Response Plan (n = 229, M = 2.10, SD = 1.15, Mdn = 2.00) and the National Response Framework (n = 226, M = 2.03, SD = 1.11, Mdn = 2.00) (see Table 9). One-third of respondents reported having very low (40.2%) and low (26.6%) levels of training about the National Animal Health Emergency Response Plan, while 10.5% reported having high and 3.5% reported having very high levels of training about the plan. Slightly more than one-third of respondents reported having very low (42.9%) and low (25.7%) levels of training about the National Response Framework, with 8.8% indicating having high and 2.7% indicating having very high levels of training about the framework (see Table I1).

Respondents also reported low levels (n = 231, M = 1.68, SD = 1.04, Mdn = 1.00) of participation in response drills/scenarios on the national level (Table 9). The majority of respondents reported very low (61.5%) and low (20.3%) levels of experience as participants in national response drills/scenarios, while less than one-tenth of respondents

indicated having high (4.8%) and very high (3.0%) levels of experience as participants in response drills/scenarios on the national level (see Table I1)

Veterinarians' Training in Disease Recognition and Reporting

Respondents reported receiving varying levels of training about the 10 dangerous animal diseases included in the survey. Veterinarians reported receiving the lowest level of training about Nipah and Hendra virus, with increasing levels of training received about Japanese encephalitis, Rift Valley fever, Rinderpest, African swine fever, highly pathogenic avian influenza, classical swine fever, exotic Newcastle disease, bovine spongiform encephalopathy, and foot-and-mouth disease (see Table 10). The median levels of training received were low (*Mdn* = 2.00) for all diseases except bovine spongiform encephalopathy (*Mdn* = 3.00) and foot-and-mouth disease (*Mdn* = 3.00).

Frequencies of responses for levels of training about each of the diseases are available in Table I1. At least one-half of respondents reported having very low and low levels of training about highly pathogenic avian influenza (50.5%), exotic Newcastle disease (51.3%), classical swine fever (54%), African swine fever (54.7%), rinderpest (57.3%), Rift Valley fever (62%), Japanese encephalitis (70.2%), and Nipah and Hendra virus (73.6%).

About one-third (32.5%) of respondents reported having very low and low levels of training about foot-and-mouth disease, while slightly more than one-third (36.9%) reported having very low and low levels of training about bovine spongiform encephalopathy. About one-quarter or fewer of respondents indicated having high and very high levels of training about Nipah and Hendra virus (9.2%), Japanese encephalitis (9.8%), Rift Valley fever (16.8%), highly pathogenic avian influenza (22.1%), rinderpest

Table 10

Veterinarians' Levels of Training in Disease Recognition and Reporting

Disease	*n*	*M*	*SD*	*Mdn*
Nipah and Hendra virus	227	1.95	1.08	2.00
Japanese encephalitis	225	2.02	1.09	2.00
Rift Valley Fever	226	2.27	1.18	2.00
Rinderpest	227	2.41	1.29	2.00
African swine fever	225	2.47	1.30	2.00
Highly pathogenic avian influenza	226	2.52	1.23	2.00
Classical swine fever	226	2.53	1.30	2.00
Exotic Newcastle disease	228	2.56	1.25	2.00
Bovine spongiform encephalopathy	228	3.05	1.36	3.00
Foot-and-mouth disease	228	3.16	1.36	3.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

(22.9%), African swine fever (24.0%), exotic Newcastle disease (25.0%), and classical swine fever (26.1%). Nearly one-half of respondents indicated having high or very high levels of training about bovine spongiform encephalopathy (43.0%) and foot-and-mouth disease (48.6%).

Veterinarians' Prior Experiences and Training in Communication Skills

Respondents' levels of experience and training in serving as a source of information and communication ranged from low to high (see Table 11). Veterinarians who completed the questionnaire reported low levels of experience as a source of animal

Table 11

Veterinarians' Levels of Experience and Training in Communication

Variable	*n*	*M*	*SD*	*Mdn*
Serving as a Source of Animal Health Information				
Appearing on television	234	2.14	1.18	2.00
Speaking on a live radio broadcast	233	2.21	1.20	2.00
Offering information to the media	233	2.56	1.24	3.00
Answering media members' questions	233	2.62	1.22	3.00
Speaking at a community meeting	232	3.30	1.17	4.00
Offering information to clients	234	4.15	0.83	4.00
Answering clients' questions	234	4.18	0.82	4.00
Training Received in Communication				
Serving as a spokesperson	229	2.48	1.16	2.00
Interviewing	224	2.71	1.13	3.00
Public speaking	227	3.04	1.14	3.00
Written communication	227	3.04	1.22	3.00
Interpersonal communication	228	3.30	1.11	4.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

health information for "appearing on television" (n = 234, M = 2.14, SD = 1.18) and "speaking on a live radio broadcast" (n = 233, M = 2.21, SD = 1.20), and they reported high levels of experience with "offering information to clients" (n = 234, M = 4.15, SD =

0.83) and “answering clients’ questions” (*n* = 234, *M* = 4.18, *SD* = 0.82). The median levels of experience for serving as a source of information ranged from low (*Mdn* = 2.00) to high (*Mdn* = 4.00) (see Table 11).

Few respondents reported very low and low levels of experience with “answering clients’ questions” (4.7%) and “offering information to clients” (5.2%). Between one-quarter and one-half of respondents indicated having very low and low levels of experience with “speaking at a community meeting” (25.4%), “answering media members’ questions” (45.5%), and “offering information to the media” (48.9%). More than one-half of respondents reporting having very low and low levels of experience with “speaking on a live radio broadcast” (61.8%) and “appearing on television” (64.6%). The majority of respondents indicated having high and very high levels of experience with “offering information to clients” (85.0%) and “answering clients’ questions” (85.9%), while less than one-fifth of respondents reported having high and very high levels of experience with “appearing on television” (14.9%) and “speaking on a live radio broadcast” (18%) (see Table I1).

Respondents reported being neutral on the level of training received about specific aspects of communication. The lowest level of training received was reported for “serving as a spokesperson” (*n* = 229, *M* = 2.48, *SD* = 1.16), and the highest level of training received was for “interpersonal communication” (*n* = 228, *M* = 3.30, *SD* = 1.11). Median levels of training received ranged from low (*Mdn* = 2.00) to high (*Mdn* = 4.00) (see Table 11).

One-third or fewer of respondents reported having very low and low levels of training about “interpersonal communication” (21.5%), “public speaking” (29.1%), and

"written communication" (33.0%), while more than one-half (52.4%) of respondents reported having very low and low levels of training about "serving as a spokesperson." For "interviewing," 42.8% of respondents reported having received very low and low levels of training. About one-quarter of respondents reported having received high and very high levels of training about "serving as a spokesperson" (21.0%) and "interviewing" (25.9%). For "public speaking" and "written communication," 37.9% of respondents and 42.3% of respondents reported having received high or very high levels of training, respectively. About one-half (52.2%) of respondents reported receiving high or very high levels of training about "interpersonal communication" (see Table I1).

Findings Related to Objective 2: Veterinarians' Perceptions of Vulnerability of Animal Populations to Selected Animal Diseases

Veterinarians' who completed the questionnaire were asked to indicate their perceptions of the levels of vulnerability of animal populations on the local, state, and national levels to disease outbreaks (see Table 12 and Table 13). Respondents also were asked about the levels of threat posed by specific groups on the local, state, and national levels (see Table 14 and Table 15). The number of respondents varied for each item (see Table 14 and Table 15).

Local Vulnerability to Disease Outbreaks

For all diseases included in the questionnaire, respondents' average perceived vulnerability to disease outbreaks was lower for the local level than on the state and national levels (see Table 12). The average levels of perceived vulnerability for all diseases were neutral. The median levels of vulnerability for the diseases were either

Table 12

Veterinarians' Average Perceived Levels of Vulnerability to Disease Outbreaks

	Level of Organization (*M, SD*)		
Disease	Local	State	National
Highly pathogenic avian influenza	2.94, 1.29	3.48, 1.17	3.98, 1.00
Foot-and-mouth disease	3.40, 1.38	3.82, 1.20	4.09, 1.05
Rift Valley fever	2.74, 1.29	3.26, 1.24	3.61, 1.14
Exotic Newcastle disease	2.79, 1.28	3.35, 1.25	3.87, 1.07
Nipah and Hendra virus	2.56, 1.21	3.02, 1.19	3.38, 1.14
Classical swine fever	2.92, 1.26	3.34, 1.22	3.73, 1.06
African swine fever	2.74, 1.35	3.25, 1.29	3.66, 1.15
Bovine spongiform encephalopathy	2.63, 1.25	2.99, 1.27	3.24, 1.35
Rinderpest	2.85, 1.33	3.30, 1.28	3.53, 1.23
Japanese encephalitis	2.60, 1.24	3.00, 1.27	3.33, 1.22

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

equal to or less than median levels of vulnerability on the state and national levels, ranging from low to high (see Table 13).

Less than one-half of respondents indicated very low and low levels of vulnerability on the local level for seven diseases, including highly pathogenic avian influenza (42.7%), classical swine fever (43.1%), rinderpest (44.1%), Rift Valley fever (47.2%), bovine spongiform encephalopathy (48.3%), exotic Newcastle disease (48.5%), and Nipah and Hendra virus (49.4%). About one-half of respondents reported very low

Table 13

Veterinarians' Median Perceived Levels of Vulnerability to Disease Outbreaks

	Level of Organization (*Mdn*, *n*)		
Disease	Local	State	National
Highly pathogenic avian influenza	3.00, 286	4.00, 255	4.00, 238
Foot-and-mouth disease	4.00, 288	4.00, 254	4.00, 236
Rift Valley fever	3.00, 282	3.00, 252	4.00, 235
Exotic Newcastle disease	3.00, 285	4.00, 252	4.00, 236
Nipah and Hendra virus	3.00, 279	3.00, 251	3.00, 234
Classical swine fever	3.00, 281	4.00, 252	4.00, 235
African swine fever	2.00, 277	4.00, 249	4.00, 236
Bovine spongiform encephalopathy	3.00, 286	3.00, 254	4.00, 236
Rinderpest	3.00, 281	4.00, 252	4.00, 235
Japanese encephalitis	2.00, 278	3.00, 247	4.00, 233

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

and low levels of vulnerability to African swine fever (50.6%) and Japanese encephalitis (51.1%). For foot-and-mouth disease, 29.6% of respondents indicated very low or low levels of vulnerability. One-third or fewer of respondents indicated high or very high levels of vulnerability for Nipah and Hendra virus (21.3%), Japanese encephalitis (25.0%), bovine spongiform encephalopathy (28.1%), Rift Valley fever (30.3%), exotic Newcastle disease (32.7%), African swine fever (33.6%). Less than one-half of

Table 14

Veterinarians' Average Perceived Levels of Threat Posed by Potential Sources of Disease Outbreaks

	Level of Organization (*M*, *SD*)		
Sources of Disease Outbreaks	Local	State	National
Natural	2.39, 1.11	2.56, 1.12	2.90, 1.13
International terrorists	2.84, 1.25	3.03, 1.22	3.69, 1.10
Domestic groups	2.77, 1.17	2.85, 1.19	3.24, 1.19
Producers' disgruntled employees	2.27, 1.08	2.29, 1.04	2.53, 1.09
Producers' neighbors	2.09, 1.06	2.14, 1.04	2.30, 1.06

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Table 15

Veterinarians' Median Perceived Levels of Threat Posed by Potential Sources of Disease Outbreaks

	Level of Organization (*Mdn*, *n*)		
Sources of Disease Outbreaks	Local	State	National
Natural	2.00, 283	2.00, 251	3.00, 238
International terrorists	3.00, 283	3.00, 252	4.00, 239
Domestic groups	3.00, 283	3.00, 251	3.00, 240
Producers' disgruntled employees	2.00, 283	2.00, 252	2.00, 239
Producers' neighbors	2.00, 282	2.00, 249	2.00, 239

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

respondents indicated high or very high levels of vulnerability to rinderpest (36.8%), classical swine fever (37.4%), and highly pathogenic avian influenza (38.5%)and. More than one-half (56.6%) of respondents indicated high or very high levels of vulnerability to foot-and-mouth disease (see Table I2).

Respondents' average perceived levels of threat were lower for all sources of disease outbreaks on the local level than on the state and national levels. Low levels of threat were perceived for "producers' neighbors" (*M* = 2.09, *SD*= 1.06), "producers' disgruntled employees" (*M* = 2.27, *SD*= 1.08), and "natural" sources (*M* = 2.39, *SD* = 1.11), while neutral levels of threat were perceived for "domestic groups" (*M* = 2.77, *SD* = 1.17) and "international terrorists" (*M* = 2.84, *SD* = 1.25) (see Table 14). Respondents' median perceived levels of threat on the local level were equal to median levels of threat on the state level and lower than medians for the national level for "natural" sources and "international terrorists," with medians of 2.00 and 3.00, respectively (see Table 15). Median perceived levels of threat reported by respondents for "domestic groups" (*Mdn* = 3.00), "producers' disgruntled employees" (*Mdn* = 2.00), and "producers' neighbors" (*Mdn* = 2.00) were equal to medians for the state and national levels.

More than one-half of respondents indicated very low and low levels of threat are posed by "natural" (58.6%) sources of disease outbreaks, "producers' disgruntled employees" (63.8%), and "producers' neighbors" (69.8%). Less than one-half of respondents indicated very low and low levels of threat from "international terrorists" (42.8%) and "domestic groups" (45.3%). Less than one-fifth of respondents perceived high and very high levels of threat were posed by "producers' neighbors" (10.9%), "producers' disgruntled employees" (15.4%), and "natural" sources of disease outbreaks

(19.3%). Around one-third of respondents indicated high and very high levels of threat were posed by “domestic groups” (32.3%) and “international terrorists” (38.3%) (see Table I2).

State Vulnerability to Disease Outbreaks

Respondents’ average perceived levels of vulnerability to disease outbreaks on the state level were greater than all averages for the local level and less than all averages for the national level (see Table 12). On the state level, respondents’ average perceived levels of vulnerability of animal populations to outbreaks of all diseases, except highly pathogenic avian influenza and foot-and-mouth disease were neutral. For highly pathogenic avian influenza and foot-and-mouth disease, respondents perceived high levels of vulnerability. Respondents’ median levels of perceived vulnerability varied from neutral to high, being neutral (*Mdn* = 3.00) for Rift Valley Fever, Nipah and Hendra virus, bovine spongiform encephalopathy, and Japanese encephalitis, and high (*Mdn* = 4.00) for all other diseases (see Table 13). The median perceived levels of vulnerability on the state level were equal to the median perceived levels of vulnerability on the national level, except for Rift Valley fever (*Mdn* = 3.00), bovine spongiform encephalopathy (*Mdn* = 3.00), and Japanese encephalitis (*Mdn* = 3.00), which were lower than median perceived levels of vulnerability on the state level.

One-third or fewer of respondents indicated very low or low levels of vulnerability on the state level to all diseases: foot-and-mouth disease, 18.4%; highly pathogenic avian influenza, 24.1%; Rift Valley fever, 28.3%; Rinderpest, 29.5%; exotic Newcastle disease, 30.3%; classical swine fever, 30.3%; African swine fever, 33.9%; Nipah and Hendra virus, 34.0%; Japanese encephalitis, 35.4%; and bovine spongiform

encephalopathy, 38.2%.and Less than one-half of respondents indicated high or very high levels of vulnerability to Nipah and Hendra virus (36.0%), Japanese encephalitis (39.0%), bovine spongiform encephalopathy (40.6%), and Rift Valley fever (46.5%). One-half or more of respondents indicated high or very high levels of vulnerability on the state level for African swine fever (50.2%), classical swine fever (51.2%), rinderpest (52.7%), exotic Newcastle disease (53.6%), highly pathogenic influenza (58.4%), and foot-and-mouth disease (71.9%).(see Table I2).

The average levels of threat posed by all potential sources of disease outbreaks were greater on the state level than on the local level and less than the averages for all sources on the national level (see Table 14). Respondents' average perceived levels of threat ranged from low to neutral, with the highest threat perceived to be from "international terrorists" (M = 3.03, SD = 1.22) and the lowest threat perceived to be from "producers' neighbors" (M = 2.14, SD = 1.04). The median perceived levels of threat on the state level were lower for "natural" sources (Mdn = 2.00) and "international terrorists" (Mdn = 3.00) than on the national level (see Table 15). All other median perceived levels of threat were equal to median perceived levels of threat on the national level.

On the state level, less than one-half of respondents indicated very low or low levels of threat posed by "international terrorists" (36.7%) and "domestic groups" (45.2%). More than one-half of respondents perceived very low or low levels of threat from "natural" sources of disease outbreaks (55.6%), "producers' disgruntled employees" (62.8%), and "producers' neighbors" (69.6%). One-quarter to one-half of respondents perceived high or very high levels of threat from "natural" sources of disease outbreaks

(25.0%), “domestic groups” (33.7%), and “international terrorists” (43.9%). Less than one-fifth of respondents indicated high or very high levels of threat are posed by “producers’ neighbors” (11.6%) and “producers’ disgruntled employees” (15.0%) (see Table I2).

National Vulnerability to Disease Outbreaks

For all diseases included in the questionnaire, respondents’ average perceived levels of vulnerability on the national level were high for all diseases except bovine sponginform encephalopathy, Japanese encephalitis, and Nipah and Hendra virus (see Table 12). The median perceived levels of vulnerability on the national level were high (*Mdn* = 4.00) for all diseases except Nipah and Hendra virus, about which respondents were neutral (*Mdn* = 3.00) (see Table 13).

One-quarter or less of respondents perceived low or very low levels of vulnerability on the national level to outbreaks of highly pathogenic avian influenza (10.0%), foot-and-mouth disease (10.6%), exotic Newcastle disease (12.7%), classical swine fever (15.3%), African swine fever (18.6%), Rift Valley fever (19.1%), Nipah and Hendra virus (21.2%), rinderpest (22.9%), and Japanese encephalitis (26.5%). About one-third (34.2%) of respondents indicated very low or low levels of vulnerability to bovine spongiform encephalopathy. About one-half or more of respondents indicated high or very high levels of vulnerability to all diseases: Nipah and Hendra virus, 49.3%; Japanese encephalitis, 50.8%; bovine spongiform encephalopathy, 51.1%; Rift Valley fever, 61.0%; rinderpest, 61.0%; African swine fever, 65.9%; classical swine fever, 67.8%; exotic Newcastle disease, 73.0%; highly pathogenic avian influenza, 79.5%; and foot-and-mouth disease, 80.6%.(see Table I2).

Respondents' average perceived levels of threat posed by potential sources of diseases on the national level ranged from low to high (see Table 14), with the highest level of threat perceived to be from "international terrorists" (M = 3.69, SD = 1.10) and the lowest threat perceived to be from "producers' neighbors" (M = 2.30, SD = 1.06). The median perceived levels of threat from all sources of disease outbreaks ranged from low (Mdn = 2.00) for "producers' disgruntled employees" and "producers' neighbors" to high (Mdn = 4.00) for "international terrorists" (see Table 15).

Less than one-third of respondents perceived very low or low levels of threat from "international terrorists" (17.5%) and "domestic groups" (31.2%). More than one-third (39.3%) of respondents perceived very low or low levels of threat from "natural" sources of disease outbreaks. More than one-half of respondents indicated very low or low levels of threat are posed by "producers' disgruntled employees" (53.0%) and "producers' neighbors" (60.4%). Less than one-quarter of respondents perceived high or very high levels of threat are posed by "producers' neighbors" (13.3%) and "producers' disgruntled employees" (20.0%). Respondents indicated high or very high levels of threat are posed by "natural" sources of disease outbreaks (35.2%) and "domestic groups" (45.7%). More than one-half (69.6%) of respondents perceived high or very high levels of threat are posed by "international terrorists" on the national level (see Table I2).

Findings Related to Objective 3: Veterinarians' Perceptions of the Potential Severity of Outbreaks of Selected Animal Diseases

Veterinarians who responded to the survey were asked to indicate their perceptions about the severity of outbreaks of the 10 dangerous animal diseases included

in the survey on the local, state, and national levels (see Table 16 and Table 17). The number of respondents varied for each item (see Table 17).

Local Severity of Disease Outbreaks

On the local level, respondents' average perceptions of severity of outbreaks of all diseases included in the survey were neutral (see Table 16), with the lowest average perceived severity indicated for foot-and-mouth disease (M = 2.94, SD = 1.22) and the highest average perceived severity indicated for rinderpest (M = 3.39, SD = 1.31).

Table 16

Veterinarians' Average Perceived Levels of Severity of Disease Outbreaks

	Level of Organization (*M, SD*)		
Disease	Local	State	National
Highly pathogenic avian influenza	3.27, 1.29	3.75, 1.10	4.13, 0.93
Foot-and-mouth disease	2.94, 1.22	4.23, 0.96	4.25, 0.95
Rift Valley fever	3.31, 1.25	3.59, 1.10	3.73, 1.07
Exotic Newcastle disease	3.10, 1.31	3.61, 1.15	4.01, 0.97
Nipah and Hendra virus	2.96, 1.11	3.29, 1.07	3.51, 1.10
Classical swine fever	3.18, 123	3.62, 1.07	3.91, 1.00
African swine fever	3.16, 1.27	3.60, 1.12	3.88, 1.07
Bovine spongiform encephalopathy	3.14, 1.37	3.43, 1.32	3.41, 1.40
Rinderpest	3.39, 1.31	3.62, 1.16	3.71, 1.18
Japanese encephalitis	3.02, 1.21	3.29, 1.14	3.47, 1.16

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Table 17

Veterinarians' Median Perceived Levels of Severity of Disease Outbreaks

	Level of Organization (*Mdn*, *n*)		
Disease	Local	State	National
Highly pathogenic avian influenza	4.00, 284	4.00, 253	4.00, 238
Foot-and-mouth disease	4.00, 281	4.00, 252	4.00, 238
Rift Valley fever	3.00, 282	4.00, 251	4.00, 236
Exotic Newcastle disease	3.00, 284	4.00, 252	4.00, 235
Nipah and Hendra virus	3.00, 276	3.00, 248	4.00, 234
Classical swine fever	3.00, 282	4.00, 248	4.00, 235
African swine fever	3.00, 279	4.00, 248	4.00, 234
Bovine spongiform encephalopathy	3.00, 284	4.00, 252	4.00, 236
Rinderpest	4.00, 280	4.00, 250	4.00, 235
Japanese encephalitis	3.00, 274	3.00, 247	4.00, 232

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Respondents' average perceived levels of severity for outbreaks of all diseases on the local level were lower than the average perceived levels of severity for outbreaks of all diseases on the state and national levels.

Respondents' median levels of perceived severity of disease outbreaks on the local level ranged from neutral (*Mdn* = 3.00) to high (*Mdn* = 4.00) (see Table 17). Median levels of perceived severity on the local level were less than median levels for the state and national levels for Rift Valley Fever, exotic Newcastle disease, classical swine

fever, African swine fever, and bovine spongiform encephalopathy. Median levels of perceived severity on the local level were equal to the median levels on the state and/or national levels for all other diseases.

On the local level, one-third or less of respondents indicated outbreaks of all diseases would be very low or low: foot-and-mouth disease, 15.5%; Rift Valley fever, 26.4%; rinderpest, 26.6%; Japanese encephalitis, 32.3%; Nipah and Hendra virus, 32.8%; classical swine fever, 33.1%; African swine fever, 33.8%; and highly pathogenic avian influenza, 33.9%;. More than one-third of respondents reported outbreaks of bovine spongiform encephalopathy (36.7%) and exotic Newcastle disease (38.4%) would be very low or low. Less than one-half of respondents indicated the severity of outbreaks on the local level would be high or very high for Nipah and Hendra virus (31.3%), Japanese encephalitis (37.7%), exotic Newcastle disease (44.4%), classical swine fever (46.1%), African swine fever (46.7%), and Rift Valley fever (47.9%). About one-half or more of respondents indicated high or very high levels of severity would occur for bovine spongiform encephalopathy (49.6%), highly pathogenic avian influenza (52.1%), rinderpest (57.5%), and foot-and-mouth disease (74.6%) (see Table I3).

State Severity of Disease Outbreaks

Respondents' average perceived levels of severity of disease outbreaks on the state level ranged from neutral to high (see Table 16). Respondents' indicated the lowest perceived level of severity for Nipah and Hendra virus (M = 3.29, SD = 1.07) and Japanese encephalitis (M = 3.29, SD = 1.14). The highest perceived level of severity was for foot-and-mouth disease (M = 4.23, SD = 0.96). Respondents' average perceived levels of severity of disease outbreaks on the state level were lower than on the national level

for all diseases except bovine spongiform encephalopathy (*M* = 3.43, *SD* = 1.32), which was nearly equal to the average perceived level of severity on the national level (*M* = 3.41, *SD* = 1.40).

Respondents' median perceived levels of severity of disease outbreaks on the state level were high (*Mdn* = 4.00) for all diseases except Nipah and Hendra virus (*Mdn* = 3.00) and Japanese encephalitis (*Mdn* = 3.00) (see Table 17). All median perceived levels of severity of outbreaks on the state level were equal to the median perceived levels of severity of outbreaks on the national level, except for Nipah and Hendra virus and Japanese encephalitis, which were less than median perceived levels of severity on the national level.

On the state level, less than one-quarter of respondents indicated the severity of outbreaks of all diseases would be very low or low: foot-and-mouth disease, 6.7%; classical swine fever, 14.8%; highly pathogenic avian influenza, 14.9%; Rift Valley fever, 15.8%; rinderpest, 16.6%; African swine fever, 16.8%; exotic Newcastle disease, 19.3%; Nipah and Hendra virus, 21.6%; Japanese encephalitis, 22.0%; and bovine spongiform encephalopathy, 24.0%. Slightly less than one-half of respondents indicated severity of outbreaks of Nipah and Hendra virus (44.8%) and Japanese encephalitis (48.2%) would be high or very high. More than one-half of respondents indicated high or very high levels of severity would be incurred during outbreaks of bovine spongiform encephalopathy (55.5%), Rift Valley fever (57.3%), African swine fever (60.4%), classical swine fever (60.8%), rinderpest (61.1%), exotic Newcastle disease (62.6%), highly pathogenic avian influenza (67.5%), and foot-and-mouth disease (85.0%) (see Table I3).

National Severity of Disease Outbreaks

On the national level, respondents' average perceived levels of severity of disease outbreaks were high for all diseases except bovine spongiform encephalopathy (see Table 16). Respondents' average perceived level of severity of a disease outbreak was lowest for bovine spongiform encephalopathy (M = 3.41, SD = 1.40) and highest for foot-and-mouth disease (M = 4.25, SD = 0.95). All median perceived levels of severity of disease outbreaks were high (Mdn = 4.00) for the national level (see Table 17).

One-fifth or less of respondents indicated the severity of outbreaks would be very low or low for all diseases except bovine spongiform encephalopathy: highly pathogenic avian influenza, 6.7%; foot-and-mouth disease, 7.1%; exotic Newcastle disease, 8.5%; classical swine fever, 11.0%; African swine fever, 12.8%; Rift Valley fever, 13.1%; rinderpest, 17.0%; Nipah and Hendra virus, 18.8%; and Japanese encephalitis, 20.2%. For bovine spongiform encephalopathy, 30.4% of respondents indicated the severity of an outbreak would be very low or low. For all diseases, more than one-half of respondents indicated severity of outbreaks would be high or very high: Japanese encephalitis, 53.2%; Nipah and Hendra virus, 53.6%; bovine spongiform encephalopathy, 56.9%; Rift Valley fever, 63.3%; rinderpest, 65.2%; African swine fever, 72.4%; classical swine fever, 74.2%; exotic Newcastle disease, 77.5%; highly pathogenic avian influenza, 84.1%; and foot-and-mouth disease, 85.7% (see Table I3).

Findings Related to Objective 4: Veterinarians' Perceptions of Readiness to Respond to Outbreaks of Selected Animal Diseases

Respondents were asked to report their perceptions about the availability of resources about preparing for animal health emergencies and response measures for animal health emergencies on the local, state, and national levels (see Table 18 and Table 19). Respondents also were asked to report their levels of confidence in groups on the local, state, and national levels to respond appropriately to animal health emergencies (see Table 20 and Table 21). The number of respondents varied for each item (see Table 19 and Table 21).

Readiness to Respond on the Local Level

Veterinarians who completed the questionnaire indicated nearly equal but low availability of resources about preparing for animal health emergencies (M = 2.38, SD = 1.05, Mdn = 2.00) and about response measures for animal health emergencies (M = 2.36, SD = 1.03, Mdn = 2.00) on the local level (see Table 18 and Table 19). The average availability and median availability of these resources on the local level was less than the average availability of resources on the state and national levels.

More than one-half of respondents indicated the availability of resources about preparing for animal health emergencies (58.0%) and about response measures for animal health emergencies (57.2%) is very low or low. Less than one-fifth of respondents indicated availability of resources about preparing for animal health emergencies (17.9%) and about response measures for animal health emergencies (15.9%) is high or very high (see Table I4).

Table 18

Veterinarians' Average Perceived Levels of Availability of Resources about Animal Health Emergencies

	Level of Organization (*M*, *SD*)		
Reource	Local	State	National
Resources about preparation	2.38, 1.05	3.03, 0.90	3.14, 0.95
Resources about response measures	2.36, 1.03	3.00, 0.90	3.14, 0.91

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Table 19

Veterinarians' Median Perceived Levels of Availability of Resources about Animal Health Emergencies

	Level of Organization (*Mdn*, *n*)		
Resource	Local	State	National
Resources about preparation	2.00, 244	3.00, 243	3.00, 241
Resources about response measures	2.00, 244	3.00, 240	3.00, 241

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Table 20

Veterinarians' Average Levels of Confidence in Groups' Abilities to Respond to Animal Health Emergencies

	Level of Organization (*M*, *SD*)		
Group	Local	State	National
Government	2.09, 0.99	3.15, 1.00	3.19, 1.04
Industry organizations	2.50, 0.97	2.88, 0.98	3.03, 0.99
Cooperative Extension/land-grant university specialists	2.89, 1.09	3.23, 1.02	3.15, 1.02
Veterinarians	3.28, 1.03	3.49, 0.89	3.52, 0.91
Producers	2.49, 1.02	2.56, 0.95	2.63, 0.91

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Table 21

Veterinarians' Median Levels of Confidence in Groups' Abilities to Respond to Animal Health Emergencies

	Level of Organization (*Mdn*, *n*)		
Group	Local	State	National
Government	2.00, 246	3.00, 244	3.00, 245
Industry organizations	2.00, 244	3.00, 246	3.00, 242
Cooperative Extension/land-grant university specialists	3.00, 245	3.00, 245	3.00, 246
Veterinarians	3.00, 244	4.00, 246	4.00, 244
Producers	2.00, 245	3.00, 245	3.00, 245

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Respondents' average levels of confidence in local groups to respond appropriately to animal health emergencies ranged from low to neutral (see Table 20), with the lowest level of confidence expressed in local government (M = 2.09, SD = 0.99) and the highest level of confidence expressed in veterinarians in the local area (M = 3.28, SD = 1.03). The respondents' average levels of confidence in all local groups to respond to animal health emergencies were lower than the levels of confidence in similar groups on the state and national levels. Respondents' median levels of confidence in local groups to respond to animal health emergencies were less than their levels of confidence in similar groups on the state and national levels, except for Cooperative Extension/land-grant university specialists, in which respondents' level of confidence was equal at all levels (see Table 21).

Less than one-half of respondents indicated having very low or low levels of confidence in "veterinarians in my local area" (25.7%) and "local Cooperative Extension/land-grant university specialists" (36.5%). More than one-half of respondents indicated having very low or low levels of confidence in "local industry organizations" (51.3%), "producers in my local area" (53.0%), and "local government" (71.4%) . Less than one-fifth of respondents reported having high or very high levels of confidence in "local government" (12.1%), "local industry organizations" (15.8%), and "producers in my local area" (17.4%). About one-third (34.0%) of respondents reported having high or very high levels of confidence in "local Cooperative Extension/land-grant university specialists, and 47.6% of respondents indicated having high or very high levels of confidence in "veterinarians in my local area" (see Table I4).

Readiness to Respond on the State Level

Respondents were neutral about the availability of resources on the state level about preparing for animal health emergencies (M = 3.03, SD = 0.90, Mdn = 3.00) and about response measures for animal health emergencies (M = 3.00, SD = 0.90, Mdn = 3.00) (see Table 18 and Table 19). The average perceived availability of these resources was less on the state level than on the national level, and the median perceived availability was equal for the state and national levels (see Table 19).

Less than one-third of respondents indicated very low or low levels of availability of resources about preparing for animal health emergencies (29.9%) and about response measures for animal health emergencies (31.9%). About one-third of respondents also indicated high or very high levels of availability of resources about preparing for animal health emergencies (33.6%) and about response measures for animal health emergencies (32.0%) (see Table I4).

Respondents indicated neutral average levels of confidence in state groups to respond to animal health emergencies (see Table 20). Respondents were least confident in producers throughout their states (M = 2.56, SD = 0.95) and most confident in veterinarians throughout their states (M = 3.49, SD = 0.89) to respond to animal health emergencies. All median levels of confidence on the state level were neutral (Mdn = 3.00), except for the high (Mdn = 4.00) level of confidence in veterinarians throughout respondents' states (see Table 21). Median levels of confidence in state groups reported by respondents were equal to respondents' levels of confidence in similar groups on the national level.

One-quarter or less of respondents reported having very low or low levels of confidence in “veterinarians throughout my state” (13.7%) and “state Cooperative Extension/land-grant university specialists” (23.9%). Around one-third of respondents indicated having very low or low levels of confidence in “state government” (28.1%) and “state industry organizations” (36.3%). Nearly one-half (48.2%) of respondents indicated having high or very high levels of confidence in “producers throughout my state.” Less than one-half of respondents reported having high or very high levels of confidence in “producers throughout my state” (16.6%), “state industry organizations” (31.4%), “state government” (43.1%), and “state Cooperative Extension/land-grant university specialists” (46.2%). More than one-half (55.7%) of respondents reported having high or very high levels of confidence in “veterinarians throughout my state” (see Table I4).

Readiness to Respond on the National Level

Respondents were neutral about the availability of resources on the national level about preparing for (M = 3.14, SD = 0.95, Mdn = 3.00) and about response measures for (M = 3.14, SD = 0.91, Mdn = 3.00) animal health emergencies (see Table 18 and Table 19).

On the national level, less than one-third of respondents reported very low or low availability of resources about preparing for animal health emergencies (28.1%) and about response measures for animal health emergencies (27.7%). More than one-third of respondents indicated high or very high availability of resources about preparing for animal health emergencies (39.7%) and about response measures for animal health emergencies (39.7%) (see Table I4).

Respondents' average levels of confidence in groups on the national level to respond appropriately to animal health emergencies ranged from neutral to high (see Table 20). Respondents expressed the least confidence in producers throughout the U.S. (M = 2.63, SD = 0.91) and the most confidence in veterinarians throughout the U.S. (M = 3.52, SD = 0.91). The median levels of confidence in all national groups reported by respondents were neutral (Mdn = 3.00), except for the high (Mdn = 4.00) level of confidence expressed in veterinarians throughout the U.S. (see Table 21).

Less than one-third of respondents reported very low or low levels of confidence in "veterinarians throughout the U.S." (14.2%), "national Cooperative Extension/land-grant university specialists" (25.4%), "federal government" (28.0%), and "national industry organizations" (29.5%). Nearly one-half (44.5%) of respondents indicated very low or low levels of confidence in "producers throughout the U.S." Less than one-half of respondents reported high or very high levels of confidence in "producers throughout the U.S." (17.0%), "national industry organizations" (35.7%), "national Cooperative Extension/land-grant university specialists" (43.1%), and "federal government" (46.6%). More than one-half of respondents indicated high or very high levels of confidence in "veterinarians throughout the U.S." (58.6%) (see Table I4).

Findings Related to Objective 5: Veterinarians' Self-reported Knowledge and Abilities in Emergency Response, Disease Recognition and Reporting, and Communication Skills

Veterinarians were asked to report their levels of confidence in acting in multiple roles as first responders and their levels of knowledge of emergency response plans, levels of confidence implementing emergency response procedures, and levels of training needed to improve their skills in implementing emergency response plans on local, state,

and national levels (see Table 22). The number of respondents varied for each item (see Table 22).

Acting as First Responders

Respondents reported neutral average levels of confidence in acting as first responders as veterinarians (M = 2.87, SD = 1.13) and in any other role (M = 2.68, SD = 1.07) (see Table 22). The median level of confidence reported by respondents for both roles was neutral (Mdn = 3.00).

More than one-third of respondents indicated having very low or low levels of confidence in acting as a first responder in the role of a veterinarian (36.2%) and in any role other than as a veterinarian (39.8%). Less than one-third of respondents reported having high or very high levels of confidence in acting as a first responder in the role of a veterinarian (31.6%) and in any role other than as a veterinarian (22.8%) (see Table I5).

Local, State, and National Emergency Response Plans

Local Emergency Response Plans

Veterinarians who responded to the survey reported having a low (M = 2.20, SD = 1.12) average level of knowledge about emergency response plans in their local areas and neutral (M = 3.09, SD = 1.16) average level of confidence in implementing emergency response plans (see Table 22). Respondents' average levels of knowledge and confidence about local response plans were lower than the average levels of knowledge and confidence reported for state and national response plans. Respondents' median levels of knowledge (Mdn = 2.00) and confidence (Mdn = 3.00) about local response plans were equal to the levels of knowledge and confidence reported for state and national response plans (see Table 22).

Table 22

Veterinarians' Self-reported Abilities and Knowledge in Emergency Response

Variable	*n*	*M*	*SD*	*Mdn*
Level of Confidence as a First Responder				
As a veterinarian	237	2.87	1.13	3.00
Any role other than as a veterinarian	236	2.68	1.07	3.00
Level of knowledge about emergency response plans				
Local emergency response plan	241	2.20	1.12	2.00
State emergency response plan	241	2.40	1.16	2.00
NAHERP	241	2.30	1.15	2.00
National Response Framework	241	2.24	1.13	2.00
Level of Confidence in Implementing Emergency Response Plans				
Local emergency response plan	235	3.09	1.16	3.00
State emergency response plan	236	3.14	1.08	3.00
NAHERP	236	3.03	1.13	3.00
National Response Framework	236	3.00	1.16	3.00
Level of Training Needed to Improve Skills in Implementing Emergency Plans				
Local emergency response plan	227	3.78	0.92	4.00
State emergency response plan	227	3.79	0.92	4.00
NAHERP	227	3.84	0.96	4.00
National Response Framework	224	3.83	0.96	4.00
Participant in local drills/scenarios	228	3.75	0.89	4.00
Participant in state drills/scenarios	228	3.79	0.89	4.00

Participant in national drills/scenarios	228	3.81	0.87	4.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

More than one-half (62.7%) of respondents reported having very low or low levels of knowledge about local emergency response plans, while 16.2% of respondents reported having high or very high levels of knowledge about local plans. Less than one-third of respondents indicated having very low or low levels of confidence in implementing local plans, and nearly one-half (46%) indicated having high or very high levels of confidence in implementing local plans (see Table I5).

Respondents' average perceived level of training needed to implement local response plan procedures was high (M = 3.78, SD = 0.92), and their average perceived level of training needed as participants in response drills/scenarios on the local level was high (M = 3.75, SD = 0.89) (see Table 22). The median perceived levels of training needed in both implementation and as participants in local response drills/scenarios were high (Mdn = 4.00) and were equal to the median levels for similar training at the state and national levels (see Table 22). Less than one-tenth of respondents reported needing very low or low levels of training in implementing response plans (8.8%) and through local response drills/scenarios (7.5%) (see Table I5). A majority of respondents reported needing high or very high levels of training in implementing local plans (68.7%) and as participants in local response drills/scenarios (66.7%).

State Emergency Response Plans

Respondents' reported having a low (M = 2.40, SD = 1.16) average level of knowledge about emergency response plans in their states and a neutral (M = 3.14, SD =

1.08) level of confidence about implementing state emergency response procedures (see Table 22). The respondents' average level of knowledge about state emergency response plans was higher than their knowledge of national emergency response plans, and their average level of confidence in implementing state emergency response procedures was higher than their average level of confidence in implementing national emergency response plans. The median levels of respondents' knowledge (*Mdn* = 2.00) of state plans and confidence (*Mdn* = 3.00) in implementing state plans were equal to their levels of knowledge and confidence on the national level (see Table 22).

More than one-half of respondents reported having very low or low levels of knowledge about state emergency response plans. About one-fifth (21.2%) of respondents indicated having high or very high levels of knowledge about state plans. About one-quarter of respondents (26.6%) reported having very low or low levels of confidence in implementing state plans, while 43.7% of respondents reported having high or very high levels of confidence in implementing state plans (see Table I5).

Respondents' average perceived needs for training about state emergency response plans (*M* = 3.79, *SD* = 0.92) and as participants in state response drills/scenarios (*M* = 3.79, *SD* = 0.89) were high (see Table 22). The average levels of need for training on the state level reported by respondents were slightly lower than the average levels of need for training on the national level. The median levels of perceived need for training about state emergency response plans and as participants in state response drills/scenarios were high (*Mdn* = 4.00) and were equal to the median levels of need for training on the national level (see Table 22). Less than one-tenth (8.8%) of respondents indicated very low or low levels of need for training about implementing state emergency response

plans and as participants in state response drills/scenarios (7.9%). A majority of respondents indicated high or very high needs for training about implementing state plans (69.6%) and through state response drills/scenarios (68.9%) (see Table I5).

National Emergency Response Plans

The respondents' average levels of knowledge about the National Animal Health Emergency Response Plan (*M* = 2.30, *SD* = 1.15) and National Response Framework (*M* = 2.24, *SD* = 1.13) were low, as were the median levels of knowledge reported about both plans (*Mdn* = 2.00) (see Table 22). Respondents' average and median levels of confidence in implementing the National Animal Health Emergency Response Plan (*M* = 3.03, *SD* = 1.13, *Mdn* = 3.00) and National Response Framework (*M* = 3.00, *SD* = 1.16, *Mdn* = 3.00) were neutral.

More than one-half of respondents indicated having very low or low levels of knowledge about the National Animal Health Emergency Response Plan (60.2%) and National Response Framework (60.6%). Less than one-fifth of respondents reported having high or very high levels of knowledge about the National Animal Health Emergency Response Plan (18.3%) and National Response Framework (16.2%). About one-third of respondents reported having very low or low levels of confidence in implementing the National Animal Health Emergency Response Plan (31.4%) and National Response Framework (32.2%), while slightly more than one-third of respondents indicated high or very high levels of confidence in implementing the National Animal Health Emergency Response Plan (39.4%) and National Response Framework (39.0%) (see Table I5).

Similar to perceived needs for training on the local and state levels, respondents perceived their average need for training as high for the National Animal Health Emergency Response Plan (M = 3.84, SD = 0.96) and National Response Framework (M = 3.83, SD = 0.96). Respondents also reported an average level of high (M = 3.81, SD = 0.87) need for training as participants in national response drills/scenarios. The median perceived need for training about the National Animal Health Emergency Response Plan, about the National Response Framework, and as participants in national response drills/scenarios was high (Mdn = 4.00).

About one-tenth of respondents reported needing very low or low levels of training about implementing the National Animal Health Emergency Response Plan (9.7%) and National Response Framework (9.8%). Nearly three-fourths of respondents indicated high and very high needs for training about the National Animal Health Emergency Response Plan (70.5%) and National Response Framework (70.6%). Less than one-tenth (7.4%) of respondents reported very low or low needs for training through national response drills/scenarios, while a majority (69.3%) indicated high or very high needs for such training (see Table I5).

Disease Recognition and Reporting

Veterinarians who completed the questionnaire were asked about their perceptions of their levels of knowledge (see Table 23) and confidence (see Table 24) about disease recognition and reporting, and about their perceived need for training about disease recognition and reporting (see Table 25). The number of respondents varied for each item.

Table 23

Veterinarians' Perceived Levels of Knowledge about Disease Recognition and Reporting

Disease	*n*	*M*	*SD*	*Mdn*
Nipah and Hendra virus	36	1.95	0.98	2.00
Japanese encephalitis	236	2.05	1.03	2.00
Rift Valley Fever	237	2.36	1.11	2.00
African swine fever	237	2.41	1.17	2.00
Classical swine fever	235	2.54	1.21	2.00
Highly pathogenic avian influenza	239	2.57	1.17	2.00
Exotic Newcastle disease	239	2.62	1.16	3.00
Rinderpest	235	2.51	1.20	2.00
Bovine spongiform encephalopathy	238	3.26	1.24	4.00
Foot-and-mouth disease	238	3.50	1.14	4.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Respondents' average and median levels of knowledge about the diseases included in the questionnaire ranged from low to high (see Table 23). The lowest average level of knowledge was reported for Nipah and Hendra virus (M = 1.95, SD = 0.98), and the highest average level of knowledge was reported for foot-and-mouth disease (M = 3.50, SD = 1.14). Median levels of knowledge were low (Mdn = 2.00) for all diseases except exotic Newcastle disease (Mdn = 3.00), foot-and-mouth disease (Mdn = 4.00), and bovine spongiform encephalopathy (Mdn = 4.00) (see Table 23).

Table 24

Veterinarians' Levels of Confidence in Disease Recognition and Reporting

Disease	*n*	*M*	*SD*	*Mdn*
Nipah and Hendra virus	237	2.05	1.06	2.00
Japanese encephalitis	235	2.12	1.06	2.00
Rift Valley Fever	235	2.41	1.12	2.00
African swine fever	237	2.51	1.23	2.00
Rinderpest	236	2.54	1.22	2.00
Classical swine fever	237	2.63	1.24	3.00
Exotic Newcastle disease	237	2.65	1.20	3.00
Highly pathogenic avian influenza	237	2.73	1.21	3.00
Bovine spongiform encephalopathy	237	3.30	1.22	4.00
Foot-and-mouth disease	237	3.60	1.16	4.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Less than one-half of respondents reported having very low or low levels of knowledge about foot-and-mouth disease (20.6%), bovine spongiform encephalopathy (28.2%), and exotic Newcastle disease (48.6%). More than one-half of respondents indicated having very low or low levels of knowledge about highly pathogenic avian influenza (51.5%), classical swine fever (53.6%), rinderpest (54.1%), African swine fever (58.2%), Rift Valley fever (62.0%), Japanese encephalitis (70.3%), and Nipah and Hendra virus (75.9%). About one-quarter or less of respondents reported having high or very high levels of knowledge about all diseases except foot-and-mouth disease and

Table 25

Veterinarians' Perceived Levels of Need for Training about Disease Recognition and Reporting

Disease	*n*	*M*	*SD*	*Mdn*
Foot-and-mouth disease	230	3.34	1.06	3.00
Bovine spongiform encephalopathy	230	3.36	1.08	3.00
Exotic Newcastle disease	230	3.67	0.96	4.00
Classical swine fever	229	3.68	0.95	4.00
Highly pathogenic avian influenza	230	3.69	0.96	4.00
African swine fever	230	3.75	0.95	4.00
Rinderpest	227	3.76	0.97	4.00
Rift Valley Fever	230	3.81	0.92	4.00
Japanese encephalitis	226	3.97	0.88	4.00
Nipah and Hendra virus	227	3.98	0.87	4.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

bovine spongiform encephalopathy: Nipah and Hendra virus, 6.7%; Japanese encephalitis, 9.3%; Rift Valley fever, 14.0%; African swine fever, 19.0%; rinderpest, 21.2%; highly pathogenic avian influenza, 22.2%; exotic Newcastle disease, 24.3%; and classical swine fever, 24.7%. More than one-half of respondents reported having high or very high levels of knowledge about bovine spongiform encephalopathy (51.7%) and foot-and-mouth disease (60.9%) (see Table I5).

The average levels of confidence reported by respondents in their abilities to recognize and diagnose the 10 dangerous animal diseases ranged from low to high (see Table 24). The lowest average level of confidence was reported for Nipah and Hendra virus (M = 2.06, SD= 1.06), and the highest average level of confidence was reported for foot-and-mouth disease (M = 3.60, SD = 1.16). Respondents' median levels of confidence in their disease recognition and reporting abilities ranged from low (Mdn= 2.00) to high (Mdn = 4.00), with respondents reporting low levels of confidence for five of the diseases and high levels of confidence for two of the diseases (see Table 24).

Less than one-half of respondents indicated having very low or low levels of confidence in recognizing and reporting foot-and-mouth disease (19.9%), bovine spongiform encephalopathy (26.5%), highly pathogenic avian influenza (46.0%), exotic Newcastle disease (48.9%), and classical swine fever (49.4%). More than one-half of respondents indicated having very low or low levels of confidence about rinderpest (53.0%), African swine fever (54.1%), Rift Valley fever (57.9%), Japanese encephalitis (68.5%), and Nipah and Hendra virus (71.7%). Less than one-third of respondents indicated having high or very high levels of confidence about recognizing and reporting all diseases except foot-and-mouth disease and bovine spongiform encephalopathy, including Nipah and Hendra virus (8.8%), Japanese encephalitis (10.6%), Rift Valley fever (14.9%), African swine fever (20.7%), rinderpest (22.1%), classical swine fever (26.1%), exotic Newcastle disease 26.2%), and highly pathogenic avian influenza (29.5%). More than one-half of respondents reported having high or very high levels of confidence about bovine spongiform encephalopathy (52.3%) and foot-and-mouth disease (65.4%) (see Table I5).

Respondents' average perceived levels of need for training about disease recognition and reporting were neutral to high for all diseases (see Table 25). The lowest average perceived level of need for training was reported for foot-and-mouth disease (*M* = 3.34, *SD* = 1.06), and the highest average perceived level of need for training was reported for Nipah and Hendra virus (*M* = 3.98, *SD* = 0.87). The median perceived levels of need reported were high (*Mdn* = 4.00) for all diseases except foot-and-mouth disease (*Mdn* = 3.00) and bovine spongiform encephalopathy (*Mdn* = 3.00).

About one-fifth or less of respondents indicated very low or low needs for training about all diseases: Nipah and Hendra virus, 6.2%; Japanese encephalitis, 6.6%; Rift Valley fever, 8.7%; highly pathogenic avian influenza, 9.6%; exotic Newcastle disease, 10.0%; African swine fever, 10.5%; rinderpest, 11.0%; classical swine fever, 11.4%; bovine spongiform encephalopathy, 20.0%; and foot-and-mouth disease, 20.9%. About one-half or more of respondents indicated high or very high levels of need for training about recognizing and reporting all diseases: foot-and-mouth disease, 45.2%; bovine spongiform encephalopathy, 48.2%; exotic Newcastle disease, 63.1%; classical swine fever, 63.3%; highly pathogenic avian influenza, 64.0%; African swine fever, 66.6%; rinderpest, 68.3%; Rift Valley fever, 70.9%; Nipah and Hendra virus, 76.2%; and Japanese encephalitis, 77.0% (see Table I5).

Communication Skills

Respondents were asked to report their levels of confidence in serving as sources of information for specific groups (see Table 26) and in specific situations (see Table 27) during animal health emergencies. Respondents also were asked to report their perceived

Table 26

Veterinarians' Levels of Confidence as Sources of Information for Specific Groups during Animal Health Emergencies

Group	*n*	*M*	*SD*	*Mdn*
Industry groups – national	233	2.61	1.18	3.00
Federal government	227	2.62	1.21	3.00
National Cooperative Extension/land-grant university specialists	233	2.65	1.23	3.00
Media – television	230	2.66	1.20	3.00
Media – radio	234	2.68	1.20	3.00
Industry groups – state	232	2.81	1.20	3.00
State Cooperative Extension/land-grant university specialists	233	2.85	1.22	3.00
State government	231	2.86	1.21	3.00
Nonprofit groups not directly associated with animal agriculture	234	2.88	1.18	3.00
Local Cooperative Extension/land-grant university specialists	233	2.94	1.23	3.00
Media – print	234	2.97	1.21	3.00
Local government	234	3.04	1.24	3.00
Industry groups – local	233	3.06	1.20	3.00
Community members who are not clients	233	3.76	1.03	4.00
Clients	232	3.95	0.97	4.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Table 27

Veterinarians' Levels of Confidence as Sources of Information in Specific Situations during Animal Health Emergencies

Situation	*n*	*M*	*SD*	*Mdn*
Appearing on television	233	2.45	1.18	2.00
Speaking on a live radio broadcast	232	2.55	1.22	2.00
Offering information to the media	233	2.78	1.17	3.00
Answering media members' questions	233	2.84	1.16	3.00
Speaking at a community meeting	231	3.37	1.12	4.00
Offering information to clients	231	3.89	0.97	4.00
Answering clients' questions	233	3.89	0.97	4.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Table 28

Veterinarians' Perceived Levels of Need for Training in Communication Skills

Communication Skill	*n*	*M*	*SD*	*Mdn*
Interpersonal communication	230	2.88	1.00	3.00
Written communication	229	3.07	1.08	3.00
Public speaking	230	3.13	1.03	3.00
Interviewing	228	3.32	1.03	3.00
Serving as a spokesperson	230	3.53	1.01	4.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

levels of training needed in communication skills (see Table 28). The number of respondents varied for each item.

Veterinarians who responded to the survey reported average levels of confidence ranging from neutral to high in serving as sources of information for specific groups during animal health emergencies (see Table 26). The lowest average level of confidence reported was for serving as a source of information for national industry groups (M = 2.61, SD = 1.18), and the highest average level of confidence reported was for serving as a source of information for clients (M = 3.95, SD = 0.97). The median levels of confidence reported were neutral (Mdn = 3.00) for all groups except clients (Mdn = 4.00) and community members who are not clients (Mdn = 4.00).

Less than one-third of respondents indicated very low or low levels of confidence in serving as sources of information for "clients" (8.6%), "community members who are not clients" (11.6%), "industry groups – local" (31.4%), and "local government" (32.5%). One-third to one-half of respondents reported having very low or low levels of confidence for "media – print" (33.8%), "nonprofit groups that are not directly associated with animal agriculture" (36.7%), "local Cooperative Extension/land-grant university specialists" (36.9%), "state government" (37.2%), "state Cooperative Extension/land-grant university specialists" (39.1%), "industry groups – state" (40.9%), "media – radio" (44.4%), "media – television" (44.7%), "national Cooperative Extension/land-grant university specialists" (46.4%), "industry groups – national" (47.2%), and "federal government" (47.6%). About one-quarter to one-half of respondents indicated high or very high levels of confidence in serving as sources of information for "industry groups – national" (24.5%), "media – television" (25.6%), "media – radio" (26.0%), "federal

government" (26.4%), "national Cooperative Extension/land-grant university specialists" (27.5%), "industry groups – state" (31.1%), "state Cooperative Extension/land-grant university specialists" (33.1%), "state government" (33.3%), "nonprofit groups that are not directly associated with animal agriculture" (33.7%), "media – print" (36.7%), "local Cooperative Extension/land-grant university specialists" (37.4%), "local government" (41.9%), and "industry groups – local" (42.0%) . More than one-half of respondents indicated high or very high levels of confidence about "community members who are not clients" (68.2%) and "clients" (75.9%) (see Table I5).

Respondents' average levels of confidence and median levels of confidence in serving as sources of information in specific situations during animal health emergencies ranged from low to high (see Table 27). The lowest average level of confidence was reported for "appearing on television" (M = 2.45, SD = 1.18), and the highest average levels of confidence were reported for "answering clients' questions" (M = 3.89, SD = 0.97) and "offering information to clients" (M = 3.89, SD = 0.97).

Less than one-half of respondents reported having very low or low levels of confidence about serving as sources of information in all situations except "speaking on a live radio broadcast," for which 51.7% reported very low or low levels of confidence: "answering clients' questions," 11.6%; "offering information to clients," 11.7%; "speaking a community meeting," 21.2%; "appearing on television," 35.8%; "answering media members' questions," 39.9%; and "offering information to the media," 42.5%. Less than one-half of respondents indicated having high or very high levels of confidence in serving as a source of information when "appearing on television" (21.4%), "speaking on a live radio broadcast" (24.2%), "offering information to the media" (28.8%), and

"answering media members' questions" (31.8%) . More than one-half of respondents reported having high or very high levels of confidence about "speaking at a community meeting" (51.5%), "answering clients' questions" (75.1%), and "offering information to clients" (75.3%) (see Table I5).

Respondents' reports of their perceived levels of communication training needed resulted in averages ranging from neutral to high (see Table 28). The lowest average perceived level of training was reported for "interpersonal communication" (M = 2.88, SD = 1.00), and the highest average perceived level of training was reported for "serving as a spokesperson" (M = 3.53, SD = 1.01). The medians for all communication skills except "serving as spokesperson" (Mdn = 4.00) were neutral (Mdn = 3.00) (see Table 28).

Less than one-third of respondents reported very low or low needs for training in all communication skills: "serving as a spokesperson," 15.7%; "interviewing," 20.6%; "public speaking," 25.2%; "written communication," 27.9%; and "interpersonal communication," 32.6% . One-quarter to one-half of respondents reporting having high or very high needs for training about "interpersonal communication" (26.9%), "written communication" (38.0%), "public speaking" (38.3%), and "interviewing" (48.6%). More than one-half (55.7%) of respondents reported high or very high needs for training about "serving as a spokesperson" (see Table I5).

Findings Related to Objective 6: Influence of Cost on Veterinarians' Interest in Training about Emergency Response, Disease Recognition and Reporting, and Communication

Veterinarians who completed the questionnaire were asked to indicate the level of influence of cost on their interest in training about emergency response procedures,

disease recognition and reporting, and communication (Table 29). The number of respondents varied for each item.

The average levels of influence of cost on training were neutral to high and nearly equal for all topics, and the medians for level of influence were neutral (*Mdn* = 3.00) for all topics. Less than one-fifth of respondents reported very low and low levels of influence of cost on training about emergency response procedures (14.8%), disease recognition and reporting (18%), and communication (15%). Nearly one-half of respondents reported high or very high levels of influence on cost about emergency response procedures (48.5%), disease recognition and reporting (48.7%), and communication (48.1%) (see Table I6).

Findings Related to Objective 7: Veterinarians' Intentions to Participate in Training about Emergency Response, Disease Recognition and Reporting, and Communication Skills

Veterinarians who completed the questionnaire were asked to indicate their levels of interest in training about emergency response plans (see Table 30), disease recognition and reporting (see Table 31), and communication (see Table 32). The number of respondents varied for each item.

Emergency Response Plans

The average level of interest of respondents in participating in training about implementing emergency response plans and in participating in response drills/scenarios ranged from neutral to high for all local, state, and national topics (see Table 30). Respondents expressed the least interest in participating in national response drills/scenarios (*M* = 3.21, *SD* = 1.08) and in training about the National Response

Table 29

Level of Influence of Cost on Veterinarians' Interest in Training

Topic of Training	*n*	*M*	*SD*	*Mdn*
Emergency response procedures	229	3.44	1.02	3.00
Disease recognition and reporting	228	3.41	1.06	3.00
Communication	227	3.47	1.04	3.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Framework (*M* = 3.28, *SD* = 1.04) and the National Animal Health Emergency Response Plan (*M* = 3.31, *SD* = 1.02).

Respondents reported having the most interest in participating in training about local emergency response plans (*M* = 3.54, *SD* = 0.96) and in local response drills/scenarios (*M* = 3.49, *SD* = 1.04). The median levels of interest in training ranged from neutral (*Mdn* = 3.00) to high (*Mdn* = 4.00), with the lower medians associated with national response drills/scenarios, the National Response Framework, and the National Animal Health Emergency Response Plan (see Table 30).

About one-fifth or less of all respondents indicated very low or low levels of interest in training about local emergency response plans (11.5%), state emergency response plans (13.8%), National Animal Health Emergency Response Plan (20.1%), and National Response Framework (21.4%). Less than one-half of respondents reported high and very high levels of interest in training about the National Animal Health Emergency Response Plan (47.8%) and National Response Framework (45.9%), while more than

Table 30

Veterinarians' Interest in Training about Emergency Response Plans

	n	*M*	*SD*	*Mdn*
Training about Implementing Emergency Response Plans				
Local emergency response plan	225	3.54	0.96	4.00
State emergency response plan	225	3.44	0.94	4.00
National Animal Health Emergency Response Plan	224	3.31	1.02	3.00
National Response Framework	220	3.28	1.04	3.00
Participating in Response Drills/Scenarios				
Local	227	3.49	1.04	4.00
State	227	3.40	1.06	4.00
National	226	3.21	1.08	3.00
Types of Training				
Online, instructor-paced	226	2.96	1.06	3.00
Web conference	226	3.01	1.05	3.00
Online, self-paced	226	3.35	1.12	4.00
Seminar/workshop	225	3.57	1.03	4.00
Workshop at a conference	226	3.64	1.03	4.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Table 31

Veterinarians' Interest in Training about Disease Recognition and Reporting

	M	*SD*	*Mdn*
Training about Recognizing and Reporting Diseases (*n* = 228)			
Exotic Newcastle disease	3.50	1.06	4.00
Highly pathogenic avian influenza	3.50	1.07	4.00
Nipah and Hendra virus	3.53	1.06	4.00
Japanese encephalitis	3.54	1.06	4.00
Rinderpest	3.56	1.07	4.00
Classical swine fever	3.57	1.02	4.00
African swine fever	3.57	1.02	4.00
Rift Valley fever	3.57	1.05	4.00
Bovine spongiform encephalopathy	3.57	1.10	4.00
Foot-and-mouth disease	3.63	1.09	4.00
Types of Training (*n* = 228)			
Online, instructor-paced	3.00	1.09	3.00
Web conference	3.07	1.06	3.00
Online, self-paced	3.37	1.09	4.00
Workshop at a conference	3.57	1.06	4.00
Seminar/workshop	3.58	1.04	4.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

Table 32

Veterinarians' Interest in Training about Communication

	n	*M*	*SD*	*Mdn*
Training about Communication Skills				
Serving as a spokesperson	226	3.11	1.12	3.00
Written communication	226	3.15	1.13	3.00
Public speaking	226	3.23	1.12	3.00
Interviewing	225	3.24	1.08	3.00
Interpersonal communication	226	3.30	1.12	3.00
Types of Training				
Web conference	227	2.74	1.03	3.00
Online, instructor-paced	225	2.78	1.05	3.00
Online, self-paced	227	2.96	1.11	3.00
Seminar/workshop	227	3.24	1.08	3.00
Workshop at a conference	226	3.25	1.11	3.00

Note. Levels were reported on 5-point scales (1 = very low, 5 = very high).

one-half of respondents indicated high or very high levels of interest in training about local plans (59.6%) and state plans (54.7%) (see Table I7).

Less than one-quarter of respondents reported very low or low levels of interest in participating in response drills/scenarios on the local level (15.0%), state level (17.6%), and national level (23.9%). Less than one-half of respondents indicated high or very high levels of interest in response drills/scenarios on the national level (43.8%), while more

than one-half of respondents reported high or very high levels of interest about drills/scenarios on the local level (57.7%) and state level (52.4%) (see Table I7).

Regarding types of training about emergency response plans, respondents indicated average interests ranging from neutral to high for different types of training (see Table 30). The type of training respondents were least interested in was online – instructor-paced (M = 2.96, SD = 1.06), and respondents were most interested in receiving training through a workshop at a conference (M = 3.64, SD = 1.03). The median values for interest in type of training ranged from neutral (Mdn = 3.00) to high (Mdn = 4.00), with online – instructor-paced and Web conference training receiving neutral values (see Table 30).

About one-quarter or less of respondents expressed very low or low levels of interest in all types of training about emergency response procedures, including conference workshops (12.0%), seminar/workshop (12.5%), online – self-paced (20.3%), online – instructor-paced (27.8%), and Web conference (27.9%). About one-third of respondents indicated high or very high levels of interest in training via online – instructor-paced (33.2%) and Web conference (34.5%) methods. More than one-half of respondents indicated high or very high levels of interest in online – self-paced (51.7%), seminar/workshop (59.1%), and conference workshop (61.1%) methods of training (see Table I7).

Disease Recognition and Reporting

Respondents' average levels of interest in training about disease recognition and reporting were high and nearly equal for all 10 dangerous animal diseases included in this survey (see Table 31). All median values for interest in training about disease recognition

and reporting indicated high (*Mdn* = 4.00) levels of interest for all diseases (see Table 31).

Less than one-fifth of respondents indicated very low or low levels of interest in training about recognition and reporting of all diseases: classical swine fever, 11.9%; African swine fever, 11.9%; Rift Valley fever, 12.2%; foot-and-mouth disease, 12.7%; rinderpest, 13.1%; Nipah and Hendra virus, 13.2%; Japanese encephalitis, 13.6%; exotic Newcastle disease, 14.5%; bovine spongiform encephalopathy, 14.5%; and highly pathogenic avian influenza, 14.9%. Less than one-half (41.8%) of respondents indicated high or very high levels of interest in training about foot-and-mouth disease. For all other diseases, more than one-half of respondents indicated high or very high levels of interest in training: exotic Newcastle disease, 54.8%; highly pathogenic avian influenza, 55.7%; Nipah and Hendra virus, 56.2%; Japanese encephalitis, 56.6%; African swine fever, 57.1%; Rift Valley fever, 57.4%; classical swine fever, 57.5%; rinderpest, 59.2%; and bovine spongiform encephalopathy, 59.7% (see Table I7).

For types of training about disease recognition and reporting, respondents' average levels of interest in the types of training were neutral to high (see Table 31). Respondents were least interested in online – instructor-paced training (*M* = 3.00, *SD* = 1.09) and most interested in training through a seminar/workshop (*M* = 3.58, *SD* = 1.04) and through a workshop at a conference (*M* = 3.57, *SD* = 1.06). The median values for interest in types of training ranged from low (*Mdn* = 3.00) to high (*Mdn* = 4.00), with online – instructor-paced and Web conference training receiving neutral values (see Table 31).

Less than one-third of respondents reported having very low or low levels of interest in all types of training about disease recognition and reporting: seminar/workshop (13.1%), conference workshops (14.9%), online – self-paced (18.0%), Web conference (25.9%), and online – instructor-paced (28.9%). Slightly more than one-third of respondents indicated high or very high levels of interest in training via online – instructor paced (35.0%) and Web conference (36.8%) methods. More than one-half of respondents indicated high or very high levels of interest in online – self-paced (52.6%), conference workshop (59.2%), and seminar/workshop (61.4%) training (see Table I7).

Communication Skills

The respondents' average and median levels of interest in training about communication skills were neutral for all skills (see Table 32). Respondents were least interested in training about "serving as a spokesperson" (M = 3.11, SD = 1.12) and "written communication" (M = 3.15, SD = 1.13), and they were most interested in training about "intrapersonal communication" (M = 3.30, SD = 1.12).

About one-quarter of respondents expressed very low or low levels of interest in training about all communication skills: "interpersonal communication," 21.7%; "interviewing," 23.6%; "public speaking," 25.2%; "written communication," 25.7%, and "serving as a spokesperson," 28.3%. Less than one-half of respondents indicated high or very high levels of interest in training about all communication skills: "serving as a spokesperson," 40.7%; "written communication," 42.4%; "public speaking," 46.4%; "interviewing," 46.6%; and "interpersonal communication," 48.6% (see Table I7).

Respondents' average levels of interest in the types of training about communication were neutral (see Table 32). Respondents were least interested in training

via Web conference (*M* = 2.74, *SD* = 1.03) and most interested in training through a seminar/workshop (*M* = 3.24, *SD* = 1.08) and workshop at a conference (*M* = 3.25, *SD* = 1.11). The median levels of interest for all types of training were neutral (*Mdn* = 3.00).

Less than one-third of respondents indicated very low or low levels of interest in training via seminar/workshop (22.1%), conference workshop (22.5%), and online – self-paced (30.4%)methods. Slightly more than one-third of respondents expressed very low or low levels of interest in online – instructor-paced (37.4%) and Web conference (39.2%) training about communication skills. About one-quarter to one-third of respondents reported high and very high levels of interest in training via Web conference (24.7%), online – instructor-paced (27.5%), and online – self-paced (34.3%) methods. Slightly less than one-half of respondents indicated high and very high levels of interest in training through seminar/workshop (44.5%) and conference workshop (44.6%) methods (see Table I7).

Findings Related to Objective 8: Relationships among Veterinarians' Experiences and Training, Perceptions, Knowledge and Abilities, and Intentions to Participate in Training

Confirmatory factory analysis was performed to verify relationships among veterinarians' prior experiences and training; perceptions of vulnerability and severity; self-perceived knowledge and abilities; and perceptions of response efficacy to produce protection motivation (Rogers, 1983), or the intention to participate in training about emergency response procedures, disease recognition and reporting, and communication on local, state, and national levels. The analysis did not produce distinct factors that supported the protection motivation model. Due to the lack of factors, the Borich needs assessment model (Borich, 1980; Waters & Haskell, 1989) was used to identify and rank

areas in which educational opportunities and resources about emergency response training and disease recognition and reporting should be provided for practicing veterinarians.

Areas of Need for Training about Emergency Response Procedures, Disease Recognition and Reporting, and Communication Skills

Areas of need for training were identified and ranked using a modified Borich needs assessment model, with mean weighted discrepancy scores (MWDS) calculated from respondents' expressed levels of interest in training and respondents' self-perceived levels of knowledge (Waters & Haskell, 1989) about each emergency response plan and each of the 10 diseases included in the survey. Mean weighted discrepancy scores could not be calculated for communication skills as a mistake in questionnaire construction prevented matching scaled items for level of interest in training and level of knowledge from being included.

Needs for training were prioritized by ranking the mean weighted discrepancy scores for each topic in descending order of value, with the largest mean weighted discrepancy score indicating a greater need for training. High discrepancy was indicated by mean weighted discrepancy scores of 4.00 or greater. Mean weighted discrepancy scores of 2.00 to 3.99 indicated moderate discrepancy. Low discrepancy was indicated by mean weighted discrepancy scores of 0.00 to 1.99. Mean weighted discrepancy scores below 0.00 would have indicated negligible discrepancy; however, all mean weighted discrepancy scores were greater than 0.00.

Emergency Response Training

Mean weighted discrepancy scores were applied as indicators of need for education about local, state, and national emergency response plans (see Table 33).

The mean weighted discrepancy scores for the emergency response plans indicated at least a moderate need for training about all plans included in the survey. Local emergency response plans were identified as the area of greatest importance (MWDS = 4.89) for training and were classified as having a high need for training. State emergency response plans (MWDS = 3.74), the National Animal Health Emergency Response Plan (MWDS = 3.45), and the National Response Framework (MWDS = 3.42) each received moderate discrepancy scores, indicating a moderate need for training. State emergency response plans were prioritized as having a higher need for training than the National Animal Health Emergency Response Plan or the National Response Framework.

Disease Recognition and Reporting

Mean weighted discrepancy scores were used to indicate need for training about highly pathogenic avian influenza, foot-and-mouth disease, Rift Valley fever, exotic Newcastle disease, Nipah and Hendra virus, classical swine fever, African swine fever, bovine spongiform encephalopathy, Rinderpest, and Japanese encephalitis (Table 34). The greatest needs for training are in recognition and reporting of Nipah and Hendra virus and Japanese encephalitis, with the least need for training in recognition and reporting of foot-and-mouth disease. Four diseases were ranked as having a high need for training, including Nipah and Hendra virus (MWDS = 5.63), Japanese encephalitis (MWDS = 5.49), Rift Valley fever (MWDS = 4.43), and African swine fever (MWDS =

Table 33

Veterinarians' Needs for Training about Emergency Response Procedures

Category	Emergency response procedure	MWDS
High	Local emergency response plans	4.89
Moderate	State emergency response plans	3.74
Moderate	National Animal Health Emergency Response Plan	3.45
Moderate	National Response Framework	3.42

Table 34

Veterinarians' Needs for Training about Disease Recognition and Reporting

Category	Disease	MWDS
High	Nipah and Hendra virus	5.63
High	Japanese encephalitis	5.49
High	Rift Valley fever	4.43
High	African swine fever	4.24
Moderate	Rinderpest	3.87
Moderate	Classical swine fever	3.78
Moderate	Highly pathogenic avian influenza	3.41
Moderate	Exotic Newcastle disease	3.09
Low	Bovine spongiform encephalopathy	1.25
Low	Foot-and-mouth disease	0.49

4.24). Moderate discrepancies were calculated for Rinderpest (MWDS = 3.87), classical swine fever (MWDS = 3.78), highly pathogenic avian influenza (MWDS = 3.41), and exotic Newcastle disease (MWDS = 3.09), indicating a moderate need for training. Low needs for training were indicated by low discrepancies for bovine spongiform encephalopathy (MWDS = 1.25) and foot-and-mouth disease (MWDS = 0.49).

Chapter Summary

This study used quantitative survey methodology to determine veterinarians' perceptions of susceptibility to and preparedness for responding to emergency events, self-reported knowledge of emergency response and management procedures and communication skills, and areas in which training should be provided to better prepare veterinarians for contributing to emergency management and public health responses.

The typical veterinarian who completed this questionnaire was a 49-year-old (M = 49.21, SD = 11.67) male (71%) who held a bachelor's degree (68.3%) and practiced in a companion animal – exclusive (32.4%), mixed animal (22.7%), or companion animal – predominant (18.8%) practice. Nearly all (98.4%) respondents had been veterinarians for more than one year, and nearly one-half (48.3%) were sole owners of their practices. The majority (66.7%) of respondents had no experience as first responders.

Respondents had low levels of training about emergency response plans on the local level (M = 2.06, SD = 1.08) and state level (M = 2.28, SD = 1.24), as well as about the National Animal Health Emergency Response Plan (M = 2.10, SD = 1.15) and National Response Framework (M = 2.03, SD = 1.11). Respondents' levels of experience and training in disease recognition and reporting ranged from low for Nipah and Hendra virus (M = 1.95, SD = 1.08) to neutral (M = 3.16, SD = 1.36). Respondents' levels of

experience as sources of information ranged from low for “appearing on television” (*M* = 2.14, *SD* = 1.18) to high for “answering clients’ questions” (*M* = 4.18, *SD* = 0.82), and respondents’ levels of training received in communication were neutral and ranged from 2.48 (*SD* = 1.16) for “serving as a spokesperson” to 3.30 (*SD* = 1.11) for “interpersonal communication”.

Respondents indicated varying perceptions of vulnerability to disease on local, state, and national levels, with local vulnerability lower than state and national vulnerability for all diseases. The average level of national vulnerability for all diseases also was higher than for local or state levels. Perceptions of vulnerability ranged from neutral for Nipah and Hendra virus (*M* = 2.56, *SD* = 1.21) on the local level to high for foot-and-mouth disease (*M* = 4.09, *SD* = 1.05) on the national level.

Respondents’ perceptions of severity ranged from neutral for foot-and-mouth disease (*M* = 2.94, *SD* = 1.22) on the local level to high for foot-and-mouth disease (*M* = 4.25, *SD* = 0.95) on the national level. The average levels of perceived severity were lower for all diseases on the local level than on the state and national levels, and perceived severity for all diseases were higher for the national level than for local and state levels.

Respondents indicated low levels of availability of resources about preparing for animal health emergencies (*M* = 2.38, *SD* = 1.05) and about response measures for animal health emergencies (*M* = 2.36, *SD* = 1.03). Respondents’ levels of confidence in groups to respond to animal health emergencies ranged from low for “local government” (*M* = 2.09, *SD* = 0.99) to neutral for “veterinarians in my local area” (*M* = 3.28, *SD* = 1.03). Respondents’ average levels of confidence in local groups to respond to animal

health emergencies were lower than their levels of confidence in all similar groups on the state and national levels.

Respondents expressed neutral average levels of confidence in acting as first responders as veterinarians (M = 2.87, SD = 1.13) and in any other role (M = 2.68, SD = 1.07). Respondents reported low levels of knowledge about emergency response plans on the local (M = 2.20, SD = 1.12) and state (M = 2.40, SD = 1.16) levels, as well as about the National Animal Health Emergency Response Plan (M = 2.30, SD = 1.15) and National Response Framework (M = 2.24, SD = 1.13). Respondents expressed neutral levels of confidence about implementing local plans (M = 3.09, SD = 1.16), state plans (M = 3.14, SD = 1.08), National Animal Health Emergency Response Plan (M = 3.03, SD = 1.13), and National Response Framework (M = 3.00, SD = 1.16).

Respondents' self-reported levels of knowledge about disease recognition and reporting ranged from low for Nipah and Hendra virus (M = 1.95, SD = 0.98) to high for foot-and-mouth disease (M = 3.50, SD = 1.14), with levels of confidence ranging from neutral for Nipah and Hendra virus (M = 2.05, SD = 1.06) to high for foot-and-mouth disease (M = 3.60, SD = 1.16). Respondents' levels of confidence in serving as sources of information for groups varied from neutral for "industry groups – national" (M = 2.61, SD = 1.18) to high for "clients" (M = 3.95, SD = 0.97). Respondents' levels of confidence in serving as sources of information in specific situations ranged from neutral for "appearing on television" (M = 2.45, SD = 1.18) to high for "answering clients' questions" (M = 3.89, SD = 0.97) and "offering information to clients" (M = 3.89, SD = 0.97).

The level of influence of cost on respondents' interest in training was neutral for emergency response procedures (*M* = 3.44, *SD* = 1.02) and disease recognition and reporting (*M* = 3.41, *SD* = 1.06), and high for communication skills (*M* = 3.47, *SD* = 1.04).

Respondents' levels of interest in training about emergency response were neutral for state plans (*M* = 3.44, *SD* = 0.94) and National Response Framework (*M* = 3.28, *SD* = 1.04) and high for local plans (*M* = 3.54, *SD* = 0.96) and the National Animal Health Emergency Response Plan (*M* = 3.50, *SD* = 1.14). Respondents expressed high levels of interest in training about disease recognition and reporting for all diseases and neutral levels of interest in training about all communication skills.

Using a modified Borich needs assessment model (Borich, 1980; Waters & Haskell, 1989), needs for training about emergency response procedures and disease recognition and reporting were prioritized. Needs for training about emergency response procedures were moderate to high, with the greatest need for training in local emergency response plans (MWDS = 4.89). For disease recognition and reporting, high and moderate needs for training were identified for 8 of the 10 diseases. The greatest needs for training are in Nipah and Hendra virus (MWDS = 5.63) and Japanese encephalitis (MWDS = 5.49).

CHAPTER 5

CONCLUSIONS, RECOMMENDATIONS, AND IMPLICATIONS

Responding to dangers threatening American agriculture has become a priority in homeland security and emergency preparedness initiatives during the past decade (Crutchley et al., 2007; Moats, 2008). Potential threats to U.S. agricultural production include natural disasters and bioterrorism attacks, both of which could cause economic and social disruption (Wohl & Nusbaum, 2007). To ensure effective responses to all types of emergencies impacting agriculture, all-hazards response plans have been developed (DeOtte, 2007; Geering et al., 1999; Wohl & Nusbaum).

The structure for all-hazards responses has been developed through legislation (Monke, 2007; Spellman, 2008) and documents created within the executive branch of the U.S. government (Garris, 2006; Moats, 2008; Wenzel, 2007). Through this structure, specific roles in incident responses have been identified for veterinarians (Garris; Geering et al., 1999; Moats; Wenzel, 2007), in addition to roles as first responders described in veterinary medical literature (Amass et al., 2008; Brown, 2003; Hendrix et al., 2006; Ortega et al., 2007; Wenzel; Wenzel & Wright, 2007; Wohl & Nusbaum, 2007). A lack of veterinary expertise and capacity to fulfill these roles has been identified, however (Amass et al.; Monke).

Providing awareness-level training and resources about areas ranging from surveillance to the incident command system will help increase U.S. veterinary capacity for emergency response (Hendrix et al., 2006; Wenzel & Wright, 2007). Opportunities

and resources may be provided through veterinary medical curricula, continuing education, and coordination of veterinary education (Baker et al., 2003). The importance of these programs has been recognized throughout the fields of veterinary medicine and emergency response (Katz et al., 2006; Shaffer et al., 2007).

Statement of the Problem

Veterinarians have been identified by Oklahoma beef producers (Ashlock, 2006) and Kansas beef feedlot managers (Riley, 2007) as preferred sources of information during animal-related agroterrorism events. In addition, practitioners of veterinary medicine have identified emergency response and management as an important issue facing veterinarians during the 21st century. Within the veterinary profession, calls have been made for increased levels of awareness, preparedness, and involvement in emergency management and public health responses (Amass et al., 2008; Baker et al., 2003; Brown, 2003; Hendrix et al., 2006; Kelly, 2005; Thurmond & Brown, 2002; Wenzel & Wright, 2007; Wohl & Nusbaum, 2007).

During emergencies that impact animals, veterinarians likely will be the first responders in containing potential or actual crises through their roles in diagnosing, treating, and reporting animal and/or herd health status (Moats, 2008). Veterinarians also serve, intentionally and unintentionally, as sources of information for clients, community members who are not clients, the media, government officials, and other audiences. Following appropriate emergency response procedures and effectively disseminating information to multiple audiences during emergencies that involve animals is vital to attaining high levels of resiliency within the agricultural industry. Veterinarians must be knowledgeable about emergency response and management, as well as possess adequate

skills for communicating with the public, media, and government officials during animal-related emergencies.

However, despite the calls for increasing the contribution of veterinarians in emergency situations, minimal information has been collected and/or reported regarding veterinarians' perceptions of and preparedness for their roles in emergency responses nor used in identifying areas for training through continuing education and/or veterinary school courses.

Significance of the Study

The results of this study benefits the veterinary profession, the U.S. livestock industry and entire agricultural industry, and entities responsible for implementing emergency response and management procedures in the U.S. by providing insights into how to better prepare first responders for emergencies that impact animals. This study provides a foundation for testable hypotheses about how to improve veterinarians' skills as first responders and communicators during disease outbreaks that impact animals. These hypotheses could serve as a framework for courses to be included in veterinary school curricula and for continuing education opportunities for practicing veterinarians. Providing such opportunities for veterinarians to improve their skills as first responders and communicators will be one avenue for meeting calls within the veterinary profession for increased levels of awareness, preparedness, and involvement in emergency management and public health responses.

Purpose

The purpose of this study was to determine veterinarians' self-reported perceptions of susceptibility to and preparedness for responding to emergency events, determining veterinarians' self-reported knowledge of emergency response and management procedures and communication skills, and identifying areas in which training should be provided to better prepare veterinarians for contributing to emergency management and public health responses.

Objectives

Specific objectives in meeting the purpose of this study were to:

1. Determine veterinarians' self-reported prior experiences and training in emergency response and management on the local, state, and national levels; recognition and reporting of selected animal diseases; and communication skills.
2. Determine veterinarians' perceptions of the vulnerability of animal populations on the local, state, and national levels to natural or man-made outbreaks of selected animal diseases.
3. Determine veterinarians' perceptions of the potential severity of natural or man-made outbreaks of selected animal diseases on the local, state, and national levels.
4. Determine veterinarians' perceptions of readiness to respond to natural and man-made outbreaks of selected animal diseases on the national, state, and local levels.

5. Determine veterinarians' self-reported knowledge of and abilities in the areas of emergency response and management on the state, local, and national levels; recognition and reporting of selected animal diseases; and communication skills.
6. Determine the influence of cost on veterinarians' interest in training about emergency response and management, disease recognition and reporting, and communication skills.
7. Determine veterinarians' intentions to participate in training about emergency responses and management on the local, state, and national levels; recognition and reporting of selected animal diseases; and communication skills.
8. Describe relationships among veterinarians' self-reported prior experiences and training, perceptions of vulnerability to disease outbreaks, perceptions of potential severity of disease outbreaks, perceptions of readiness to respond to disease outbreaks, self-reported knowledge and abilities, influence of cost on training, and intentions to participate in training.

Procedures

Licensed veterinarians in Oklahoma who have primary practice locations in Oklahoma, Kansas, Missouri, Arkansas, or Texas were surveyed using an online instrument. Content of the survey was based on a review of literature (Garris, 2006; Moats, 2008) and opinions from experts in veterinary medicine. Validity and reliability of

the instrument were confirmed through review by a panel of experts (see Appendix B) and pilot testing (see Appendix C).

A census (N = 1,173) was conducted using methods suggested by Dillman (2009). Veterinarians were sent a personalized e-mail introduction (see Appendix E) containing a link to the survey. Personalized e-mail reminders (see Appendix F) were sent on a weekly basis for two weeks to all veterinarians who had not responded to the survey.

Veterinarians who had not completed the questionnaire one week after the second reminder was sent were classified as nonrespondents. Follow-up contact with nonrespondents began 10 days after the primary data collection period ended. Two e-mail reminders (see Appendix G) were sent to nonrespondents on a weekly basis, and the survey was closed one week after the second reminder.

The online instrument and contact e-mails were provided as hard copies via fax to veterinarians upon their request. Responses were pooled for analysis after t-tests demonstrated no statistical differences ($p > 0.05$) between online and fax responses, and respondents and nonrespondents.

Data were analyzed using descriptive statistics, confirmatory factor analysis, and a modified Borich needs assessment model (Borich, 1980; Waters & Haskell, 1989). The final response rate for the survey was 24.8%.

Summary of Findings

Findings Related to Demographic Characteristics of the Population

The majority of respondents were male (71%) and held bachelor's degrees (68.3%) in addition to required doctor of veterinary medicine degrees. The average age of respondents was 49.21 years (SD = 11.67). The majority (72.4%) of respondents were in

private practice, and most respondents reported primary types of practice of companion animal – exclusive (32.4%), mixed animal (22.7%), or companion animal – predominant (18.8%). Nearly all (98.4%) respondents had been veterinarians for more than one year, and nearly one-half (48.3%) were sole owners of their practices. Primary practice locations reported by respondents included all Oklahoma Homeland Security regions (56.4%), Kansas (6.2%), Texas (6.2%), Arkansas (4.1%), and Missouri (1.4%).

All but 28 respondents reported having agricultural experience, with the most common experiences including living or having lived in a rural area, working or having worked on a farm, college agricultural courses, working or having worked in a rural area, and living or having lived on a farm. The majority (66.7%) of respondents did not have experience as emergency medical personnel, fire personnel, or law enforcement personnel.

Respondents reported being members of 69 associations, with a majority holding memberships in the American Veterinary Medical Association (64.9%) and state veterinary medical associations (60.8%). The amount of funding available to respondents for continuing education averaged $2,418.09 (*SD* = $3,350.74) and ranged from $0 to $20,000.

Findings for Objective 1: Veterinarians' Experiences and Training in Emergency Response, Disease Recognition and Reporting, and Communication Skills

Respondents' reported low levels of experience as first responders in the role of veterinarian (*M* = 2.44, *SD* = 1.24, *Mdn* = 2.00) and in any role other than as veterinarian (*M* = 2.22, *SD* = 1.11, *Mdn* = 2.00). Respondents had low levels of training about emergency response plans on the local level (*M* = 2.06, *SD* = 1.08, *Mdn* = 2.00) and state

level (*M* = 2.28, *SD* = 1.24, *Mdn* = 2.00), as well as about the National Animal Health Emergency Response Plan (*M* = 2.10, *SD* = 1.15, *Mdn* = 2.00) and National Response Framework (*M* = 2.03, *SD* = 1.11, *Mdn* = 2.00). Respondents also reported low levels of participation in response drills/scenarios on the local (*M* = 1.76, *SD* = 1.08, *Mdn* = 1.00), state (*M* = 1.83, *SD* = 1.18, *Mdn* = 1.00), and national (*M* = 1.68, *SD* = 1.04, *Mdn* = 1.00) levels.

Respondents' levels of experience and training in disease recognition and reporting ranged from low for Nipah and Hendra virus (*M* = 1.95, *SD* = 1.08, *Mdn* = 2.00) to neutral for foot-and-mouth disease (*M* = 3.16, *SD* = 1.36, *Mdn* = 3.00). Respondents' levels of experience as sources of information ranged from low for "appearing on television" (*M* = 2.14, *SD* = 1.18, *Mdn* = 2.00) to high for "answering clients' questions" (*M* = 4.18, *SD* = 0.82, *Mdn* = 4.00), and respondents' levels of training received in communication were neutral.

Findings for Objective 2: Veterinarians' Perceptions of Vulnerability of Animal Populations to Selected Animal Diseases

Respondents indicated varying perceptions of vulnerability to disease on local, state, and national levels, with local vulnerability lower than state and national vulnerability for all diseases. The average level of national vulnerability for all diseases also was higher than for local or state levels. On the local level, perceptions of vulnerability were neutral for all diseases. On the state level, perceptions of vulnerability ranged from neutral for bovine spongiform encephalopathy (*M* = 2.99, *SD* = 1.27, *Mdn* = 3.00) to high for foot-and-mouth disease (*M* = 3.82, *SD* = 1.20, *Mdn* = 4.00). On the national level, perceptions of vulnerability ranged from neutral for bovine spongiform

encephalopathy (*M* = 3.24, *SD* = 1.35, *Mdn* = 4.00) to high for foot-and-mouth disease (*M* = 4.09, *SD* = 1.05, *Mdn* = 4.00).

Respondents' perceived levels of threat posed by potential sources of disease outbreaks were lower on the local level than on the state and national levels, and threats were perceived as higher for the national level than for the local or state levels. "Producers' neighbors" were perceived to pose the lowest level of threat on all levels, including local (*M* = 2.09, *SD* = 1.06, *Mdn* = 2.00), state (*M* = 2.14, *SD* = 1.04, *Mdn* = 2.00), and national (*M* = 2.30, *SD* = 1.06, *Mdn* = 2.00). "International terrorists" were perceived to be the greatest threat on all levels, including local (*M* = 2.84, *SD* = 1.25, *Mdn* = 3.00), state (*M* = 3.03, *SD* = 1.22, *Mdn* = 3.00), and national (*M* = 3.69, *SD* = 1.10, *Mdn* = 4.00).

Findings for Objective 3: Veterinarians' Perceptions of the Potential Severity of Outbreaks of Selected Animal Diseases

The average levels of perceived severity were lower for all diseases on the local level than on the state and national levels, and perceived severity for all diseases was higher for the national level than for local and state levels. On the local level, respondents' perceptions of severity were neutral for all diseases. On the state level, respondents' perceptions of severity ranged from neutral for Nipah and Hendra virus (*M* = 3.29, *SD* = 1.07, *Mdn* = 3.00) and Japanese encephalitis (*M* = 3.29, *SD* = 1.14, *Mdn* = 3.00) to high for foot-and-mouth disease (*M* = 4.23, *SD* = 0.96, *Mdn* = 4.00). On the national level, respondents' perceptions of severity ranged from neutral for bovine spongiform encephalopathy (*M* = 3.41, *SD* = 1.40, *Mdn* = 4.00) to high for foot-and-mouth disease (*M* = 4.25, *SD* = 0.95, *Mdn* = 4.00).

Findings for Objective 4: Veterinarians' Perceptions of Readiness to Respond to Outbreaks of Selected Animal Diseases

The level of availability of resources on the local level was lower than for state and national levels, and the availability of resources was nearly equal for the state and national levels. Respondents indicated neutral levels of availability of resources on the local level about preparing for animal health emergencies (M = 2.38, SD = 1.05, Mdn = 2.00) and about response measures for animal health emergencies (M= 2.36, SD = 1.03, Mdn = 2.00). On the state level, respondents reported neutral levels of availability of resources about preparing for animal health emergencies (M = 3.03, SD = 0.90, Mdn = 3.00) and about response measures for animal health emergencies (M= 3.00, SD = 0.90, Mdn = 3.00). On the national level, respondents also reported neutral levels of availability of resources about preparing for animal health emergencies (M = 3.14, SD = 0.95, Mdn = 3.00) and about response measures for animal health emergencies (M = 3.14, SD = 0.91, Mdn = 3.00).

Respondents' average levels of confidence in local groups to respond to animal health emergencies were lower than their levels of confidence in all similar groups on the state and national levels. On the state and national levels, the groups in which respondents had the least and most confidence were producers and veterinarians, respectively. On the local level, respondents expressed the highest level of confidence in veterinarians (M = 3.28, SD = 1.03, Mdn = 3.00) and the lowest level of confidence in government (M = 2.09, SD = 0.99, Mdn = 2.00). On the state level, respondents indicated levels of confidence ranging from neutral for producers (M = 2.56, SD = 0.95, Mdn = 3.00) to high for veterinarians (M = 3.49, SD = 0.89, Mdn = 4.00). On the national level,

respondents expressed levels of confidence ranging from neutral for producers (*M* = 2.63, *SD* = 0.91, *Mdn* = 3.00) to high for veterinarians (*M*= 3.52, *SD* = 0.91, *Mdn* = 4.00).

Findings for Objective 5: Veterinarians' Knowledge and Abilities in Emergency Response, Disease Recognition and Reporting, and Communication Skills

Respondents expressed neutral average levels of confidence in acting as first responders as veterinarians (*M* = 2.87, *SD* = 1.13, *Mdn* = 3.00) and in any other role (*M* = 2.68, *SD* = 1.07, *Mdn* = 3.00). Respondents reported low levels of knowledge about emergency response plans on the local (*M* = 2.20, *SD* = 1.12, *Mdn* = 2.00) and state (*M* = 2.40, *SD* = 1.16, *Mdn* = 2.00) levels, as well as about the National Animal Health Emergency Response Plan (*M* = 2.30, *SD* = 1.15, *Mdn* = 2.00) and National Response Framework (*M* = 2.24, *SD* = 1.13, *Mdn* = 2.00). Respondents expressed neutral levels of confidence about implementing local plans (*M* = 3.09, *SD* = 1.16, *Mdn* = 3.00), state plans (*M* = 3.14, *SD* = 1.08, *Mdn* = 3.00), National Animal Health Emergency Response Plan (*M* = 3.03, *SD* = 1.13, *Mdn* = 3.00), and National Response Framework (*M* = 3.00, *SD* = 1.16, *Mdn* = 3.00). Respondents indicated high levels of need for training about local plans (*M* = 3.78, *SD* = 0.92, *Mdn* = 4.00), state plans (*M* = 3.79, *SD* = 0.92, *Mdn* = 4.00), National Animal Health Emergency Response Plan (*M* = 3.84, *SD* = 0.96, *Mdn* = 4.00), National Response Framework (*M* = 3.83, *SD* = 0.96, *Mdn* = 4.00), local drills/scenarios (*M* = 3.75, *SD* = 0.89, *Mdn* = 4.00), state drills/scenarios (*M* = 3.79, *SD* = 0.89, *Mdn* = 4.00), and national drills/scenarios (*M* = 3.81, *SD* = 0.87, *Mdn* = 4.00).

Respondents' self-reported levels of knowledge about disease recognition and reporting ranged from low for Nipah and Hendra virus (*M* = 1.95, *SD* = 0.98, *Mdn* = 2.00) to high for foot-and-mouth disease (*M* = 3.50, *SD* = 1.14, *Mdn* = 4.00), with levels

of confidence ranging from low for Nipah and Hendra virus (*M* = 2.05, *SD* = 1.06, *Mdn* = 2.00) to high for foot-and-mouth disease (*M* = 3.60, *SD* = 1.16, *Mdn* = 4.00). Respondents' perceived needs for training about disease recognition and reporting ranged from neutral for foot-and-mouth disease (*M* = 3.34, *SD* = 1.06, *Mdn* = 3.00) to high for Nipah and Hendra virus (*M* = 3.98, *SD* = 0.87, *Mdn* = 4.00).

Respondents' levels of confidence in serving as sources of information for groups varied from neutral for "industry groups – national" (*M* = 2.61, *SD* = 1.18, *Mdn* = 3.00) to high for "clients" (*M* = 3.95, *SD* = 0.97, *Mdn* = 4.00). Respondents' levels of confidence in serving as sources of information in specific situations ranged from neutral for "appearing on television" (*M* = 2.45, *SD* = 1.18) to high for "answering clients' questions" (*M* = 3.89, *SD* = 0.97) and "offering information to clients" (*M* = 3.89, *SD* = 0.97). Respondents' perceived needs for training about communication skills ranged from neutral for "interpersonal communication" (*M* = 2.88, *SD* = 1.00, *Mdn* = 3.00) to high for "serving as a spokesperson" (*M* = 3.53, *SD* = 1.01, *Mdn* = 4.00).

Findings for Objective 6: Influence of Cost on Veterinarians' Interest in Training about Emergency Response, Disease Recognition and Reporting, and Communication Skills

The level of influence of cost on respondents' interest in training was neutral for emergency response procedures (*M* = 3.44, *SD* = 1.02, *Mdn* = 3.00) and disease recognition and reporting (*M* = 3.41, *SD* = 1.06, *Mdn* = 3.00), and high for communication skills (*M* = 3.47, *SD* = 1.04, *Mdn* = 3.00).

Findings for Objective 7: Veterinarians' Intentions to Participate in Training about Emergency Response, Disease Recognition and Reporting, and Communication Skills

Respondents' levels of interest in training about emergency response were neutral for state plans (*M* = 3.44, *SD* = 0.94, *Mdn* = 4.00), and National Response Framework (*M* = 3.28, *SD* = 1.04, *Mdn* = 3.00) and high for local plans (*M* = 3.54, *SD* = 0.96, *Mdn* = 4.00) and the National Animal Health Emergency Response Plan (*M* = 3.50, *SD* = 1.14, *Mdn* = 3.00). Respondents also expressed neutral levels of interest in participating in response drills/scenarios on state (*M* = 3.40, *SD* = 1.06, *Mdn* = 4.00) and national (*M* = 3.21, *SD* = 1.08, *Mdn* = 3.00) levels and a high level of interest on the local (*M* = 3.49, *SD* = 1.04, *Mdn* = 4.00). Related to types of training about emergency response plans, respondents' levels of interest ranged from neutral about online – instructor-paced training (*M* = 2.96, *SD* = 1.06, *Mdn* = 3.00) to high about conference workshops (*M* = 3.64, *SD* = 1.03, *Mdn* = 4.00).

Respondents expressed high levels of interest in training about disease recognition and reporting for all diseases, ranging from 3.50 for highly pathogenic avian influenza (*SD* = 1.07, *Mdn* = 4.00) and exotic Newcastle disease (*SD* = 1.06, *Mdn* = 4.00) to 3.63 for foot-and-mouth disease (*SD* = 1.09, *Mdn* = 4.00). Respondents expressed neutral to high levels of interest about types of training about disease recognition and reporting ranging from 3.00 for online – instructor-paced (*SD* = 1.09, *Mdn* = 3.00) to 3.58 for seminar/workshop (*SD* = 1.04, *Mdn* = 4.00).

Respondents' levels of interest for training were neutral for all communication skills, ranging from 3.11 for "serving as a spokesperson" (*SD* = 1.12, *Mdn* = 3.00) to 3.30

for “interpersonal communication” (*SD* = 1.12, *Mdn* = 3.00). Respondents’ levels of interest in all about communication skills were neutral.

Findings for Objective 8: Relationships among Veterinarians’ Experiences and Training, Perceptions, Knowledge and Abilities, and Intentions to Participate in Training

Using a modified Borich needs assessment model (Borich, 1980; Waters & Haskell, 1989), needs for training about emergency response procedures and disease recognition and reporting were prioritized. Needs for training about emergency response procedures were moderate to high, with the greatest need for training in local emergency response plans (MWDS = 4.89). For disease recognition and reporting, high and moderate needs for training were identified for 8 of the 10 diseases. The greatest needs for training are in Nipah and Hendra virus (MWDS = 5.63) and Japanese encephalitis (MWDS = 5.49).

Conclusions

Conclusions Related to Demographic Characteristics of the Population

The demographic characteristics of respondents in this study shared similarities and differences with the population of U.S. veterinarians and respondents from previous surveys. Demographic data about Oklahoma veterinarians were not available. Demographic information described in this study was more extensive than that reported in previous studies (Ablah et al., 2008; Hsu et al., 2008; Katz et al., 2006).

Nearly three-fourths of the respondents in this study were male (71%), with an average age of 49.2 years and median age of 50 years. In contrast, the percentage of males working as veterinarians is about one-half (50.3%) of the U.S. veterinary population (AVMA, 2009). Respondents to surveys of veterinarians in Hawaii (Katz et

al., 2006) and New York (Ablah et al., 2008) were 57% and 54% male, respectively. However, respondents to a survey of veterinarians in Texas were 72.7% male (Hsu et al., 2008), and the median age of respondents in this study was near the median age category of 40 to 49 years reported for veterinarians in Hawaii (Katz et al.).

Nearly three-fourths (72.4%) of respondents in this study reported being in private practice, which is slightly higher than the number of U.S. veterinarians in private practice (65.9%) (AVMA, 2009) and lower than the 80% of respondents to a survey in Hawaii who reported working in a patient-care setting (Katz et al., 2006). The majority of respondents who were private practitioners worked in companion animal – exclusive (32.4%), mixed animal (22.7%), and companion animal – predominant (18.8%) practices. In comparison, 67.3% of U.S. veterinarians in private practice work in companion animal – exclusive practices, followed by 9.9% in companion animal – predominant practices, and 7.3% in mixed animal practices (AVMA).

Key demographic characteristics for which no comparisons were found included experiences in agriculture other than as a veterinarian, experiences as first responders, geographic distribution of licensed Oklahoma veterinarians' primary practice locations, career length, roles in current practices, length of employment at current practices, number of full-time and part-time veterinarians per practice, association memberships, and available funding for continuing education. In addition, comparisons of demographic characteristics had not been reported in the literature.

Comparisons of demographic characteristics of respondents in this study produced insights into respondents' backgrounds. Most sole owners were in mixed animal practices, followed by companion animal – exclusive and companion animal –

predominant practices. Respondents ages 30 to 69 years who had experiences as first responders were likely to have experiences as emergency medical personnel, which was the most common first-responder experience across all age categories. Respondents reporting funding available were distributed across types of practice in a similar order to type of practice reported.

Conclusions for Objective 1: Veterinarians' Experiences and Training in Emergency Response, Disease Recognition and Reporting, and Communication Skills

Respondents reported having low levels of experience and training in emergency response on local, state, and national levels, as well as low to neutral levels of experience and training in recognizing and reporting the 10 dangerous animal diseases included in this study. Respondents' levels of experience and training as sources of animal health information in specific situations ranged from low to high, while their levels of experience and training with specific communication skills were neutral. Other studies also have examined respondents' experiences and training in emergency response procedures and disease recognition and reporting (Ablah et al., 2008; Hsu et al., 2008; Katz et al., 2006), although studies including communication experiences and training have not been reported.

Respondents' levels of experience as first responders were low and nearly equal for "as a veterinarian" and in "any role other than as a veterinarian." This reflected respondents' reported lack of experiences as first responders as fire personnel, law enforcement personnel, and emergency medical personnel. Outbreaks of the diseases included in this survey have not been reported in Oklahoma, and respondents may not have considered other types of emergencies in which they have served as responders.

Respondents also reported similar low levels of training about local emergency response plans, state emergency response plans, the National Animal Health Emergency Response Plan, and the National Response Framework, despite the need for veterinarians to be knowledgeable about emergency response measures to be effective resources during animal health emergencies (Amass et al., 2008; Crutchley et al., 2007; Geering et al., 1999; Hsu et al., 2008; Katz et al., 2006; Moats, 2008; Wenzel, 2007). In addition, the levels of respondents' experiences as participants in response drills/scenarios on local, state, and national levels were low. These deficiencies in training may demonstrate a lack of appropriate and consistent training opportunities, lack of awareness of training opportunities, low participation in available training opportunities because of perceptions that opportunities do not satisfy training needs, or a combination of those three influences (S. Mason, personal communication). However, a similar lack of experience and training in bioterrorism preparedness and response was reported by a majority of veterinarians in Hawaii (88%) (Katz et al.) and Texas (80%) (Hsu et al.). Experiences as part of response drills/scenarios may be particularly important, as such exercises have been demonstrated to have a lasting, positive effect on veterinarians' knowledge about emergency response procedures (Crutchley et al.).

Ranking respondents' low to neutral levels of training in recognizing and reporting the dangerous animal diseases included in this study resulted in an order of diseases that varied from the importance placed on the diseases as part of the National Veterinary Stockpile. However, the order of diseases did reflect training that may have been provided due to recent outbreaks of diseases within the U.S. or in countries that are important U.S. trade partners. For inclusion in the stockpile by 2011, the order in which

diseases are ranked from most to least important is as follows: highly pathogenic avian influenza, foot-and-mouth disease, Rift Valley fever, exotic Newcastle disease, Nipah and Hendra virus, classical swine fever, African swine fever, bovine spongiform encephalopathy, rinderpest, and Japanese encephalitis (Garris, 2006). In comparison, respondents reported receiving the lowest levels of training about Nipah and Hendra virus, Japanese encephalitis, Rift Valley fever, rinderpest, and African swine fever. Attention placed on highly pathogenic avian influenza, exotic Newcastle disease, bovine spongiform encephalopathy, and foot-and-mouth disease during the past decade possibly resulted in more training opportunities about these diseases.

Similar potential reasons for not participating in training about emergency response procedures also may be influencing participation in training about disease recognition and reporting, particularly those diseases in which respondents have the lowest levels of training. Lack of opportunities, lack of awareness, and lack of perceived need due to lack of base knowledge about the diseases and low probabilities for disease outbreaks in respondents' local areas may influence respondents' participation in training, as well as the prevalence of respondents who were companion animal practitioners. Firsthand experiences with many of these diseases are unlikely to have occurred in many countries (Geering et al., 1999), and fewer veterinarians are receiving sufficient training in disease recognition and control (Thurmond & Brown, 2002).

Respondents had the least experience serving as a source of animal health information by appearing on television and high levels of experience with answering clients' questions and offering information to clients, as would be expected of practitioners who spend the majority of their time in patient-care settings. These

experiences also reflect the higher level of training reported for interpersonal communication than for other communication skills. Low levels of experience reported for appearing on television, speaking on radio broadcasts, offering information to the media, and answering media members' questions also reflect respondents' low levels of training in serving as a spokesperson, and interviewing, while respondents' neutral level of experience with speaking at a community meeting reflects their neutral levels of training about public speaking. These communication experiences and skills are important for veterinarians, as they are preferred sources of information about animal disease outbreaks and agroterrorism (Ashlock, 2006; Riley, 2007) and will play important roles as information conduits during emergency responses and public health emergencies (Wenzel & Wright, 2007).

Respondents' lack of perceived need for training and lack of awareness about available training opportunities about emergency response, disease recognition and reporting, and communication skills may indicate that such training opportunities are a relatively new innovation in veterinary medicine (Rogers, 2003). In addition, respondents may have negative perceptions of existing opportunities due to lack of peer support for participation in training (Rogers, 2003). These influences also may prevent respondents from developing the intentions, or protection motivation, to follow through on a coping response (Rogers, 1983), such as participating in training.

Conclusions for Objective 2: Veterinarians' Perceptions of the Vulnerability of Animal Populations to Selected Animal Diseases

Respondents' perceptions of vulnerability to animal disease outbreaks on local, state, and national levels ranged from neutral to high. In addition, respondents'

perceptions of levels of threat posed by potential sources of disease outbreaks varied from low to high. Other studies about veterinarians and response to animal disease outbreaks (Ablah et al, 2008; Hsu et al., 2008; Katz et al., 2006) have not reported veterinarians' perceptions of vulnerability, although comparisons may be made between perceptions of respondents in this study and perceptions of beef producers in Oklahoma (Ashlock, 2006) and beef feedlot managers in Kansas (Riley, 2007) about vulnerability to agroterrorism.

Respondents perceived vulnerability to outbreaks of the 10 dangerous animal diseases to be lower on the local level than on the state and national levels, with national vulnerability to all diseases being higher than for local and state levels. These separations may reflect a mindset that disease outbreaks will not occur in an individual's immediate geographic area, which is consistent with the perceptions of Oklahoma beef producers (Ashlock, 2006) and Kansas feedlot managers (Riley, 2007) about the potential for agroterrorism events in their local areas. Perceptions that disease outbreaks are not relevant to respondents' local areas may result in low levels of participation in training and emergency preparedness programs, as perceived vulnerability influences the development of protection motivation (Rogers, 1983).

The diseases associated with the lowest and highest levels of vulnerability on the state and national levels were bovine spongiform encephalopathy and foot-and-mouth disease, respectively. On the local level, foot-and-mouth disease also was the disease receiving the highest vulnerability rating. However, the lowest level of vulnerability perceived on the local level was for Nipah and Hendra virus. The ranking of diseases based on respondents' perceptions of vulnerability to disease outbreaks was somewhat

consistent with the order of importance of those diseases for inclusion into the National Veterinary Stockpile by 2011 (Garris, 2006). The tenth disease to be included in the stockpile is Japanese encephalitis, which was second in perceived vulnerability on all levels. However, the first disease to be included in the stockpile is highly pathogenic avian influenza, which was ninth-highest in perceived level of vulnerability on all levels. Foot-and-mouth disease is the second disease listed for inclusion in the stockpile, and Nipah and Hendra virus is fifth on the list to be included (Garris, 2006).

The perception of lower vulnerability to Nipah and Hendra virus may be related to respondents' lack of experience with the disease, as it was the disease about which respondents had received the least training. Lack of experience with sources of threat often may influence perceptions of vulnerability (Rogers, 1983). Rankings of the vulnerability to other diseases were fairly consistent across local, state, and national levels, although the order of vulnerability was not consistent with order based on the level of training received. The consistent perceptions of high vulnerability to foot-and-mouth disease may reflect the higher levels of training respondents reported having about this disease, as well as heightened awareness of the potential for introduction of foot-and-mouth disease due to the outbreak in the United Kingdom in 2001 (Moats, 2008).

The levels of threat respondents perceived to be posed by potential sources of disease outbreaks were lower on the local level than on the state and national levels, and threats were perceived as higher for the national level than for the local or state levels. The order of potential sources of perceived threat was the same for all levels, with the lowest perceived level of threat from producers' neighbors and the highest perceived level of threat from international terrorists. This was somewhat consistent with Kansas

beef feedlot managers' perceptions of threat from similar sources, as managers perceived international terrorists to be more of a threat than neighbors (Riley, 2007).

Conclusions for Objective 3: Veterinarians' Perceptions of the Potential Severity of Outbreaks of Selected Animal Diseases

Respondents' perceptions about the level of potential severity of disease outbreaks ranged from neutral to high across local, state, and national levels. On the local level, respondents indicated neutral levels of severity for all diseases, while potential severity was higher for state and national levels. Other studies have not reported veterinarians' perceptions or the perceptions of similar groups about the levels of potential severity of outbreaks of the diseases included in this study.

Respondents' average levels of perceived severity were lower for all diseases on the local level than on the state and national levels, while perceived severity for all diseases was higher for the national level than for local and state levels. Similar to perceived levels of vulnerability to disease, these separations may reflect a mindset that disease outbreaks in respondents' immediate geographic areas will be less severe than in other locations. Perceived severity of a threat also is a factor in the development of protection motivation (Rogers, 1983), and lack of perceived severity of local disease outbreaks could influence respondents not to participate in training opportunities.

On the local level, respondents' perceived levels of severity were lowest for foot-and-mouth disease and highest for rinderpest, while the highest perceived levels of severity on the state and national levels were for foot-and-mouth disease. On the state level, the lowest perceived levels of severity were for Nipah and Hendra virus and Japanese encephalitis. On the national level, respondents' perceptions of severity were

lowest for bovine spongiform encephalopathy. Also similar to respondents' perceptions of vulnerability, the order of diseases based on perceptions of potential severity was not consistent with the order of diseases for inclusion in the National Veterinary Stockpile by 2011. Similar patterns were observed for levels of potential severity as for levels of vulnerability, with highly pathogenic avian influenza being ranked high for severity on all levels and foot-and-mouth disease ranked high for severity on the state and national levels. Japanese encephalitis and Nipah and Hendra virus were ranked lower in potential severity than their respective positions on the stockpile list (Garris, 2006).

Respondents' perceptions of low potential severity of Nipah and Hendra virus and Japanese encephalitis also may be tied to their low levels of training about these diseases. However, respondents' perceptions of the potential severity of diseases were not highly consistent with their levels of training about the diseases. The low perceived level of potential severity of foot-and-mouth disease on the local level particularly reflects the inconsistencies with level of training received about diseases. In addition, the low perceived severity of foot-and-mouth disease on the local level may be an example of the mindset that the disease will not strike in the respondents' local areas.

Conclusions for Objective 4: Veterinarians' Perceptions of Readiness to Respond to Outbreaks of Selected Animal Diseases

Respondents indicated neutral availability of resources about preparing for and responding to animal health emergencies on the local, state, and national levels, as well as low to high levels of confidence in local, state, and national groups to respond appropriately to animal health emergencies. The levels of availability of resources on each level about preparing for animal health emergencies and about response measures

for animal health emergencies were nearly equal. Other studies about veterinarians' perceptions of emergency preparedness and response (Ablah et al., 2008; Hsu et al., 2008; Katz et al., 2006) did not examine availability of resources or perceptions of other groups that might be associated with emergency responses.

Respondents perceived the level of availability of resources on the local level to be lower than for state and national levels, and the availability of resources was nearly equal for the state and national levels. This is consistent with resources available through the Oklahoma Department of Agriculture, Food, and Forestry; the Animal Plant and Health Inspection Service of the U.S. Department of Agriculture; and the American Veterinary Medical Association. Few resources about preparedness and response plans are created and disseminated locally (L. Cole, personal communication; S. Mason, personal communication), perhaps indicating that the organizational innovation process has not yet reached the implementation phase on the local level (Rogers, 2003).

Respondents' average levels of confidence in local groups to respond to animal health emergencies were lower than their levels of confidence in all similar groups on the state and national levels. On the local level, respondents expressed the lowest level of confidence in government and the highest level of confidence in veterinarians. On the state and national levels, the groups in which respondents had the least and most confidence were producers and veterinarians, respectively.

On the local level, respondents' lack of confidence in government may reflect the low availability of resources about preparing for and responding to animal health emergencies. Government was ranked in the middle and second of the five groups on the state and national levels, respectively, which is consistent with the higher availability of

resources from these entities. In addition, respondents' had the second-highest level of confidence in Cooperative Extension/land-grant university specialists on the local and state levels, which demonstrates the value of these resources to veterinarians above industry organizations. Respondents' low levels of confidence in producers to respond appropriately reinforce the roles veterinarians need to play in educating producers about animal health emergency threats and responses (Kelly, 2005), while respondents' high levels of confidence in other veterinarians may indicate possible avenues for influencing veterinarians to become more proactive in preparing for and responding to animal health emergencies (Rogers, 2003). Involvement of other veterinarians and groups in which respondents' expressed more confidence also may help respondents develop intentions to participate in training, as communication and observational learning are important sources of information in the development of protection motivation (Rogers, 1983).

Conclusions for Objective 5: Veterinarians' Knowledge and Abilities in Emergency Response, Disease Recognition and Reporting, and Communication Skills

Respondents reported neutral levels of confidence in acting as first responders, low levels of knowledge about emergency response plans, and neutral levels of confidence about implementing emergency response plans. Respondents also indicated high needs for training about emergency response plans. Self-reported knowledge of respondents about the 10 dangerous animal diseases ranged from nearly low to high, with levels of confidence in recognizing and reporting those diseases ranging from low to high. Respondents' reported neutral to high needs for training about the diseases. Respondents' levels of confidence in serving as sources of information for specific groups and in specific situations varied from neutral to high, while their perceived levels

of need for training about communication skills ranged from neutral to high. These findings were consistent with work published in the field of veterinary medicine and animal health emergency preparedness resources that identified deficiencies in veterinarians' knowledge about their roles in emergency response and foreign animal and zoonotic diseases (Ablah et al., 2008; Crutchley et al., 2007; DeOtte, 2007; Geering et al., 1999).

Respondents' neutral average levels of confidence in acting as first responders as veterinarians and in any other role during animal health emergencies reflected respondents' low levels of experience in these roles and low availability of resources about preparedness for and responses to animal health emergencies. The low to neutral levels of knowledge about and levels of confidence in implementing local emergency response plans, state emergency response plans, the National Animal Health Emergency Response Plan, and National Response Framework also were consistent with respondents' lack of experiences and training with these plans. Understanding the components of these plans is essential for veterinarians who could be involved in emergency responses (Geering et al., 1999; Wenzel, 2007). This understanding could be built through training about the plans and through response drills/scenarios, for which respondents indicated neutral to high levels of need. A majority of veterinarians surveyed in New York also indicated needs for additional training about emergency response (Ablah et al., 2008).

Respondents' low to neutral levels of training about the 10 dangerous animal diseases included in this study also were consistent with respondents' low to high self-reported levels of knowledge about recognition and reporting of the diseases, as were

their levels of confidence in reporting and recognizing the diseases. Respondents' indicated higher needs for training about the diseases, and the order of training needed was the inverse of their levels of knowledge and confidence. Respondents' indicated low levels of knowledge and confidence about Nipah and Hendra virus and Japanese encephalitis, which were ranked first and second, respectively, in the level of training needed. Respondents also expressed the highest levels of knowledge and confidence about recognizing and reporting foot-and-mouth disease, which was ranked last among diseases for training needed. The higher levels of need identified by respondents indicate at least a minimal awareness that they may need to recognize and report occurrences of these diseases, which agrees with the suggestion of Geering et al. (1999) that veterinarians need to be aware of the possibilities of disease incidents.

Respondents' levels of confidence in serving as sources of information for specific groups and in specific situations during animal health emergencies were consistent with their levels of experience and training in communications. Lower levels of confidence were expressed for groups outside their local areas, and respondents' levels of confidence in serving as sources of information for Cooperative Extension/land-grant university specialists were ranked in the middle. These may indicate areas of need for building veterinarians' awareness of their roles as sources of information within communities (Riley, 2007). Respondents were neutral about their needs for training in these skills, although veterinarians' skills and confidence as communicators are vital to their roles as sources of information, particularly during animal health emergencies (Kelly, 2005).

Conclusions for Objective 6: Influence of Cost on Veterinarians' Interest in Training about Emergency Response, Disease Recognition and Reporting, and Communication

Respondents indicated the level of influence of cost on their interest in training was neutral and nearly equal for emergency response training and disease recognition and reporting training, and high for communication training. Other studies asking veterinarians about their interest in future training about emergency response and diseases (Ablah et al., 2008; Hsu et al., 2008; Katz et al., 2006) did not account for cost as a factor in whether veterinarians would attend training, although lack of financial incentives has been identified as a barrier to participation (Kelly, 2005). Cost may be an important influence on veterinarians' intentions to participate in training, with higher costs associated with fewer intentions to perform an action (Rogers, 1983).

Conclusions for Objective 7: Veterinarians' Intentions to Participate in Training about Emergency Response, Disease Recognition and Reporting, and Communication Skills

Respondents' levels of interest in training about emergency response, disease, and communication topics ranged from neutral to high, and their levels of interest in different types of training about these topics were neutral to high. Information about levels of interest in training about emergency response have not been reported in the literature, although parallels may be drawn between these results and studies that examined dichotomous responses related to training opportunities. Studies have not been reported in which levels of interest in training about the 10 dangerous animal diseases included in this study and communication skills were examined.

Respondents' levels of interest in training about local, state, and national emergency response plans were nearly equal, although their expressed levels of need for

training about emergency response plans were high. Studies of veterinarians in New York (Ablah et al., 2008) and Texas (Hsu et al., 2008) asked respondents about whether they would like to be informed of or participate in training opportunities, although they did not ask for respondents' levels of interest in those opportunities. In New York, nearly all (94%) respondents indicated they would like to receive additional training about emergency preparedness (Ablah et al.), while about 67% of veterinarians in a Texas study indicated they would like training in bioterrorism preparedness and response (Hsu et al.). In addition, respondents' levels of interest in response drills/scenarios on all levels were similar to their levels of interest in training about plans, although drills/scenarios may be the best way to become familiar with emergency response procedures (Crutchley et al., 2007; Deveney & Scott, 2008; Kelly, 2005; Moats, 2008).

Respondents' levels of interest about types of training about emergency response plans varied more than their levels of interest in response plan training. Respondents were most interested in conference workshops and least interested in online – instructor-paced training. In comparison, about 37% of veterinarians in north Texas preferred self-paced training via the Internet over other self-paced training opportunities and preferred small-group workshops for instructor-led training (Hsu et al., 2008).

Similar to their levels of interest in emergency response training, respondents' levels of interest in training about the 10 dangerous animal diseases also were nearly equal, although respondents' perceived levels of need for training about some diseases were high. For types of training about disease recognition and reporting, however, respondents' levels of interest were more varied. Respondents expressed the highest levels of interest in training via seminar/workshops and conference workshops and the

lowest levels of interest in online – instructor-paced training, which is consistent with respondents' levels of interest in types of training about emergency response and the preferences of Texas veterinarians (Hsu et al., 2008).

For communication skills, respondents again were nearly equal in their levels of interest about training, although some variation occurred. Respondents' levels of interest in training were slightly higher for interpersonal communication and slightly lower for serving as a spokesperson. As respondents' levels of confidence in various aspects of communication varied from low to high, respondents' lower levels of interest in training about communication indicate respondents' place less value on communication skills. All of the communication skills included in this study have been identified as important in veterinarians being able to serve as effective sources of information and first responders during animal health emergencies (Brown, 2003; Kelly, 2005). Respondents also had slightly varied levels of interest in types of training about communication compared to their levels of interest in types of training about emergency response and diseases. The least preferred method of training about communication was Web conference, while the most preferred method of training remained conference workshops. This was consistent with New York veterinarians' preferences for in-person training about zoonotic diseases (Ablah et al., 2008).

The lower levels of interest expressed by respondents when compared to respondents' perceived levels of need for training indicate the presence of other factors in respondents' intentions to participate in training about emergency response plans, diseases, and communication.In addition, cost may be a factor in these intentions

(Rogers, 1983), although respondents' reported neutral levels of influence of cost on training about emergency response and diseases recognition and reporting.

Conclusions for Objective 8: Relationships among Veterinarians' Experiences and Training, Knowledge and Abilities, Perceptions, Influence of Cost, and Intentions to Participate in Training

Distinct factors could not be determined to support protection motivation as a model for respondents' intentions to participate in training, likely due to a low subject-to-variable ratio. Using a modified Borich needs assessment model, the areas of greatest need for training were identified to be local emergency response plans, Nipah and Hendra virus, and Japanese encephalitis. Moderate to high needs for training were calculated for all emergency response topics and 8 of the 10 diseases, demonstrating the importance of education and training to enhance capabilities in emergency planning and response (Buss et al., 2006; Brown, 2003; Crutchley et al., 2007) and to advance organizations and individuals through innovation-decision processes (Rogers, 2003).

Moderate to high discrepancies were calculated for all emergency response plans. The high need for training about local emergency response plans and moderate need for training about state and national plans are consistent with deficiencies identified by respondents in availability of resources and in their own levels of experience, knowledge and confidence. First responders from all areas of health and emergency response, including veterinarians, need to be trained in emergency response procedures (Crutchley et al., 2007; Cupp et al., 2004; Nusbaum et al., 2007), and these results support such training so that inefficient use of veterinarians can be avoided during animal health emergencies (Wenzel, 2007).

Moderate to high discrepancies were calculated for all diseases except bovine spongiform encephalopathy and foot-and-mouth disease. These moderate to high needs for training are consistent with rankings of diseases based on respondents' levels of training, knowledge, and confidence and demonstrate the importance of training in disease recognition and reporting. Disease recognition and reporting are "critical skills" (Wenzel & Wright, 2007, p. 1310) for veterinarians, who are part of the first line of control and defense for natural and man-made disease outbreaks (Crutchley et al., 2007; Kosal & Anderson, 2004).

Recommendations

Recommendations Related to Demographic Characteristics of the Population

Few resources were available for demographic comparison of respondents in this study to other populations. Additional reports about veterinarians' career and practice demographic characteristics should be made available so awareness messages and training opportunities may be targeted to more closely meet veterinarians' needs for information and education.

Tailoring educational resources about animal health emergencies to different types of practices should be considered. The majority of respondents in this study worked with companion animals, which are impacted by various types of health emergencies. Companion animals and livestock all may be affected by natural disasters, supporting the need for emergency response training for veterinarians involved in all types of practice. However, the 10 dangerous diseases affect livestock and horses, which may lower companion animal practitioners' perceptions of the importance of training about emergency response and disease recognition and reporting. However, companion animal

practitioners need to be educated about zoonotic diseases to fulfill their roles as sentinels for public health concerns. Targeting awareness messages and educational opportunities will be an important avenue for increasing the interest in these topics across all types of practices.

Recommendations for Objective 1: Veterinarians' Prior Experiences and Training in Emergency Response, Disease Recognition and Reporting, and Communication Skills

Little can be done to encourage veterinarians to gain additional experiences as first responders outside the field of veterinary medicine. However, veterinarians' awareness of what constitutes an animal health emergency and the roles they play in such an emergency needs to be sharpened. Veterinarians in Oklahoma likely have been involved in responses to natural disasters, and clarifying the roles they play in all types of emergencies should be one goal for continuing education initiatives. As veterinarians' roles in emergency responses are clarified, their levels of experience with emergency response plans can be increased through training and response drills/scenarios provided by local and state agencies assisted by partners such as industry groups, law enforcement, fire personnel, and Cooperative Extension. In addition, targeting these opportunities based on career demographic characteristics will produce more effective experiences for participants.

Veterinarians' experiences related to the 10 dangerous animal diseases included in this study need to be explored further, particularly in relation to their awareness of the structure of the National Veterinary Stockpile. Based on the information provided in this study and information gathered from future studies, educational resources should be developed to increase veterinarians' levels of experience with recognition and reporting

of these diseases. All diseases may not affect veterinarians' immediate geographic area or practice, but clients and other community members likely will turn to veterinarians as sources of information if outbreaks of diseases in other locations occur. In addition, food animal practitioners need to be aware of all diseases, as disease outbreaks will impact transport of animals across large geographic areas.

The role of veterinarians as sources of information for clients and community members, regardless of the type of animal health emergency and type of practice, demands that veterinarians have adequate skills for communicating with multiple groups in multiple situations. Opportunities should be provided for veterinarians to enhance their communication skills, particularly skills beyond interpersonal communication. Increasing veterinarians' levels of experience in multiple situations will help them be more effective spokespeople during animal health emergencies.

Recommendations for Objective 2: Veterinarians' Perceptions of Vulnerability to Disease Outbreaks

Raising veterinarians' awareness of the susceptibility of animal populations in their local areas is imperative to encouraging them to be prepared as first responders for animal health emergencies involving animal disease outbreaks stemming from different sources. Veterinarians who perceive low levels of vulnerability of animals in their own areas will not be effective sources of information about emergency preparedness and response for their clients and other community members. Veterinarians' perceptions may influence the perceptions of their clients and other groups, resulting in low levels of security, disaster preparedness, and other preventive measures that could minimize the effects of an animal health emergency.

In addition, veterinarians need additional information and education about the potential for outbreaks of the disease on the National Veterinary Stockpile list, as well as the rationale behind their order of inclusion into the stockpile. Such resources may help shift veterinarians' perceptions of vulnerability on the local, state, and national levels and increase their levels of awareness and preparedness for disease outbreaks.

Recommendations for Objective 3: Veterinarians' Perceptions of Potential Severity of Disease Outbreaks

Similar to veterinarians' perceptions of vulnerability to diseases, increasing veterinarians' awareness of the potential severity of outbreaks of the 10 dangerous animal diseases is essential to their effectiveness as responders and sources of information. Veterinarians who do not perceive disease outbreaks to be potentially severe in their local areas will not be prepared for outbreaks. In addition, veterinarians who perceive lower levels of potential severity also may be as cautious when dealing with a potentially highly infectious disease, and this lack of caution could compound the effects of such diseases. Resources clarifying the dangers of the most dangerous animal diseases and their potential impacts on local, state, and national animal agriculture are needed to help create capacity for preparedness and response among private practitioners.

Recommendations for Objective 4: Veterinarians' Perceptions of Readiness to Respond to Disease Outbreaks

Veterinarians' perceptions of readiness to respond to animal health emergencies on all levels may be shifted by increasing the availability of resources about preparedness and response measures. These resources are particularly important on the local level, where resources typically are not disseminated. However, veterinarians' roles as first

responders require them to be as knowledgeable as possible about emergency response plans and organizational roles in those plans. Including veterinarians in local planning and cross-training of first responders, officials of organizations, and producers that will be involved in emergency responses will increase the effectiveness of responses. Cross-training also will demonstrate the capabilities of various entities to everyone who may be involved in responses, including veterinarians, which will help increase confidence and teamwork during an animal health emergency.

Recommendations for Objective 5: Veterinarians' Knowledge and Abilities in Emergency Response, Disease Recognition and Reporting, and Communication Skills

Training opportunities and other educational resources that target specific needs of veterinarians will increase veterinarians' levels of knowledge about emergency response, disease recognition and reporting, and communication, as well as their levels of confidence, by increasing their levels of experience with these topics. Increasing levels of knowledge and confidence will help veterinarians in effectively fulfilling roles associated with responding to animal health emergencies. Veterinarians likely have had access to training about emergency response and many or all of the diseases included in this study, and their levels of knowledge and confidence may be enhanced through better use of adult learning principles to increase participating in such opportunities. Training about communication skills also should be incorporated into emergency response and disease training, as veterinarians are less likely to seek education to develop communication skills.

Recommendations for Objective 6: Influence of Cost on Veterinarians' Interest in Training

Cost should be explored further to identify if it has a greater impact on interest in training than what was measured in this survey. Lack of financial incentives has been identified as a barrier to participation in training about emergency response and disease recognition and reporting. In addition, associations among cost, topics, and types of training may work together to influence veterinarians' interests in training, and ways to overcome barriers presented by any existing relationships need to be created.

Recommendations for Objective 7: Veterinarians' Intentions to Participate in Training about Emergency Response, Disease Recognition and Reporting, and Communication

Low levels of interest in training about emergency response and disease recognition and reporting were identified in contrast to other studies. Veterinarians' lack of interest needs to be explored further to identify potential causes and find solutions for increasing veterinarians' interest in training. As veterinarians' perceived needs for training in emergency response, diseases, and communication skills were higher than their levels of interest, other factors may need to be taken into account when trying to focus veterinarians' attention on training opportunities.

Targeting veterinarians' perceived needs for training should help increase interest, and creating training and resources that meet their levels of interest in different types of training may promote use and participation. Veterinarians indicated preferences for in-person training, and including experiential learning as part of in-person training will maximize its benefits. Response drills/scenarios have been identified as critical in expanding veterinarians' knowledge of emergency response procedures and diseases, and

drills/scenarios include inherent aspects of communication. Creating and offering more opportunities for participation in response drills/scenarios should be a goal of veterinary medical continuing education on the local, state, and national levels.

Recommendations for Objective 8: Relationships among Veterinarians' Prior Experiences and Training, Knowledge and Abilities, Perceptions, Influence of Cost, and Intentions to Participate in Training

Training opportunities and resources that focus on the areas of greatest need identified through the mean weighted discrepancy scores should be priorities in continuing education related to emergency response and disease recognition and reporting. Meeting these needs will help veterinarians overcome deficiencies in their experiences and knowledge, as well as increase their levels of confidence as first responders and sources of information during animal health emergencies.

Training veterinarians in emergency response procedures will help avoid inefficient responses that occurred during Hurricane Katrina, while training about dangerous animal diseases will further increase response capacity during animal disease outbreaks. Further examination of needs through discrepancy scores also should be conducted to identify additional areas for emphasis in training, as the discrepancy scores may be more useful than averages that provide neutral responses.

Recommendation for Future Research and Practice

Replication and expansion of this study will provide avenues for increasing response capacity for all types of animal health emergencies and for developing a more effective veterinary medical workforce. Conducting this survey in all 50 states would provide a basis for a consistent model for educating veterinarians that could in turn lead

to funding opportunities for states to increase response capacity. To achieve this goal, audiences within the veterinary profession should be described in more detail to provide a basis for targeting awareness messages, training opportunities, and educational resources about emergency response plans, disease recognition and reporting, and communication skills. Targeted resources should be created and tested quantitatively and qualitatively to ensure their effectiveness in increasing levels of experience and knowledge. Additional influences on use of resources should be explored, and results should be used in combination with testing of resources to create a consistent model for educating veterinarians about emergency response plans, disease recognition and reporting, and communication skills. Once a model is created, it should be expanded to include other agricultural stakeholder groups, such as Cooperative Extension professionals, agricultural teachers, and industry representatives, to produce targeted resources to meet their needs and increase the effectiveness of responses to emergencies impacting agriculture.

Prior to replicating this study, errors within the questionnaire should be corrected to provide consistent response scales for all items. In addition, questions should be examined and edited to ensure appropriate information is available for calculating mean weighted discrepancy scores for the purpose of identifying areas of greatest need for training. Survey methods also should be tailored to additional populations studied, including technology use and preferences, perceptions of survey length, and time available to complete the questionnaire.

Implications

Educational opportunities and resources that meet veterinarians' needs related to emergency response and management, disease recognition and reporting, and communication skills are not available or are not being targeted to appropriate populations. Key demographic information is needed to overcome these barriers to veterinarians' awareness of and use of educational resources.

Veterinarians' awareness of threats to agriculture, particularly in their immediate geographical areas, needs to be enhanced, as does their awareness of the importance of their abilities in emergency response, disease recognition and reporting, and communication. Providing training experiences that simulate emergencies is essential to developing veterinarians' abilities and perceptions of relevance to their practices. Veterinarians' perceptions of relevance to their practices in particular should be targeted to overcome their current perceptions that animal health emergencies will not impact or will have little impact on their local areas.

Cross-training about emergency response that includes veterinarians, other emergency responders, and other stakeholder groups may create opportunities for veterinarians to instigate changes in emergency preparedness and response in their local areas. Through training, veterinarians may become more aware of emergency response resources on the local level. In addition, veterinarians would be better qualified to contribute to availability of resources on the local level if they completed training at higher levels of government organization.

Other factors influencing veterinarians' interesting in training opportunities include prior knowledge, experiences, and self-efficacy, which need to be enhanced

through hands-on training opportunities. Veterinarians may be overly confident in implementing emergency response plans or serving as sources of information due to a lack of experience and training in emergency response and communication. In addition, veterinarians may not understand the implications of delays in diagnosing dangerous animal diseases. As a result, veterinarians may not participate in training, making them inefficient responders and communicators during disease outbreaks and other animal health emergencies.

Identifying Oklahoma veterinarians' strengths and deficiencies in emergency response, disease recognition and reporting, and communication skills is one step toward in-depth exploration of veterinarians' needs and influences on their perceptions. Further examination of needs and influences will provide a basis for increasing preparedness and response capacity for animal health emergencies within the veterinary medicine, which help decrease the impact of such emergencies on animal agriculture.

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APPENDICES

APPENDIX A

INSTITUTIONAL REVIEW BOARD

Oklahoma State University Institutional Review Board

Date:	Wednesday, March 25, 2009
IRB Application No	AG0915
Proposal Title:	First Responders in Animal Health Emergencies: Veterinarians' Perceptions and Training Needs
Reviewed and Processed as:	Exempt

Status Recommended by Reviewer(s): Approved Protocol Expires: 3/24/2010

Principal Investigator(s):

Traci Naile
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The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

X The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Beth McTernan in 219 Cordell North (phone: 405-744-5700, beth.mcternan@okstate.edu).

Sincerely,

Shelia Kennison, Chair
Institutional Review Board

Oklahoma State University Institutional Review Board

Date:	Friday, April 10, 2009	**Protocol Expires:**	**3/24/2010**
IRB Application No:	AG0915		
Proposal Title:	First Responders in Animal Health Emergencies: Veterinarians' Perceptions and Training Needs		
Reviewed and Processed as:	**Modification/Continuation**		

Status Recommended by Reviewer(s) **Approved**

Principal Investigator(s):

Traci Naile
446 Ag Hall
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Sara Faber
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Approvals are valid for one calendar year, after which time a request for continuation must be submitted. Any modifications to the research project approved by the IRB must be submitted for approval with the advisor's signature. The IRB office MUST be notified in writing when a project is complete. Approved projects are subject to monitoring by the IRB.

X The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

Signature

Sheila Kennison, Chair, Institutional Review Board

Friday, April 10, 2009
Date

APPENDIX B

PANEL OF EXPERTS

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APPENDIX C

PILOT TEST

First responders in animal health emergencies: Technicians'

Introduction

This survey includes questions about animal health emergencies and 10 of the most dangerous animal disease threats identified to be part of the National Veterinary Stockpile by 2011. You will be asked to consider aspects of animal health emergencies and these diseases on three levels: local, state, and national. Some questions may be repeated for each level.

All questions except demographics will ask for responses on a scale of very low, low, neutral, high, and very high. Please answer all questions to the best of your knowledge and ability.

Thank you for your assistance with this important survey. The information you provide will help shape future educational opportunities for you and your colleagues.

The dangerous animal disease threats included in this survey are: highly pathogenic avian influenza, foot-and-mouth disease, Rift Valley fever, exotic Newcastle disease, nipah and hendra virus, classical swine fever, African swine fever, bovine spongiform encephalopathy, rinderpest, and Japanese encephalitis.

Disease outbreaks: Local

The vulnerability of the animal populations in my local area to a natural or man-made outbreak of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

The severity of a natural or man-made outbreak of the following diseases in the animal populations in my local area would be:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

First responders in animal health emergencies: Technicians'

The level of threat posed by the following potential sources of outbreaks in my local area of the most dangerous animal diseases referred to in the previous questions is:

	Very low	Low	Neutral	High	Very high
Natural (emerging or re-emerging diseases)	◯	◯	◯	◯	◯
International terrorists	◯	◯	◯	◯	◯
Domestic groups	◯	◯	◯	◯	◯
Producers' disgruntled employees	◯	◯	◯	◯	◯
Producers' neighbors	◯	◯	◯	◯	◯

Disease outbreaks: State

The vulnerability of the animal populations in my state to a natural or man-made outbreak of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

The severity of a natural or man-made outbreak of the following diseases in the animal populations in my state would be:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

First responders in animal health emergencies: Technicians'

The level of threat posed by the following potential sources of outbreaks in my state of the most dangerous animal diseases referred to in the previous questions is:

	Very low	Low	Neutral	High	Very high
Natural (emerging or re-emerging diseases)	◯	◯	◯	◯	◯
International terrorists	◯	◯	◯	◯	◯
Domestic groups	◯	◯	◯	◯	◯
Producers' disgruntled employees	◯	◯	◯	◯	◯
Producers' neighbors	◯	◯	◯	◯	◯

Disease outbreaks: National

The vulnerability of U.S. animal populations to a natural or man-made outbreak of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

The severity of a natural or man-made outbreak of the following diseases in U.S. animal populations would be:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

First responders in animal health emergencies: Technicians'

The level of threat posed by the following potential sources of outbreaks in the U.S. of the most dangerous animal diseases referred to in the previous questions is:

	Very low	Low	Neutral	High	Very high
Natural (emerging or re-emerging diseases)	◯	◯	◯	◯	◯
International terrorists	◯	◯	◯	◯	◯
Domestic groups	◯	◯	◯	◯	◯
Producers' disgruntled employees	◯	◯	◯	◯	◯
Producers' neighbors	◯	◯	◯	◯	◯

Preparedness for animal health emergencies

Availability of resources about preparing for animal health emergencies on the following levels is:

	Very low	Low	Neutral	High	Very high
Local	◯	◯	◯	◯	◯
State	◯	◯	◯	◯	◯
National	◯	◯	◯	◯	◯

Availability of resources about response measures for animal health emergencies on the following levels is:

	Very low	Low	Neutral	High	Very high
Local	◯	◯	◯	◯	◯
State	◯	◯	◯	◯	◯
National	◯	◯	◯	◯	◯

First responders in animal health emergencies: Technicians'

My level of confidence in the following groups to respond appropriately to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local government	○	○	○	○	○
State government	○	○	○	○	○
Federal government	○	○	○	○	○
Local industry organizations	○	○	○	○	○
State industry organizations	○	○	○	○	○
National industry organizations	○	○	○	○	○
Local Cooperative Extension/land-grant university specialists	○	○	○	○	○
State Cooperative Extension/land-grant university specialists	○	○	○	○	○
National Cooperative Extension/land-grant university specialists	○	○	○	○	○
Veterinary technicians in my local area	○	○	○	○	○
Veterinary technicians throughout my state	○	○	○	○	○
Veterinary technicians throughout the U.S.	○	○	○	○	○
Producers in my local area	○	○	○	○	○
Producers throughout my state	○	○	○	○	○
Producers throughout the U.S.	○	○	○	○	○

Responding to animal health emergencies

My level of experience in acting as a first responder during animal health emergencies in the following roles is:

	Very low	Low	Neutral	High	Very high
As a veterinary technician	○	○	○	○	○
Any role other than as a veterinary technician	○	○	○	○	○

My knowledge of the following plans for responding to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local emergency response plan	○	○	○	○	○
State emergency response plan	○	○	○	○	○
National Animal Health Emergency Response Plan	○	○	○	○	○
National Response Framework	○	○	○	○	○

First responders in animal health emergencies: Technicians'

My level of knowledge about recognizing and reporting clinical signs of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	○	○	○	○	○
Foot-and-mouth disease	○	○	○	○	○
Rift Valley fever	○	○	○	○	○
Exotic Newcastle disease	○	○	○	○	○
Nipah and Hendra virus	○	○	○	○	○
Classical swine fever	○	○	○	○	○
African swine fever	○	○	○	○	○
Bovine spongiform encephalopathy	○	○	○	○	○
Rinderpest	○	○	○	○	○
Japanese encephalitis	○	○	○	○	○

My level of confidence in acting as a first responder during animal health emergencies in the following roles is:

	Very low	Low	Neutral	High	Very high
As a veterinary technician	○	○	○	○	○
Any role other than as a veterinary technician	○	○	○	○	○

My level of confidence in my ability to implement procedures of the following plans for responding to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local emergency response plan	○	○	○	○	○
State emergency response plan	○	○	○	○	○
National Animal Health Emergency Response Plan	○	○	○	○	○
National Response Framework	○	○	○	○	○

First responders in animal health emergencies: Technicians'

My level of confidence in my ability to recognize and report clinical signs of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

Providing animal health information

My level of experience in serving as a source of animal health information in any situation for the following groups is:

	Very low	Low	Neutral	High	Very high
Clients	◯	◯	◯	◯	◯
Community members who are not clients	◯	◯	◯	◯	◯
Media - print	◯	◯	◯	◯	◯
Media - television	◯	◯	◯	◯	◯
Media - radio	◯	◯	◯	◯	◯
Industry groups - local	◯	◯	◯	◯	◯
Industry groups - state	◯	◯	◯	◯	◯
Industry groups - national	◯	◯	◯	◯	◯
Nonprofit groups that are not directly associated with animal agriculture	◯	◯	◯	◯	◯
Local Cooperative Extension/land-grant university specialists	◯	◯	◯	◯	◯
State Cooperative Extension/land-grant university specialists	◯	◯	◯	◯	◯
National Cooperative Extension/land-grant university specialists	◯	◯	◯	◯	◯
Local government	◯	◯	◯	◯	◯
State government	◯	◯	◯	◯	◯
Federal government	◯	◯	◯	◯	◯

First responders in animal health emergencies: Technicians'

My level of experience in serving as a source of general animal health information in the following situations is:

	Very low	Low	Neutral	High	Very high
Answering clients' questions	○	○	○	○	○
Offering information to clients	○	○	○	○	○
Speaking at a community meeting	○	○	○	○	○
Answering media members' questions	○	○	○	○	○
Offering information to the media	○	○	○	○	○
Appearing on television	○	○	○	○	○
Speaking on a live radio broadcast	○	○	○	○	○

My level of confidence in serving as a source of information about animal health emergencies for the following groups is:

	Very low	Low	Neutral	High	Very high
Clients	○	○	○	○	○
Community members who are not clients	○	○	○	○	○
Media - print	○	○	○	○	○
Media - television	○	○	○	○	○
Media - radio	○	○	○	○	○
Industry groups - local	○	○	○	○	○
Industry groups - state	○	○	○	○	○
Industry groups - national	○	○	○	○	○
Nonprofit groups that are not directly associated with animal agriculture	○	○	○	○	○
Local Cooperative Extension/land-grant university specialists	○	○	○	○	○
State Cooperative Extension/land-grant university specialists	○	○	○	○	○
National Cooperative Extension/land-grant university specialists	○	○	○	○	○
Local government	○	○	○	○	○
State government	○	○	○	○	○
Federal government	○	○	○	○	○

First responders in animal health emergencies: Technicians'

My level of confidence in serving as a source of information about animal health emergencies in the following situations is:

	Very low	Low	Neutral	High	Very high
Answering clients' questions	◯	◯	◯	◯	◯
Offering information to clients	◯	◯	◯	◯	◯
Speaking at a community meeting	◯	◯	◯	◯	◯
Answering media members' questions	◯	◯	◯	◯	◯
Offering information to the media	◯	◯	◯	◯	◯
Appearing on television	◯	◯	◯	◯	◯
Speaking on a live radio broadcast	◯	◯	◯	◯	◯

My level of confidence in the following types of media to report accurately information I provide is:

	Very low	Low	Neutral	High	Very high
Print	◯	◯	◯	◯	◯
Television	◯	◯	◯	◯	◯
Radio	◯	◯	◯	◯	◯

My level of confidence in the following types of media to report accurately about animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Print	◯	◯	◯	◯	◯
Television	◯	◯	◯	◯	◯
Radio	◯	◯	◯	◯	◯

Training experiences and needs

The level of training I have received about the procedures of the following emergency response plans is:

	Very low	Low	Neutral	High	Very high
Local emergency response plan	◯	◯	◯	◯	◯
State emergency response plan	◯	◯	◯	◯	◯
National Animal Health Emergency Response Plan	◯	◯	◯	◯	◯
National Response Framework	◯	◯	◯	◯	◯

First responders in animal health emergencies: Technicians'

My level of experience as a participant in response drills/scenarios on the following levels is:

	Very low	Low	Neutral	High	Very high
Local	◯	◯	◯	◯	◯
State	◯	◯	◯	◯	◯
National	◯	◯	◯	◯	◯

The level of training I have received about recognizing and reporting clinical signs of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

The level of training I have received related to following aspects of communication is:

	Very low	Low	Neutral	High	Very high
Interpersonal communication	◯	◯	◯	◯	◯
Public speaking	◯	◯	◯	◯	◯
Interviewing	◯	◯	◯	◯	◯
Serving as a spokesperson	◯	◯	◯	◯	◯
Written communication	◯	◯	◯	◯	◯

The level of training I need to improve my skills in implementing procedures of the following plans for responding to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local emergency response plan	◯	◯	◯	◯	◯
State emergency response plan	◯	◯	◯	◯	◯
National Animal Health Emergency Response Plan	◯	◯	◯	◯	◯
National Response Framework	◯	◯	◯	◯	◯

First responders in animal health emergencies: Technicians'

The level of training I need as a participant in response drills and/or scenarios to improve my skills in responding to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local	◯	◯	◯	◯	◯
State	◯	◯	◯	◯	◯
National	◯	◯	◯	◯	◯

The level of training I need to improve my ability to recognize and report clinical signs of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

The level of training I need to improve my skills in the following aspects of communication is:

	Very low	Low	Neutral	High	Very high
Interpersonal communication	◯	◯	◯	◯	◯
Public speaking	◯	◯	◯	◯	◯
Interviewing	◯	◯	◯	◯	◯
Serving as a spokesperson	◯	◯	◯	◯	◯
Written communication	◯	◯	◯	◯	◯

Training preferences

My level of interest in training to improve my skills in implementing procedures of the following plans for responding to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local emergency response plan	◯	◯	◯	◯	◯
State emergency response plan	◯	◯	◯	◯	◯
National Animal Health Emergency Response Plan	◯	◯	◯	◯	◯
National Response Framework	◯	◯	◯	◯	◯

First responders in animal health emergencies: Technicians'

My level of interest in participating in response drills and/or scenarios to improve my skills in responding to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local	◯	◯	◯	◯	◯
State	◯	◯	◯	◯	◯
National	◯	◯	◯	◯	◯

My level of interest in training to improve my ability to recognize and report clinical signs of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

My level of interest in training to improve my skills in the following aspects of communication is:

	Very low	Low	Neutral	High	Very high
Interpersonal communication	◯	◯	◯	◯	◯
Public speaking	◯	◯	◯	◯	◯
Interviewing	◯	◯	◯	◯	◯
Serving as a spokesperson	◯	◯	◯	◯	◯
Written communication	◯	◯	◯	◯	◯

My level of interest in the following types of training about response procedures for animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Online, self-paced	◯	◯	◯	◯	◯
Online, instructor-paced	◯	◯	◯	◯	◯
Web conference	◯	◯	◯	◯	◯
Seminar/workshop	◯	◯	◯	◯	◯
Workshop at a conference	◯	◯	◯	◯	◯

First responders in animal health emergencies: Technicians'

My level of interest in the following types of training about recognizing and reporting clinical signs of the most dangerous animal diseases is:

	Very low	Low	Neutral	High	Very high
Online, self-paced	◯	◯	◯	◯	◯
Online, instructor-paced	◯	◯	◯	◯	◯
Web conference	◯	◯	◯	◯	◯
Seminar/workshop	◯	◯	◯	◯	◯
Workshop at a conference	◯	◯	◯	◯	◯

My level of interest in the following types of training about communication is:

	Very low	Low	Neutral	High	Very high
Online, self-paced	◯	◯	◯	◯	◯
Online, instructor-paced	◯	◯	◯	◯	◯
Web conference	◯	◯	◯	◯	◯
Seminar/workshop	◯	◯	◯	◯	◯
Workshop at a conference	◯	◯	◯	◯	◯

The level of influence of cost on my interest in training about the following topics is:

	Very low	Low	Neutral	High	Very high
Emergency response procedures	◯	◯	◯	◯	◯
Disease recognition and reporting	◯	◯	◯	◯	◯
Communication	◯	◯	◯	◯	◯

Career and practice demographics

The zip code in which my primary practice is located is:

ZIP: ☐

My primary type of practice is:

- ◯ Companion animal, exclusive
- ◯ Companion animal, predominant
- ◯ Food animal, exclusive
- ◯ Food animal, predominant
- ◯ Equine, exclusive
- ◯ Equine, predominant
- ◯ Mixed animal
- ◯ Other

First responders in animal health emergencies: Technicians'

The number of veterinary technicians employed by my practice is:

Number of full time

Number of part time

Does not apply (Enter zero)

Funding is available through my employer for continuing education:

- ◯ Yes
- ◯ No

I have been a veterinary technician for:

- ◯ Less than one year
- ◯ One year or more (Enter a whole number in the box below)

Number of years

I have been employed in my current practice for:

- ◯ Less than one year
- ◯ One year or more (Enter a whole number in the box below)

Number of years

I am a current member of the following associations (Mark all that apply):

- ☐ None
- ☐ National Association of Veterinary Technicians in America
- ☐ State veterinary technician association (please list all in box below)
- ☐ Other agriculture industry group (please list all)

Names of other associations

Personal demographics

My age is:

Age, in years

I am:

- ◯ Female
- ◯ Male

First responders in animal health emergencies: Technicians'

I have earned the following degrees (Mark all that apply):

- [ ] Associate's
- [ ] Bachelor's
- [ ] Master's
- [ ] Doctor of philosophy
- [ ] Doctor of education

Other than as a veterinary technician, what experiences have you had in agriculture? (Mark all that apply)

- [ ] None
- [ ] Paid work experience
- [ ] Unpaid work experience
- [ ] Live(d) in a rural area
- [ ] Live(d) on a farm
- [ ] Own(ed) a farm
- [ ] Work(ed) in a rural area
- [ ] Work(ed) on a farm
- [ ] Work(ed) for an agricultural business
- [ ] Own(ed) an agricultural business
- [ ] High school agriculture course
- [ ] College agriculture course
- [ ] Extension workshops in agriculture

Other (please specify)

Other than as a veterinary technician, what experiences have you had as a first responder? (Mark all that apply)

- [ ] Fire personnel
- [ ] Law enforcement personnel
- [ ] Emergency medical personnel
- [ ] None

APPENDIX D

INTRODUCTORY E-MAILS

Introductory e-mail

To: Licensed veterinarian
Subject: Oklahoma State University needs your assistance

Dear (Veterinarian):

As a veterinarian, you can give feedback that will provide insights into how to better prepare veterinary medical professionals to be first responders in animal health emergencies. Your views about susceptibility to and preparedness for animal health emergencies and needs for training about emergency response and communications are vital to creating educational resources for practicing veterinarians.

The primary purpose of this research study, "First Responders in Animal Health Emergencies: Veterinarians Perceptions and Training Needs," is to create a foundation for improving veterinarians' skills as first responders and community representatives during emergencies that impact animals. The results of this study are essential to creating educational resources that meet the needs of veterinarians.

The Oklahoma Veterinary Medical Association and the Oklahoma Department of Agriculture, Food, and Forestry have assisted in the preparations for this study. A report about the results will be shared with association and government representatives so that your views may be incorporated into future educational opportunities.

This survey will take approximately 30 minutes to complete. Please respond to the questions in terms of your perceptions and knowledge. You will be able to access the survey one time from your computer. If you are not able to access the online survey or prefer to complete the survey in a different format, please e-mail me at traci.naile@okstate.edu, and an alternate survey format will be provided.

By clicking on the link below, you are giving your consent to participate in this study. To access the online survey, please use your Internet browser of choice and go to:

[SurveyLink]

Your immediate response is greatly appreciated.

Your responses are voluntary and will be treated confidentially. Responses to this survey will be stored online in a password-protected account until the survey is closed and then will be stored for approximately three years in a password-protected spreadsheet on the researcher's computer in Agricultural Hall.

You may choose at any time to withdraw from the study without penalty. The risks associated with this project are not greater than those ordinarily encountered in daily life.

Thank you for taking time to complete the survey. If you have any questions about this project, please feel free to call Traci Naile at 405-744-6793 or Dwayne Cartmell at 405-744-0461. If you have questions about your rights as a research volunteer, you may make contact with Dr. Shelia

Introductory e-mail

Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-1676 or irb@okstate.edu.

Sincerely,

Traci L. Naile
Graduate Research Associate
Department of Agricultural Education, Communications & Leadership
Oklahoma State University

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
[RemoveLink]

Fax introductory letter – link only

Date: Date
To: Licensed veterinarian
Subject: Oklahoma State University needs your assistance

Dear (Veterinarian):

As a veterinarian, you can give feedback that will provide insights into how to better prepare veterinary medical professionals to be first responders in animal health emergencies. Your views about susceptibility to and preparedness for animal health emergencies and needs for training about emergency response and communications are vital to creating educational resources for practicing veterinarians.

The primary purpose of this research study, "First Responders in Animal Health Emergencies: Veterinarians' Perceptions and Training Needs," is to create a foundation for improving veterinarians' skills as first responders and community representatives during emergencies that impact animals. The results of this study are essential to creating educational resources that meet the needs of veterinarians.

The Oklahoma Veterinary Medical Association and the Oklahoma Department of Agriculture, Food, and Forestry have assisted in the preparations for this study. A report about the results will be shared with association and government representatives so that your views may be incorporated into future educational opportunities.

This survey will take approximately 15 to 30 minutes to complete. Please respond to the questions in terms of your perceptions and knowledge. If you are not able to access the online survey or prefer to complete the survey in a different format, please e-mail me at traci.naile@okstate.edu, and an alternate survey format will be provided.

By accessing the survey using the link below, you are giving your consent to participate in this study. To access the online survey, please use your Internet browser of choice and go to:

[SurveyLink]

Your immediate response is greatly appreciated.

Your responses are voluntary and will be treated confidentially. Responses to this survey will be stored online in a password-protected account until the survey is closed and then will be stored for approximately three years in a password-protected spreadsheet on the researcher's computer in Agricultural Hall.

You may choose at any time to withdraw from the study without penalty. The risks associated with this project are not greater than those ordinarily encountered in daily life.

Thank you for taking time to complete the survey. If you have any questions about this project, please feel free to call Traci Naile at 405-744-6793 or Dwayne Cartmell at 405-744-0461. If you have questions about your rights as a research volunteer, you may make contact with Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-1676 or irb@okstate.edu.

Sincerely,

Traci L. Naile
Graduate Research Associate
Department of Agricultural Education, Communications & Leadership
Oklahoma State University

Please note: If you do not wish to receive further faxes from us, please e-mail me at traci.naile@okstate.edu or call me at 405-744-6793, and you will be automatically removed from our mailing list.

Fax introductory letter – survey

Date: Date
To: Licensed veterinarian
Subject: Oklahoma State University needs your assistance

Dear (Veterinarian):

As a veterinarian, you can give feedback that will provide insights into how to better prepare veterinary medical professionals to be first responders in animal health emergencies. Your views about susceptibility to and preparedness for animal health emergencies and needs for training about emergency response and communications are vital to creating educational resources for practicing veterinarians.

The primary purpose of this research study, "First Responders in Animal Health Emergencies: Veterinarians' Perceptions and Training Needs," is to create a foundation for improving veterinarians' skills as first responders and community representatives during emergencies that impact animals. The results of this study are essential to creating educational resources that meet the needs of veterinarians.

The Oklahoma Veterinary Medical Association and the Oklahoma Department of Agriculture, Food, and Forestry have assisted in the preparations for this study. A report about the results will be shared with association and government representatives so that your views may be incorporated into future educational opportunities.

This survey will take approximately 15 to 30 minutes to complete. Please respond to the questions in terms of your perceptions and knowledge.

Please return the questionnaire via fax to 405-744-5176 or by mail to Traci Naile, 446 Agricultural Hall, Stillwater, OK 74078. By returning the questionnaire, you are giving your consent to participate in this study. Your immediate response is greatly appreciated.

Your responses are voluntary and will be treated confidentially. Responses to this survey will be stored online in a password-protected account until the survey is closed and then will be stored for approximately three years in a password-protected spreadsheet on the researcher's computer in Agricultural Hall.

You may choose at any time to withdraw from the study without penalty. The risks associated with this project are not greater than those ordinarily encountered in daily life.

Thank you for taking time to complete the survey. If you have any questions about this project, please feel free to call Traci Naile at 405-744-6793 or Dwayne Cartmell at 405-744-0461. If you have questions about your rights as a research volunteer, you may make contact with Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-1676 or irb@okstate.edu.

Sincerely,

Traci L. Naile
Graduate Research Associate
Department of Agricultural Education, Communications & Leadership
Oklahoma State University

Please note: If you do not wish to receive further faxes from us, please e-mail me at traci.naile@okstate.edu or call me at 405-744-6793, and you will be automatically removed from our mailing list.

APPENDIX E

SURVEY INSTRUMENT

First responders in animal health emergencies: Veterinarians'

Introduction

This survey includes questions about animal health emergencies and 10 of the most dangerous animal disease threats identified to be part of the National Veterinary Stockpile by 2011. You will be asked to consider aspects of animal health emergencies and these diseases on three levels: local, state, and national. Some questions may be repeated for each level.

All questions except demographics will ask for responses on a scale of very low, low, neutral, high, and very high. Please answer all questions to the best of your knowledge and ability.

Thank you for your assistance with this important survey. The information you provide will help shape future educational opportunities for you and your colleagues.

The dangerous animal disease threats included in this survey are: highly pathogenic avian influenza, foot-and-mouth disease, Rift Valley fever, exotic Newcastle disease, nipah and hendra virus, classical swine fever, African swine fever, bovine spongiform encephalopathy, rinderpest, and Japanese encephalitis.

Disease outbreaks: Local

The vulnerability of the animal populations in my local area to a natural or man-made outbreak of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	○	○	○	○	○
Foot-and-mouth disease	○	○	○	○	○
Rift Valley fever	○	○	○	○	○
Exotic Newcastle disease	○	○	○	○	○
Nipah and Hendra virus	○	○	○	○	○
Classical swine fever	○	○	○	○	○
African swine fever	○	○	○	○	○
Bovine spongiform encephalopathy	○	○	○	○	○
Rinderpest	○	○	○	○	○
Japanese encephalitis	○	○	○	○	○

The severity of a natural or man-made outbreak of the following diseases in the animal populations in my local area would be:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	○	○	○	○	○
Foot-and-mouth disease	○	○	○	○	○
Rift Valley fever	○	○	○	○	○
Exotic Newcastle disease	○	○	○	○	○
Nipah and Hendra virus	○	○	○	○	○
Classical swine fever	○	○	○	○	○
African swine fever	○	○	○	○	○
Bovine spongiform encephalopathy	○	○	○	○	○
Rinderpest	○	○	○	○	○
Japanese encephalitis	○	○	○	○	○

First responders in animal health emergencies: Veterinarians'

The level of threat posed by the following potential sources of outbreaks in my local area of the most dangerous animal diseases referred to in the previous questions is:

	Very low	Low	Neutral	High	Very high
Natural (emerging or re-emerging diseases)	◯	◯	◯	◯	◯
International terrorists	◯	◯	◯	◯	◯
Domestic groups	◯	◯	◯	◯	◯
Producers' disgruntled employees	◯	◯	◯	◯	◯
Producers' neighbors	◯	◯	◯	◯	◯

Disease outbreaks: State

The vulnerability of the animal populations in my state to a natural or man-made outbreak of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

The severity of a natural or man-made outbreak of the following diseases in the animal populations in my state would be:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

First responders in animal health emergencies: Veterinarians'

The level of threat posed by the following potential sources of outbreaks in my state of the most dangerous animal diseases referred to in the previous questions is:

	Very low	Low	Neutral	High	Very high
Natural (emerging or re-emerging diseases)	◯	◯	◯	◯	◯
International terrorists	◯	◯	◯	◯	◯
Domestic groups	◯	◯	◯	◯	◯
Producers' disgruntled employees	◯	◯	◯	◯	◯
Producers' neighbors	◯	◯	◯	◯	◯

Disease outbreaks: National

The vulnerability of U.S. animal populations to a natural or man-made outbreak of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

The severity of a natural or man-made outbreak of the following diseases in U.S. animal populations would be:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

First responders in animal health emergencies: Veterinarians'

The level of threat posed by the following potential sources of outbreaks in the U.S. of the most dangerous animal diseases referred to in the previous questions is:

	Very low	Low	Neutral	High	Very high
Natural (emerging or re-emerging diseases)	◯	◯	◯	◯	◯
International terrorists	◯	◯	◯	◯	◯
Domestic groups	◯	◯	◯	◯	◯
Producers' disgruntled employees	◯	◯	◯	◯	◯
Producers' neighbors	◯	◯	◯	◯	◯

Preparedness for animal health emergencies

Availability of resources about preparing for animal health emergencies on the following levels is:

	Very low	Low	Neutral	High	Very high
Local	◯	◯	◯	◯	◯
State	◯	◯	◯	◯	◯
National	◯	◯	◯	◯	◯

Availability of resources about response measures for animal health emergencies on the following levels is:

	Very low	Low	Neutral	High	Very high
Local	◯	◯	◯	◯	◯
State	◯	◯	◯	◯	◯
National	◯	◯	◯	◯	◯

First responders in animal health emergencies: Veterinarians'

My level of confidence in the following groups to respond appropriately to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local government	◯	◯	◯	◯	◯
State government	◯	◯	◯	◯	◯
Federal government	◯	◯	◯	◯	◯
Local industry organizations	◯	◯	◯	◯	◯
State industry organizations	◯	◯	◯	◯	◯
National industry organizations	◯	◯	◯	◯	◯
Local Cooperative Extension/land-grant university specialists	◯	◯	◯	◯	◯
State Cooperative Extension/land-grant university specialists	◯	◯	◯	◯	◯
National Cooperative Extension/land-grant university specialists	◯	◯	◯	◯	◯
Veterinarians in my local area	◯	◯	◯	◯	◯
Veterinarians throughout my state	◯	◯	◯	◯	◯
Veterinarians throughout the U.S.	◯	◯	◯	◯	◯
Producers in my local area	◯	◯	◯	◯	◯
Producers throughout my state	◯	◯	◯	◯	◯
Producers throughout the U.S.	◯	◯	◯	◯	◯

Responding to animal health emergencies

My level of experience in acting as a first responder during animal health emergencies in the following roles is:

	Very low	Low	Neutral	High	Very high
As a veterinarian	◯	◯	◯	◯	◯
Any role other than as a veterinarian	◯	◯	◯	◯	◯

My knowledge of the following plans for responding to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local emergency response plan	◯	◯	◯	◯	◯
State emergency response plan	◯	◯	◯	◯	◯
National Animal Health Emergency Response Plan	◯	◯	◯	◯	◯
National Response Framework	◯	◯	◯	◯	◯

First responders in animal health emergencies: Veterinarians'

My level of knowledge about recognizing and reporting clinical signs of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	○	○	○	○	○
Foot-and-mouth disease	○	○	○	○	○
Rift Valley fever	○	○	○	○	○
Exotic Newcastle disease	○	○	○	○	○
Nipah and Hendra virus	○	○	○	○	○
Classical swine fever	○	○	○	○	○
African swine fever	○	○	○	○	○
Bovine spongiform encephalopathy	○	○	○	○	○
Rinderpest	○	○	○	○	○
Japanese encephalitis	○	○	○	○	○

My level of confidence in acting as a first responder during animal health emergencies in the following roles is:

	Very low	Low	Neutral	High	Very high
As a veterinarian	○	○	○	○	○
Any role other than as a veterinarian	○	○	○	○	○

My level of confidence in my ability to implement procedures of the following plans for responding to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local emergency response plan	○	○	○	○	○
State emergency response plan	○	○	○	○	○
National Animal Health Emergency Response Plan	○	○	○	○	○
National Response Framework	○	○	○	○	○

First responders in animal health emergencies: Veterinarians'

My level of confidence in my ability to recognize and report clinical signs of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	○	○	○	○	○
Foot-and-mouth disease	○	○	○	○	○
Rift Valley fever	○	○	○	○	○
Exotic Newcastle disease	○	○	○	○	○
Nipah and Hendra virus	○	○	○	○	○
Classical swine fever	○	○	○	○	○
African swine fever	○	○	○	○	○
Bovine spongiform encephalopathy	○	○	○	○	○
Rinderpest	○	○	○	○	○
Japanese encephalitis	○	○	○	○	○

Providing animal health information

My level of experience in serving as a source of animal health information in any situation for the following groups is:

Clients	○	○	○	○
Community members who are not clients	○	○	○	○
Media - print	○	○	○	○
Media - television	○	○	○	○
Media - radio	○	○	○	○
Industry groups - local	○	○	○	○
Industry groups - state	○	○	○	○
Industry groups - national	○	○	○	○
Nonprofit groups that are not directly associated with animal agriculture	○	○	○	○
Local Cooperative Extension/land-grant university specialists	○	○	○	○
State Cooperative Extension/land-grant university specialists	○	○	○	○
National Cooperative Extension/land-grant university specialists	○	○	○	○
Local government	○	○	○	○
State government	○	○	○	○
Federal government	○	○	○	○

First responders in animal health emergencies: Veterinarians'

My level of experience in serving as a source of general animal health information in the following situations is:

	Very low	Low	Neutral	High	Very high
Answering clients' questions	○	○	○	○	○
Offering information to clients	○	○	○	○	○
Speaking at a community meeting	○	○	○	○	○
Answering media members' questions	○	○	○	○	○
Offering information to the media	○	○	○	○	○
Appearing on television	○	○	○	○	○
Speaking on a live radio broadcast	○	○	○	○	○

My level of confidence in serving as a source of information about animal health emergencies for the following groups is:

	Very low	Low	Neutral	High	Very high
Clients	○	○	○	○	○
Community members who are not clients	○	○	○	○	○
Media - print	○	○	○	○	○
Media - television	○	○	○	○	○
Media - radio	○	○	○	○	○
Industry groups - local	○	○	○	○	○
Industry groups - state	○	○	○	○	○
Industry groups - national	○	○	○	○	○
Nonprofit groups that are not directly associated with animal agriculture	○	○	○	○	○
Local Cooperative Extension/land-grant university specialists	○	○	○	○	○
State Cooperative Extension/land-grant university specialists	○	○	○	○	○
National Cooperative Extension/land-grant university specialists	○	○	○	○	○
Local government	○	○	○	○	○
State government	○	○	○	○	○
Federal government	○	○	○	○	○

First responders in animal health emergencies: Veterinarians'

My level of confidence in serving as a source of information about animal health emergencies in the following situations is:

	Very low	Low	Neutral	High	Very high
Answering clients' questions	○	○	○	○	○
Offering information to clients	○	○	○	○	○
Speaking at a community meeting	○	○	○	○	○
Answering media members' questions	○	○	○	○	○
Offering information to the media	○	○	○	○	○
Appearing on television	○	○	○	○	○
Speaking on a live radio broadcast	○	○	○	○	○

My level of confidence in the following types of media to report accurately information I provide is:

	Very low	Low	Neutral	High	Very high
Print	○	○	○	○	○
Television	○	○	○	○	○
Radio	○	○	○	○	○

My level of confidence in the following types of media to report accurately about animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Print	○	○	○	○	○
Television	○	○	○	○	○
Radio	○	○	○	○	○

Training experiences and needs

The level of training I have received about the procedures of the following emergency response plans is:

	Very low	Low	Neutral	High	Very high
Local emergency response plan	○	○	○	○	○
State emergency response plan	○	○	○	○	○
National Animal Health Emergency Response Plan	○	○	○	○	○
National Response Framework	○	○	○	○	○

First responders in animal health emergencies: Veterinarians'

My level of experience as a participant in response drills/scenarios on the following levels is:

	Very low	Low	Neutral	High	Very high
Local	◯	◯	◯	◯	◯
State	◯	◯	◯	◯	◯
National	◯	◯	◯	◯	◯

The level of training I have received about recognizing and reporting clinical signs of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

The level of training I have received related to following aspects of communication is:

	Very low	Low	Neutral	High	Very high
Interpersonal communication	◯	◯	◯	◯	◯
Public speaking	◯	◯	◯	◯	◯
Interviewing	◯	◯	◯	◯	◯
Serving as a spokesperson	◯	◯	◯	◯	◯
Written communication	◯	◯	◯	◯	◯

The level of training I need to improve my skills in implementing procedures of the following plans for responding to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local emergency response plan	◯	◯	◯	◯	◯
State emergency response plan	◯	◯	◯	◯	◯
National Animal Health Emergency Response Plan	◯	◯	◯	◯	◯
National Response Framework	◯	◯	◯	◯	◯

First responders in animal health emergencies: Veterinarians'

The level of training I need as a participant in response drills and/or scenarios to improve my skills in responding to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local	◯	◯	◯	◯	◯
State	◯	◯	◯	◯	◯
National	◯	◯	◯	◯	◯

The level of training I need to improve my ability to recognize and report clinical signs of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

The level of training I need to improve my skills in the following aspects of communication is:

	Very low	Low	Neutral	High	Very high
Interpersonal communication	◯	◯	◯	◯	◯
Public speaking	◯	◯	◯	◯	◯
Interviewing	◯	◯	◯	◯	◯
Serving as a spokesperson	◯	◯	◯	◯	◯
Written communication	◯	◯	◯	◯	◯

Training preferences

My level of interest in training to improve my skills in implementing procedures of the following plans for responding to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local emergency response plan	◯	◯	◯	◯	◯
State emergency response plan	◯	◯	◯	◯	◯
National Animal Health Emergency Response Plan	◯	◯	◯	◯	◯
National Response Framework	◯	◯	◯	◯	◯

First responders in animal health emergencies: Veterinarians'

My level of interest in participating in response drills and/or scenarios to improve my skills in responding to animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Local	◯	◯	◯	◯	◯
State	◯	◯	◯	◯	◯
National	◯	◯	◯	◯	◯

My level of interest in training to improve my ability to recognize and report clinical signs of the following diseases is:

	Very low	Low	Neutral	High	Very high
Highly pathogenic avian influenza	◯	◯	◯	◯	◯
Foot-and-mouth disease	◯	◯	◯	◯	◯
Rift Valley fever	◯	◯	◯	◯	◯
Exotic Newcastle disease	◯	◯	◯	◯	◯
Nipah and Hendra virus	◯	◯	◯	◯	◯
Classical swine fever	◯	◯	◯	◯	◯
African swine fever	◯	◯	◯	◯	◯
Bovine spongiform encephalopathy	◯	◯	◯	◯	◯
Rinderpest	◯	◯	◯	◯	◯
Japanese encephalitis	◯	◯	◯	◯	◯

My level of interest in training to improve my skills in the following aspects of communication is:

	Very low	Low	Neutral	High	Very high
Interpersonal communication	◯	◯	◯	◯	◯
Public speaking	◯	◯	◯	◯	◯
Interviewing	◯	◯	◯	◯	◯
Serving as a spokesperson	◯	◯	◯	◯	◯
Written communication	◯	◯	◯	◯	◯

My level of interest in the following types of training about response procedures for animal health emergencies is:

	Very low	Low	Neutral	High	Very high
Online, self-paced	◯	◯	◯	◯	◯
Online, instructor-paced	◯	◯	◯	◯	◯
Web conference	◯	◯	◯	◯	◯
Seminar/workshop	◯	◯	◯	◯	◯
Workshop at a conference	◯	◯	◯	◯	◯

First responders in animal health emergencies: Veterinarians'

My level of interest in the following types of training about recognizing and reporting clinical signs of the most dangerous animal diseases is:

	Very low	Low	Neutral	High	Very high
Online, self-paced	◯	◯	◯	◯	◯
Online, instructor-paced	◯	◯	◯	◯	◯
Web conference	◯	◯	◯	◯	◯
Seminar/workshop	◯	◯	◯	◯	◯
Workshop at a conference	◯	◯	◯	◯	◯

My level of interest in the following types of training about communication is:

	Very low	Low	Neutral	High	Very high
Online, self-paced	◯	◯	◯	◯	◯
Online, instructor-paced	◯	◯	◯	◯	◯
Web conference	◯	◯	◯	◯	◯
Seminar/workshop	◯	◯	◯	◯	◯
Workshop at a conference	◯	◯	◯	◯	◯

The level of influence of cost on my interest in training about the following topics is:

	Very low	Low	Neutral	High	Very high
Emergency response procedures	◯	◯	◯	◯	◯
Disease recognition and reporting	◯	◯	◯	◯	◯
Communication	◯	◯	◯	◯	◯

Career and practice demographics

The zip code in which my primary practice is located is:

ZIP: ☐

I am currently working as a private practitioner.
(If yes, please answer next question.)

◯ Yes

◯ No

First responders in animal health emergencies: Veterinarians'

As a private practitioner, my primary type of practice is:

- ◯ Companion animal, exclusive
- ◯ Companion animal, predominant
- ◯ Food animal, exclusive
- ◯ Food animal, predominant
- ◯ Equine, exclusive
- ◯ Equine, predominant
- ◯ Mixed animal
- ◯ Other

The number of veterinarians employed by my practice is:

Number of full time

Number of part time

The total amount of annual funding (in dollars) available in my practice for continuing education is:

(Do not include a dollar symbol)

I have been a veterinarian for:

- ◯ Less than one year
- ◯ More than one year (Enter a whole number in the box below)

Number of years

I have been employed in my current practice for:

- ◯ Less than one year
- ◯ More than one year (Enter a whole number in the box below)

Number of years

I fill the following role in my current practice:

- ◯ Sole owner
- ◯ Partner
- ◯ Associate
- ◯ Other (please specify)

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First responders in animal health emergencies: Veterinarians'

I am a current member of the following associations (Mark all that apply):

- [ ] None
- [ ] American Veterinary Medical Association
- [ ] State veterinary medical association (please list all in box below)
- [ ] Association of Avian Practitioners
- [ ] American Association of Bovine Practitioners
- [ ] American Association of Equine Practitioners
- [ ] American Association of Feline Practitioners
- [ ] American Association of Food Hygiene Veterinarians
- [ ] American Association of Small Ruminant Practitioners
- [ ] American Association of Swine Veterinarians
- [ ] Society for Theriogenology
- [ ] American Society of Laboratory Animal Practitioners
- [ ] American Animal Hospital Association
- [ ] American Association of Corporate and Public Practice Veterinarians
- [ ] National Association of Federal Veterinarians
- [ ] Uniformed Services of The United States
- [ ] Other agriculture industry group (please list all)

Names of other associations

Personal demographics

My age is:

Age, in years

I am:

- ◯ Female
- ◯ Male

First responders in animal health emergencies: Veterinarians'

I have earned the following degrees (Mark all that apply):

- [ ] Associate's
- [ ] Bachelor's
- [ ] Master's
- [ ] Doctor of philosophy
- [ ] Doctor of education
- [ ] Doctor of veterinary medicine

Other than as a veterinarian, what experiences have you had in agriculture? (Mark all that apply)

- [ ] None
- [ ] Paid work experience
- [ ] Unpaid work experience
- [ ] Live(d) in a rural area
- [ ] Live(d) on a farm
- [ ] Own(ed) a farm
- [ ] Work(ed) in a rural area
- [ ] Work(ed) on a farm
- [ ] Work(ed) for an agricultural business
- [ ] Own(ed) an agricultural business
- [ ] High school agriculture course
- [ ] College agriculture course
- [ ] Extension workshops in agriculture

Other (please specify)

Other than as a veterinarian, what experiences have you had as a first responder? (Mark all that apply)

- [ ] Fire personnel
- [ ] Law enforcement personnel
- [ ] Emergency medical personnel
- [ ] None

Comments

First responders in animal health emergencies: Veterinarians'

Please use the box below to provide any comments you have related to the areas of animal disease, emergency response, and communication that were included in this survey.

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APPENDIX F

REMINDER LETTERS

Reminder 1

To: Licensed veterinarian
Subject: Oklahoma State University needs your assistance

Dear (Veterinarian):

Just a reminder that I need your help! A week ago, I e-mailed you a link to an online survey that will help us learn about your perceptions of and experiences with emergency response procedures and communications. The primary purpose of this research study, "First Responders in Animal Health Emergencies: Veterinarians Perceptions and Training Needs," is to provide information to be used in creating educational resources for veterinarians.

The survey will take approximately 30 minutes to complete and is only available for a short time. Please respond to the questions in terms of your perceptions. You will be able to access the survey one time from your computer. If you are not able to access the online survey or prefer to complete the survey in a different format, please e-mail me at traci.naile@okstate.edu, and an alternate survey format will be provided.

By clicking on the link below, you are giving your consent to participate in this study. To access the online survey, please use your Internet browser of choice and go to:

[SurveyLink]

Sincerely,

Traci L. Naile
Graduate Research Associate
Department of Agricultural Education, Communications & Leadership
Oklahoma State University

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
[RemoveLink]

Reminder 2

To: Licensed veterinarian
Subject: Oklahoma State University needs your assistance

Dear (Veterinarian):

Just a reminder that I need your help! Two weeks ago, I e-mailed you a link to an online survey that will help us learn about your views of emergency response procedures and communications. This study, "First Responders in Animal Health Emergencies: Veterinarians Perceptions and Training Needs," will provide a basis for educational resources for veterinary medical professionals.

The survey will take approximately 30 minutes to complete and is available for two more weeks. You will be able to access the survey one time from your computer. If you are not able to access the online survey or prefer to complete the survey in a different format, please e-mail me at traci.naile@okstate.edu, and an alternate survey format will be provided.

By clicking on the link below, you are giving your consent to participate in this study. To access the online survey, please use your Internet browser of choice and go to:

[SurveyLink]

Sincerely,

Traci L. Naile
Graduate Research Associate
Department of Agricultural Education, Communications & Leadership
Oklahoma State University

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
[RemoveLink]

Fax reminder 1 – link only

Date: Date
To: Licensed veterinarian
Subject: Oklahoma State University needs your assistance

Dear (Veterinarian):

Just a reminder that I need your help! A week ago, I faxed you a link to an online survey that will help us learn about your perceptions of and experiences with emergency response procedures and communications. The primary purpose of this research study, "First Responders in Animal Health Emergencies: Veterinarians Perceptions and Training Needs," is to provide information to be used in creating educational resources for veterinarians.

The survey will take approximately 15 to 30 minutes to complete and is only available for a short time. Please respond to the questions in terms of your perceptions. You will be able to access the survey one time from your computer. If you are not able to access the online survey or prefer to complete the survey in a different format, please e-mail me at traci.naile@okstate.edu, and an alternate survey format will be provided.

By accessing the survey using the link below, you are giving your consent to participate in this study. To access the online survey, please use your Internet browser of choice and go to:

[SurveyLink]

Sincerely,

Traci L. Naile
Graduate Research Associate
Department of Agricultural Education, Communications & Leadership
Oklahoma State University

Please note: If you do not wish to receive further faxes from us, please e-mail me at traci.naile@okstate.edu or call me at 405-744-6793, and you will be automatically removed from our mailing list.

Fax reminder 2 – link only

Date: Date
To: Licensed veterinarian
Subject: Oklahoma State University needs your assistance

Dear (Veterinarian):

Just a reminder that I need your help! Two weeks ago, I faxed you a link to an online survey that will help us learn about your views of emergency response procedures and communications. This study, "First Responders in Animal Health Emergencies: Veterinarians Perceptions and Training Needs," will provide a basis for educational resources for veterinary medical professionals.

The survey will take approximately 15 to 30 minutes to complete and is available for two more weeks. You will be able to access the survey one time from your computer. If you are not able to access the online survey or prefer to complete the survey in a different format, please e-mail me at traci.naile@okstate.edu, and an alternate survey format will be provided.

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Sincerely,

Traci L. Naile
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Department of Agricultural Education, Communications & Leadership
Oklahoma State University

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Fax reminder 1 – survey

Date: Date
To: Licensed veterinarian
Subject: Oklahoma State University needs your assistance

Dear (Veterinarian):

Just a reminder that I need your help! A week ago, I faxed you a survey that will help us learn about your perceptions of and experiences with emergency response procedures and communications. The primary purpose of this research study, "First Responders in Animal Health Emergencies: Veterinarians Perceptions and Training Needs," is to provide information to be used in creating educational resources for veterinarians.

The survey will take approximately 15 to 30 minutes to complete. Please respond to the questions in terms of your perceptions.

Please return the questionnaire via fax to 405-744-5176 or by mail to Traci Naile, 446 Agricultural Hall, Stillwater, OK 74078. By returning the questionnaire, you are giving your consent to participate in this study.

Sincerely,

Traci L. Naile
Graduate Research Associate
Department of Agricultural Education, Communications & Leadership
Oklahoma State University

Please note: If you do not wish to receive further faxes from us, please e-mail me at traci.naile@okstate.edu or call me at 405-744-6793, and you will be automatically removed from our mailing list.

Fax reminder 2 – survey

Date: Date
To: Licensed veterinarian
Subject: Oklahoma State University needs your assistance

Dear (Veterinarian):

Just a reminder that I need your help! Two weeks ago, I faxed you survey that will help us learn about your views of emergency response procedures and communications. This study, "First Responders in Animal Health Emergencies: Veterinarians Perceptions and Training Needs," will provide a basis for educational resources for veterinary medical professionals.

The survey will take approximately 15 to 30 minutes to complete.

Please return the questionnaire via fax to 405-744-5176 or by mail to Traci Naile, 446 Agricultural Hall, Stillwater, OK 74078. By returning the questionnaire, you are giving your consent to participate in this study.

Sincerely,

Traci L. Naile
Graduate Research Associate
Department of Agricultural Education, Communications & Leadership
Oklahoma State University

Please note: If you do not wish to receive further faxes from us, please e-mail me at traci.naile@okstate.edu or call me at 405-744-6793, and you will be automatically removed from our mailing list.

APPENDIX G

NONRESPONDENT REMINDERS

Nonrespondent reminder 1

To: Licensed veterinarian
Subject: Animal health emergency response survey

Dear (Veterinarian):

I could still use your help! During the last few weeks, I requested your participation in an online survey about veterinarians as first responders in animal health emergencies. Your views are vital to creating educational resources that will help better prepare veterinary medical professionals for all types of emergencies impacting animals, including disease outbreaks, tornadoes, floods, hurricanes, and wildfires.

The primary purpose of this research study, "First Responders in Animal Health Emergencies: Veterinarians Perceptions and Training Needs," is to create a foundation for providing resources that meet veterinarians' needs. While this survey is based on questions about specific animal diseases, it also asks about emergency response procedures and communication skills that apply regardless of the type of emergency or species of animal affected.

The Oklahoma Veterinary Medical Association and the Oklahoma Department of Agriculture, Food, and Forestry have assisted me with this study. A report about the results will be shared with association and government representatives so that your views may be incorporated into future educational opportunities.

This survey will take approximately 15 minutes to complete. Please respond to the questions in terms of your perceptions and knowledge. You will be able to access the survey one time from your computer. If you are not able to access the online survey or prefer to complete the survey in a different format, please e-mail me at traci.naile@okstate.edu, and an alternate survey format will be provided.

By clicking on the link below, you are giving your consent to participate in this study. To access the online survey, please use your Internet browser of choice and go to:

[SurveyLink]

Your immediate response is greatly appreciated.

Your responses are voluntary and will be treated confidentially. Responses to this survey will be stored online in a password-protected account until the survey is closed and then will be stored in a password-protected spreadsheet until the project is complete. Original survey responses will be accessible only to Traci Naile, Sara Faber, and Dwayne Cartmell and will be destroyed upon completion of the project.

You may choose at any time to withdraw from the study without penalty. The risks associated with this project are not greater than those ordinarily encountered in daily life.

Thank you for taking time to complete the survey. If you have any questions about this project, please feel free to call Traci Naile at 405-744-6793 or Dwayne Cartmell at 405-744-0461. If you

Nonrespondent reminder 1

have questions about your rights as a research volunteer, you may make contact with Dr. Shelia Kennison, IRB Chair, 219 Cordell North, Stillwater, OK 74078, 405-744-1676 or irb@okstate.edu.

Sincerely,

Traci L. Naile
Graduate Research Associate
Department of Agricultural Education, Communications & Leadership
Oklahoma State University

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
[RemoveLink]

Nonrespondent reminder 2

To: Licensed veterinarian
Subject: Animal health emergency response survey

Dear (Veterinarian):

I could still use your help! The online survey "First Responders in Animal Health Emergencies: Veterinarians Perceptions and Training Needs" will be available for one more week.

Your views are vital to creating educational resources that will help better prepare veterinary medical professionals for all types of emergencies impacting animals, including disease outbreaks, tornadoes, floods, hurricanes, and wildfires. The primary purpose of this research study is to create a foundation for providing resources that meet veterinarians' needs. In addition, a report about the results will be shared with the Oklahoma Veterinary Medical Association and the Oklahoma Department of Agriculture, Food, and Forestry so that your views may be incorporated into future educational opportunities.

This survey will take approximately 15 minutes to complete. Please respond to the questions in terms of your perceptions and knowledge. You will be able to access the survey one time from your computer. If you are not able to access the online survey or prefer to complete the survey in a different format, please e-mail me at traci.naile@okstate.edu, and an alternate survey format will be provided.

By clicking on the link below, you are giving your consent to participate in this study. To access the online survey, please use your Internet browser of choice and go to:

[SurveyLink]

Sincerely,

Traci L. Naile
Graduate Research Associate
Department of Agricultural Education, Communications & Leadership
Oklahoma State University

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
[RemoveLink]

APPENDIX H

VETERINARIANS' ASSOCIATION MEMBERSHIPS

Academy of Rural Practitioners

Academy of Veterinary Consultants

Academy of Veterinary Dentistry

American Academy of Comparative Toxicology

American Animal Hospital Association

American Association of Bovine Practitioners

American Association of Corporate and Public Practice Veterinarians

American Association of Equine Practitioners

American Association of Feline Practitioners

American Association of Small Ruminant Practitioners

American Association of Swine Veterinarians

American Association of Veterinary Diagnosticians

American Association of Veterinary Laboratory Diagnosticians

American Association of Veterinary Technician Educators

American Association of Zoo Veterinarians

American Association Wildlife Veterinarians

American Board of Veterinary Preventive Medicine

American Board of Veterinary Toxicology

American Board Veterinary Practitioners

American College of Poultry Veterinarians

American College of Veterinary Anesthesiologists

American College of Veterinary Internal Medicine

American College of Veterinary Pathologists

American College of Veterinary Surgeons

American College Veterinary Internal Medicine

American Embryo Transfer Association

American Quarter Horse Association

American Society of Agronomy

American Society of Laboratory Animal Practitioners

American Society of Microbiologists

American Veterinary Dental Society

American Veterinary Medical Association

American Veterinary Society for Animal Behavior

Appaloosa Horse Club

Arkansas Poultry Veterinary Association

Arkansas Veterinary Medical Association

Association of Avian Practitioners

Association of Reptile and Amphibian Veterinarians

Capital Area Veterinary Medical Association – Austin, Texas

Central Oklahoma Veterinary Medical Association

Dairy Cattle Reproduction Council

Dallas County Veterinary Medical Association

International Association for Aquatic Animal Medicine

International Veterinary Pain in Animal Management

Iowa Veterinary Medical Association

Kansas Livestock Association

Kansas Veterinary Medical Association

Mississippi Cattlemen’s Association

Missouri Pork Producers Association

Missouri Veterinary Medical Association

National Association of Federal Veterinarians

National Cattlemen's Beef Association

National Institute for Animal Agriculture

Northeastern Oklahoma Veterinary Medical Association

Oklahoma Cattlemen's Association

Oklahoma Grain and Stocker Producers Association

Oklahoma Quarter Horse Association

Oklahoma Thoroughbred Association

Oklahoma Veterinary Medical Association

Society for Theriogenology

Texas and Southwest Cattle Raisers

Texas Cattle Feeders Association

Texas Cattle Veterinary Medical Association

Texas Equine Veterinary Association

Texas Veterinary Medical Association

Tulsa County Veterinary Medical Association

Uniformed Services of the United States

United States Animal Health Association

Veterinary Emergency and Critical Care Society

APPENDIX I

FREQUENCIES OF RESPONSES TO SCALED ITEMS

Table 1

Questions and Items Related to Objective 1: Veterinarians' Experiences and Prior Training in Emergency Response and Management, Recognition and Reporting of Selected Diseases, and Communication Skills

	Response (*n*)				
Question and Item	Very Low	Low	Neutral	High	Very High
My level of experience in acting as a first responder during animal health emergencies in the following roles is:					
As a veterinarian	71	61	54	39	15
Any role other than as a veterinarian	80	66	56	30	5
The level of experience as a participant in response drills/scenarios on the following levels is:					
Local	137	38	36	14	6
State	135	40	24	24	8
National	142	47	24	11	7
The level of training I have received about the procedures of the following emergency response plans is:					
Local emergency response plan	91	69	40	28	3
State emergency response plan	83	58	43	36	11
National Animal Health Emergency Response Plan	92	61	44	24	8
National Response Framework	97	58	45	20	6
The level of training I have received about recognizing and reporting clinical signs of the following diseases is:					
Highly pathogenic avian influenza	61	53	62	34	16
Foot-and-mouth disease	41	33	43	71	40

Rift Valley fever	75	65	48	27	11
Exotic Newcastle disease	58	59	54	40	17
Nipah and Hendra virus	100	67	39	13	8
Classical swine fever	63	59	45	39	20
African swine fever	69	54	48	35	19
Bovine spongiform encephalopathy	41	43	46	60	38
Rinderpest	73	57	45	35	17
Japanese encephalitis	93	65	45	14	8
My level of experience in serving as a source of general animal health information in the following situations is:					
Answering clients' questions	2	9	22	112	89
Offering information to clients	2	10	23	115	84
Speaking at a community meeting	22	37	53	90	30
Answering media members' questions	57	49	66	48	13
Offering information to the media	62	52	61	43	15
Appearing on television	94	57	48	26	9
Speaking on a live radio broadcast	90	54	47	34	8
The level of training I have received related to the following aspects of communication is:					
Interpersonal communication	23	26	60	98	21
Public speaking	29	37	75	67	19
Interviewing	39	57	70	47	11

Serving as a spokesperson	56	64	61	38	10
Written communication	33	42	56	74	22

Table 2

Questions and Items Related to Objective 2: Veterinarians' Perceptions of the Vulnerability of Animal Populations to Selected Animal Diseases

	Response (*n*)				
Question and Item	Very Low	Low	Neutral	High	Very High
The vulnerability of animal populations in my local area to a natural or man-made outbreak of the following diseases is:					
Highly pathogenic avian influenza	44	79	54	73	38
Foot-and-mouth disease	39	47	40	86	78
Rift Valley fever	59	75	64	54	32
Exotic Newcastle disease	49	90	54	60	34
Nipah and Hendra virus	67	72	82	38	22
Classical swine fever	40	82	55	72	34
African swine fever	61	80	44	59	35
Bovine spongiform encephalopathy	69	70	68	61	20
Rinderpest	57	68	54	69	35
Japanese encephalitis	63	80	67	47	23
The level of threat posed by the following potential sources of outbreaks in my local area of the most dangerous animal diseases referred to in the previous questions is:					
Natural (emerging or re-emerging diseases)	70	97	63	47	8
International terrorists	53	69	54	88	21
Domestic groups	45	84	64	76	16
Producers' disgruntled employees	79	103	59	36	8

Producers' neighbors	99	99	55	23	8
The vulnerability of animal populations in my state to a natural or man-made outbreak of the following diseases is:					
Highly pathogenic avian influenza	15	47	45	100	50
Foot-and-mouth disease	15	32	25	97	87
Rift Valley fever	26	46	64	71	47
Exotic Newcastle disease	21	56	41	85	51
Nipah and Hendra virus	30	56	76	61	30
Classical swine fever	17	60	47	80	50
African swine fever	26	59	40	79	47
Bovine spongiform encephalopathy	39	59	54	73	31
Rinderpest	30	45	45	88	46
Japanese encephalitis	40	48	64	65	32
The level of threat posed by the following potential sources of outbreaks in my state of the most dangerous animal diseases referred to in the previous questions is:					
Natural (emerging or re-emerging diseases)	44	96	49	53	10
International terrorists	34	59	49	87	24
Domestic groups	31	83	53	62	23
Producers' disgruntled employees	63	96	56	34	4
Producers' neighbors	76	98	47	22	7
The vulnerability of U.S. animal populations to a natural or man-made outbreak of the following diseases is:					
Highly pathogenic avian influenza	8	16	25	114	76

Foot-and-mouth disease	8	17	21	91	100
Rift Valley fever	12	33	47	88	56
Exotic Newcastle disease	9	21	34	100	73
Nipah and Hendra virus	17	33	69	75	41
Classical swine fever	8	28	40	103	57
African swine fever	14	30	37	98	58
Bovine spongiform encephalopathy	32	49	35	72	49
Rinderpest	19	35	38	89	55
Japanese encephalitis	21	41	53	77	42
The level of threat posed by the following potential sources of outbreaks in the U.S. of the most dangerous animal diseases referred to in the previous questions is:					
Natural (emerging or re-emerging diseases)	28	66	61	70	14
International terrorists	12	30	31	115	52
Domestic groups	17	58	56	71	39
Producers' disgruntled employees	45	82	65	38	10
Producers' neighbors	62	83	63	24	8

Table 3

Questions and Items Related to Objective 3: Veterinarians' Perceptions of the Potential Severity of Outbreaks of Selected Animal Diseases

	Response (*n*)				
Question and Item	Very Low	Low	Neutral	High	Very High
The severity of a natural or man-made outbreak of the following diseases in the animal populations in my local area would be:					
Highly pathogenic avian influenza	29	68	40	94	55
Foot-and-mouth disease	19	25	28	93	118
Rift Valley fever	29	46	73	80	56
Exotic Newcastle disease	37	73	49	78	49
Nipah and Hendra virus	31	60	100	63	24
Classical swine fever	28	66	59	89	42
African swine fever	34	61	55	87	44
Bovine spongiform encephalopathy	47	58	39	91	51
Rinderpest	36	39	45	102	60
Japanese encephalitis	40	49	83	74	30
The severity of a natural or man-made outbreak of the following diseases in the animal populations in my state would be:					
Highly pathogenic avian influenza	11	27	45	103	69
Foot-and-mouth disease	7	10	21	95	121
Rift Valley fever	13	27	68	88	57
Exotic Newcastle disease	14	35	46	99	60
Nipah and Hendra virus	16	38	84	81	31

Classical swine fever	12	25	61	99	53
African swine fever	14	28	57	95	56
Bovine spongiform encephalopathy	33	28	52	79	62
Rinderpest	18	24	56	93	61
Japanese encephalitis	24	31	74	88	32
The severity of a natural or man-made outbreak of the following diseases in U.S. animal populations would be:					
Highly pathogenic avian influenza	6	10	22	109	92
Foot-and-mouth disease	6	11	17	89	116
Rift Valley fever	9	22	56	88	62
Exotic Newcastle disease	5	15	33	102	81
Nipah and Hendra virus	10	34	65	79	47
Classical swine fever	5	21	35	104	71
African swine fever	8	22	35	96	74
Bovine spongiform encephalopathy	32	40	30	70	65
Rinderpest	15	25	42	86	68
Japanese encephalitis	16	31	62	76	48

Table 4

Questions and Items Related to Objective 4: Veterinarians' Perceptions of Readiness to Respond to Outbreaks of Selected Animal Diseases

	Response (*n*)				
Question and Item	Very Low	Low	Neutral	High	Very High
Availability of resources about preparing for animal health emergencies on the following levels is:					
Local	57	85	59	42	2
State	8	65	89	76	6
National	7	61	78	84	12
Availability of resources about response measures for animal health emergencies on the following levels is:					
Local	59	81	66	37	2
State	7	70	87	71	6
National	4	63	79	87	9
My level of confidence in the following groups to respond appropriately to animal health emergencies is:					
Local government	80	97	41	29	1
State government	12	57	71	93	13
Federal government	15	54	63	100	15
Local industry organizations	40	86	81	36	3
State industry organizations	21	69	80	75	3
National industry organizations	17	55	85	78	9
Local Cooperative Extension/land-grant university specialists	31	59	73	75	9
State Cooperative Extension/land-					

grant university specialists	15	44	74	97	17
National Cooperative Extension/land-grant university specialists	19	44	78	95	12
Veterinarians in my local area	9	54	66	92	25
Veterinarians throughout my state	5	29	76	115	23
Veterinarians throughout the U.S.	5	30	67	119	25
Producers in my local area	43	88	73	38	5
Producers throughout my state	33	86	87	38	3
Producers throughout the U.S.	26	84	95	39	3

Table 5

Questions and Items Related to Objective 5: Veterinarians' Self-reported Knowledge and Abilities in Emergency Response and Management, Recognition and Reporting of Selected Animal Diseases, and Communication Skills

	Response (*n*)				
Question and Item	Very Low	Low	Neutral	High	Very High
My knowledge of the following plans for responding to animal health emergencies is:					
Local emergency response plan	85	66	51	35	4
State emergency response plan	69	63	58	45	6
National Animal Health Emergency Response Plan	74	71	52	37	7
National Response Framework	81	65	56	33	6
My level of confidence in acting as a first responder during animal health emergencies in the following roles is:					
As a veterinarian	34	52	76	61	14
Any role other than as a veterinarian	42	52	88	48	6
My level of confidence in my ability to implement procedures of the following plans for responding to animal health emergencies is:					
Local emergency response plan	32	37	58	93	15
State emergency response plan	23	40	70	88	15
National Animal Health Emergency Response Plan	28	46	69	77	16
National Response Framework	33	43	68	76	16
The level of training I need to improve my skills in implementing procedures of the following plans for responding to animal health emergencies is:					
Local emergency response plan	5	15	51	109	47

State emergency response plan	5	15	49	112	46
National Animal Health Emergency Response Plan	5	17	45	103	57
National Response Framework	5	17	44	103	55
The level of training I need as a participant in response drills and/or scenarios to improve my skills in responding to animal health emergencies is:					
Local	5	12	59	111	41
State	4	14	53	113	44
National	3	14	53	112	46
My level of knowledge about recognizing and reporting clinical signs of the following diseases is:					
Highly pathogenic avian influenza	48	75	63	37	16
Foot-and-mouth disease	18	31	44	105	40
Rift Valley fever	54	93	57	17	16
Exotic Newcastle disease	47	69	65	44	14
Nipah and Hendra virus	91	88	41	10	6
Classical swine fever	55	71	51	44	14
African swine fever	61	77	54	32	13
Bovine spongiform encephalopathy	29	38	48	89	34
Rinderpest	54	73	58	33	17
Japanese encephalitis	86	80	48	16	6
My level of confidence in my ability to recognize and report clinical signs of the following diseases is:					
Highly pathogenic avian influenza	44	65	58	52	18

Foot-and-mouth disease	16	31	35	105	50
Rift Valley fever	53	83	64	20	15
Exotic Newcastle disease	46	70	59	45	17
Nipah and Hendra virus	86	84	46	11	10
Classical swine fever	53	64	58	42	20
African swine fever	57	71	60	28	21
Bovine spongiform encephalopathy	25	38	50	88	36
Rinderpest	55	70	59	33	19
Japanese encephalitis	78	83	49	17	8

The level of training I need to improve my ability to recognize and report clinical signs of the following diseases is:

Highly pathogenic avian influenza	8	14	61	105	42
Foot-and-mouth disease	11	37	78	71	33
Rift Valley fever	5	15	47	114	49
Exotic Newcastle disease	8	15	62	105	40
Nipah and Hendra virus	2	12	40	107	66
Classical swine fever	5	21	58	103	42
African swine fever	5	19	53	105	48
Bovine spongiform encephalopathy	15	31	73	79	32
Rinderpest	6	19	47	106	49
Japanese encephalitis	3	12	37	110	64

My level of confidence in serving as a source of information about animal health emergencies for the following groups is:

Clients	6	14	36	106	70
Community members who are not clients	10	17	47	104	55
Media – print	36	43	69	63	23
Media – television	50	53	68	44	15
Media – radio	48	56	69	45	16
Industry groups – local	33	40	62	76	22
Industry groups – state	40	55	65	54	18
Industry groups – national	51	59	66	44	13
Nonprofit groups that are not directly associated with animal agriculture	38	48	69	63	16
Local Cooperative Extension/land-grant university specialists	37	49	60	64	23
State Cooperative Extension/land-grant university specialists	41	50	65	58	19
National Cooperative Extension/land-grant university specialists	54	54	61	48	16
Local government	37	39	60	73	25
State government	41	45	68	59	18
Federal government	52	56	59	47	13
My level of confidence in serving as a source of information about animal health emergencies in the following situations is:					
Answering clients' questions	4	23	31	111	64
Offering information to clients	4	23	30	112	62
Speaking at a community meeting	18	31	63	86	33

Answering media members' questions	35	58	66	58	16
Offering information to the media	37	62	67	50	17
Appearing on television	60	70	53	39	11
Speaking on a live radio broadcast	56	64	56	41	15
The level of training I need to improve my skills in the following aspects of communication is:					
Interpersonal communication	23	52	93	53	9
Public speaking	17	41	84	71	17
Interviewing	13	34	70	89	22
Serving as a spokesperson	8	28	66	91	37
Written communication	22	42	78	71	16

Table 6

Questions and Items Related to Objective 6: Influence of Cost on Veterinarians' Interest in Training about Emergency Response and Management, Disease Recognition and Reporting, and Communication Skills

	Response (*n*)				
Question and Item	Very Low	Low	Neutral	High	Very High
The level of influence of cost on my interest in training about the following topics is:					
Emergency response procedures	11	23	84	76	35
Disease recognition and reporting	12	29	76	76	35
Communication	10	24	84	68	41

Table 7

Questions and Items Related to Objective 7: Veterinarians' Intentions to Participate in Training about Emergency Response and Management, Recognition and Reporting of Selected Animal Disease, and Communication Skills

	Response (*n*)				
Question and Item	Very Low	Low	Neutral	High	Very High
My level of interest in training to improve my skills in implementing procedures of the following plans for responding to animal health emergencies is:					
Local emergency response plan	12	14	65	108	26
State emergency response plan	11	20	71	105	18
National Animal Health Emergency Response Plan	13	32	72	86	21
National Response Framework	14	33	72	79	22
My level of interest in participating in response drills and/or scenarios to improve my skills in responding to animal health emergencies is:					
Local	15	19	62	101	30
State	16	24	68	92	27
National	19	35	73	78	21
My level of interest in training in the following types of training about response procedures for animal health emergencies is:					
Online, self-paced	20	26	63	88	29
Online, instructor-paced	29	34	88	66	9
Web conference	24	39	85	67	11
Seminar/workshop	13	15	64	97	36
Workshop at a conference	11	16	61	94	44
My level of interest in training to improve my ability to recognize and report clinical signs of the following diseases is:					

Highly pathogenic avian influenza	15	19	67	90	37
Foot-and-mouth disease	16	13	58	94	47
Rift Valley fever	14	14	69	91	40
Exotic Newcastle disease	15	18	70	89	36
Nipah and Hendra virus	15	15	70	90	38
Classical swine fever	12	15	70	92	39
African swine fever	12	15	70	90	39
Bovine spongiform encephalopathy	17	16	59	93	43
Rinderpest	16	14	63	96	39
Japanese encephalitis	14	17	68	90	39
My level of interest in the following types of training about recognizing and reporting clinical signs of the most dangerous animal diseases is:					
Online, self-paced	20	21	67	94	26
Online, instructor-paced	27	39	82	66	14
Web conference	24	35	85	70	14
Seminar/workshop	14	16	58	103	37
Workshop at a conference	12	22	59	94	41
My level of interest in training to improve my skills in the following aspects of communication is:					
Interpersonal communication	21	28	67	83	27
Public speaking	20	37	64	81	24
Interviewing	18	35	67	84	21
Serving as a spokesperson	23	41	70	72	20

Written communication	25	33	72	74	22
My level of interest in the following types of training about communication is:					
Online, self-paced	31	38	80	65	13
Online, instructor-paced	33	51	79	57	5
Web conference	32	57	82	51	5
Seminar/workshop	19	31	76	78	23
Workshop at a conference	20	31	74	74	27

VITA

Traci Lianne Naile

Candidate for the Degree of

Doctor of Philosophy

Dissertation: FIRST RESPONDERS IN ANIMAL HEALTH EMERGENCIES: DEFINING VETERINARIANS' AWARENESS AND TRAINING NEEDS

Major Field: Agricultural Education

Biographical:

Education:
Completed the requirements for the Doctor of Philosophy in Agricultural Education at Oklahoma State University, Stillwater, Oklahoma, in July 2009. Earned Bachelor of Science in Animal Science from Purdue University, West Lafayette, Indiana, in May 2001; Master of Science in Animal Science from Oklahoma State University, Stillwater, Oklahoma, in December 2003; and Master of Science in Agricultural Communications from Oklahoma State University, Stillwater, Oklahoma, in May 2006.

Experience:
Employed by O'Neill Marketing Communications as communications coordinator, 2005-2006; employed as coordinator of the Oklahoma AgrAbility Project, 2006-2008; and employed as a graduate research associate in Agricultural Education, Communications, and Leadership at Oklahoma State University, 2008-2009.

Professional Memberships:
American Association for Agricultural Education; American Registry of Professional Animal Scientists; Association for Communication Excellence in Agriculture, Natural Resources, and Life and Human Sciences; North American Colleges and Teachers of Agriculture; Oklahoma State University Alumni Association; Purdue Alumni Association

Name: Traci Lianne Naile Date of Degree: July 2009

Institution: Oklahoma State University Location: Stillwater, Oklahoma

Title of Study: FIRST RESPONDERS IN ANIMAL HEALTH EMERGENCIES: DEFINING VETERINARIANS' AWARENESS AND TRAINING NEEDS

Pages in Study: 264 Candidate for the Degree of Doctor of Philosophy

Major Field: Agricultural Education

Scope and Method of Study: The purpose of this study was to determine veterinarians' self-reported perceptions of susceptibility to and preparedness for responding to emergency events, self-reported knowledge of emergency response and management procedures and communication skills, and areas in which training should be provided to better prepare veterinarians for contributing to emergency management and public health responses. The target population included 1,173 veterinarians licensed in Oklahoma who provided physical practice addresses in Oklahoma, Kansas, Missouri, Texas, and Arkansas to the Oklahoma Board of Veterinary Medical Examiners. All veterinarians in the target population were surveyed using an online questionnaire from April 6, 2009, to May 21, 2009. Veterinarians received a personalized introduction to the survey, followed by two personalized reminders sent on a weekly basis. Nonrespondents received two additional reminders. Data were analyzed and interpreted using descriptive statistics. The final survey response rate was 24.8%.

Findings and Conclusions: Comparisons of demographic characteristics of respondents to previous studies demonstrated additional information is needed to target resources. Respondents reported low levels of experience and training in emergency response on all levels and disease recognition and reporting, with slightly higher levels reported for communication, reflecting a lack of available and targeted training opportunities. Respondents perceived vulnerability to and potential severity of disease outbreaks to be lower on the local levels than on state or national levels, indicating a mindset that outbreaks will not have immediate impact on respondents. Respondents also reported that fewer resources are available on the local level, as well as higher levels of confidence in state and national groups to respond to animal health emergencies. Respondents indicated lower levels of knowledge about and higher confidence in implementing emergency response plans, as well as high needs for training about response plans. Respondents indicated varied levels of knowledge, confidence, and needs for training about disease recognition and reporting and communication skills. The level of influence of cost on respondents' interest in training was neutral to high, and respondents expressed neutral to high levels of interest in training. Moderate to high needs for training were identified for all emergency response plans and 8 of the 10 diseases included in the questionnaire.

ADVISER'S APPROVAL: D. Dwayne Cartmell