Master of Public Health

Integrative Learning Experience Report

LIVESTOCK, SEAFOOD, POULTRY, AND PUBLIC HEALTH: A MULTI-FACETED FIELD EXPERIENCE AT THE KANSAS DEPARTMENT OF AGRICULTURE AND THE INTERNATIONAL MOBILITY OF VETERINARY STUDENTS (iMOVES) PROGRAM IN ITALY

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Summary/Abstract

This report summarizes experiential learning gained during a two-part field experience conducted at the Kansas Department of Agriculture (KDA) and at the University of Padova (UniPD) in northern Italy. The field experience activities occurred during the summer and fall semesters of 2018. The program with the KDA took place May 21 through September 13, 2018, while the UniPD-based activities occurred during a two-week period during the middle of the summer (June 16-29, 2018). While working at the KDA, the author was supervised by Dr. Tarrie Crnic, DVM, MPH. Thanks to the preceptorship of Dr. Crnic, the author was able to understand the structure of a local (state government) agriculture organization, engage in veterinary public health and food safety activities, hear about ideas for supporting agricultural and food businesses in Kansas, and participate in a state agricultural conference touching on issues of public health importance. At the UniPD, the author participated in a multi-faceted "International MObility of VEterinary Students," or iMOVES, field trip program that addressed the concepts of Food Safety, Public Health, and Animal Welfare to a group of veterinary medicine and public health students. Thanks to the iMOVES and UniPD programs, the author was able to broaden her experience in European livestock production, understand the international perspectives of food safety and animal welfare, and visit a commercial broiler farm, an international seafood importation and processing company, and a high technology cattle slaughterhouse.

Subject Keywords: KDA, iMOVES, Padova, Italy, food safety, shadowing

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Chapter 1 - Field Experience Scope of Work

This field experience took place in two venues: at the Kansas Department of Agriculture (KDA) in Manhattan, Kansas, and at the University of Padova (UniPD) in northern Italy. The field experience activities occurred during the summer and fall semesters of 2018. The program with the KDA took place May 21 through September 13, 2018. While working at the KDA, the author was supervised by Dr. Tarrie Crnic, DVM, MPH (and a former MPH student of the author's advisor, Dr. Kastner). The second part of the field experience occurred June 16-29, 2018 at the UniPD. The "International MObility of VEterinary Students," or iMOVES, program was conducted by the UniPD and aimed at addressing the concepts of Food Safety, Public Health, and Animal Welfare to a group of veterinary medicine and public health students. Participating universities included Texas A&M University, Colorado State University, Kansas State University, the University of Pennsylvania, and the University of Padova (Italy); all of these universities sent students to participate in this training. The program provided opportunities to attend the lectures from the UniPD professors, an Australian professor, a European Union veterinary official posted in the United States, faculty members from KSU and Texas A&M, and officials based at a local commercial broiler farm, a high technology cattle slaughterhouse, and an import-export seafood product company.

The two-part field experience touched on important public health related concepts including food safety (in a variety of commodity and food-category areas), animal health and welfare (in both traditional food animals as well as seafood), and microbiological and chemical science. The author, a government official from Thailand, was delighted to work with the likes of Dr. Crnic, a State of Kansas government employee with expertise in both veterinary medicine and public health, as well as several other public health-oriented scientists at the KDA and in Italy.

Since arriving at Kansas State University over two years ago, the author wanted to widen, deepen, and enrich her understanding of a variety of veterinary public health issues, and this field experience did that.

Obviously, the scientific literature has much to say about the kinds of issues and concepts addressed by the author's field experience. The World Organization for Animal Health (OIE) has publicly declared that national veterinary services are to be involved in the food safety systems of member countries (OIE, 2018). Veterinarians become involved in public health and food safety because food-borne zoonotic diseases derive from livestock as well as seafood products (Buncic, 2006). In the *Federal Meat Inspection Act*, a veterinarian is designated—in § 679a. subsection (e)(3)(A)—as a scientific-expertise representative of the government to carry out meat processing facilities' evaluations (USDA, 2016). Likewise, in Kansas, the competent veterinarians, by the order of the Secretary, have a state-level legal authority to inspect the slaughtering and processing plants under the *Kansas Meat and Poultry Inspection Act* (USDA, 2013).

Chapter 2 - Learning Objectives and Project Description

During the Spring of 2018, the author (in consultation with her advisor, Dr. Justin Kastner) devised a two-part field experience proposal. The proposal featured the following anticipated learning objectives and activities:

Learning Objectives:

1. To understand the structure and administration of the governmental public health organizations which related to animal health and food safety.
2. To integrate knowledge acquired in coursework with real-life activities of the Kansas Department of Agriculture.
3. To grow in knowledge of Kansas, the United States, and global food safety regulations and their implementation.
4. To learn more about veterinarians' roles in food safety and public health.
5. To learn about the public health challenges of state government programs.

Field Experience Activities:

1. Shadow biosecurity, animal health, and/or other regulatory officials involved in public health.
2. As allowed, participate in KDA's on-site visits to livestock production facilities.
3. During the second half of June 2018, participate in a two-week food safety, public health, and animal welfare policy course (an International Mobility of Veterinary Students, or iMOVES program) that would provide additional public health knowledge regarding European Union and other global approaches to food safety regulation.

True to the original plan (but inevitably adjusted with the realities of the actual KDA and UniPD opportunities), the author performed or participated in several unique public health related experiential-learning activities. At the KDA, the activities included taking scrapie samples from sheep for the National Scrapie Eradication Program, participating in on-site evaluations of state livestock markets, shadowing KDA staff on their visits to dairy farms and a milk plant (where performance-based and survey inspections occurred), and engaging in discussions with personnel responsible for the *"From the Land of Kansas"* entrepreneurship program and the KDA's international marketing programs. The author was able to also attend the Kansas Ag Summit. These activities were all, to varying degrees, related to animal health, disease control, veterinary public health, and food safety. While with the iMOVES program (which focused on food safety, public health, and animal welfare), field experience activities included assisting with a necropsy examination while visiting a broiler farm, touring the operations of an international seafood company, and walking through the entire active processing line at a cattle slaughterhouse.

Both the KDA and the host institution for the iMOVES program (i.e., the University of Padua) have a rich heritage of veterinary and public health activities. For example, the KDA claims to be the nation's first state department of agriculture, and the Kansas Division of Animal Health (DAH) was created in 1969 (KDA, 2018a). The KDA works to support agriculture in Kansas and its high number of agricultural operations. In Padova, Italy, the University of Padova has long served veterinary, scientific, and public health objectives. For example, and with reference to the centuries-old efforts by scholars to contribute to the knowledge of medicine and health, the University of Padova's College of Medicine was established in the middle of the 1200s. This marked the beginning of medical and public health education at the University of Padova. Since then, the medical teaching has been developed, and until the 1800s the field of Veterinary

Medicine was part of the curricula for physicians and surgeons (Negro Del Piero, 2001). The author, who was privileged to walk the streets, alleys, walkways, lecture halls, and anatomical theatres of this campus, can declare that there is a rich history of Veterinary Medicine at the University of Padova.

Chapter 3 - Reflection

3.1 Shadowing the Kansas Department of Agriculture

3.1.1. Disease control and surveillance

Disease control and surveillance is a major role of the Kansas Department of Agriculture's (KDA's) Division of Animal Health, which seeks to promote the health and welfare of livestock and protect human beings from public health threats. During the KDA field experience, the author took part in the National Scrapie Eradication Program (NSEP), which is based on a cooperative agreement executed by the USDA Animal and Plant Health Inspection Service (APHIS) with states in the United States (9 C.F.R. § 54.2, 2008). The Regulatory Scrapie Slaughter Surveillance (RSSS), an activity under the NSEP, is conducted annually and involves the collection of tissue samples from sheep and goat carcasses. Scrapie is a transmissible spongiform encephalopathy of public health importance (USDA, 2017). The RSSS efforts were initiated in 2003 and have aimed to identify and trace scrapie-infected carcasses back to the farm. The goal is for all scrapie-infected flocks to be destroyed and the disease eradicated (USDA, 2018b). The samples must be collected from both the sheep and goat population in each state, and official ear tags play an important role in identifying the origin of the animals. The brain stem is the part that is used for the scrapie testing as shown in Figure 3.1. The steps of sampling include selecting the animal which older than two years old, checking the ear tag, clipping off the ear with the tag, collecting the brainstem, and lastly putting the ear tag and the sample in formalin transporting media.

Figure 3.1 A brain stem sample from a goat and a transporting medium.

Figure 3.2 The atmosphere of a local sheep and goat slaughterhouse.

In accordance with the decentralized political structure of the United States, each state has its own regulations (typically based on federal regulations and guidelines), while some states have more stringent rules. Many states, such as Kansas, Nebraska, Illinois, and Alabama, require the bovine tuberculosis (TB) test at the state of origin before allowing movement to farms or feedlots (Alabama Department of Agriculture, 2014; Illinois Department of Agriculture, 2018; Indiana State Board of Animal Health, 2018; Nebraska Department of Agriculture, 2018). Tuberculosis, a contagious, infectious, and communicable disease caused by *Mycobacterium bovis*, has for years

alarmed veterinary public health officials across the country and world. The U.S. Department of Agriculture bovine tuberculosis monthly reports showed that the disease's occurrence is persistent over the United States (USDA, 2018c). The caudal fold tuberculin test is a typical screening test used in surveillance efforts. A veterinarian will intradermally inject tuberculin (a bovine purified protein derivative from the tubercle bacillus) into the caudal fold of the cattle's tail; the cattle are then examined by palpation 72 ± 6 hours after injection (California Department of Food and Agriculture, 2016). If an animal is positive for bovine tuberculosis, the injected area will be swollen. In such positive cases, the veterinarian must inform a state veterinary inspector in the area; he/she will then confirm the result with the comparative cervical tuberculin (CC) test. This test is to compare the thickness of the skin fold where injected by the attenuated *M. avium* and *M. bovis* intradermally. The injection area is at the side of the neck. In the event of a positive result for *M. bovis*, the KDA compensates the owner for the estimated value of the animal, then collects the samples of internal organs, sending them to the official laboratory to culture and conduct microscopic and histopathologic tests. If the cultivation is positive, the flock will be quarantined, and more disease investigations will be performed.

The author visited a dairy feedlot to observe the TB test examination. It is the responsibility of accredited veterinarians to perform the test and issue (and endorse) a Certificate of Veterinary Inspection (CVI). With regard to the CVI endorsement, the veterinarian has to conduct the tests required by the state of destination. During the author's visit, a herd of cows was being transported to a state requiring the TB test. A veterinarian examined the results at the cattle's tail as shown in Figure 3.3, and there was a cow that tested positive. Per the protocol described above, the veterinary inspector conducted the CC test on that cow as shown in Figure 3.4. Apparently, the cow had negative results to the CC test, and the herd was allowed to be transported.

Figure 3.3 A veterinarian examining the caudal fold tuberculin test results.

Figure 3.4 The cervical area for performing the comparative cervical tuberculin test.

3.1.2. Dairy Inspection Program

The KDA's milk inspectors enforce the Grade "A" Pasteurized Milk Ordinance (Grade "A" PMO) 2017 Revision and all Kansas dairy laws related to inspection. There are two types of dairy farm inspections. One is performance-based inspection, and the other is survey inspection. The intervals could be three, four, or six months depend on the farms' performance and laboratory results whereas the survey inspection is conducted once a year.

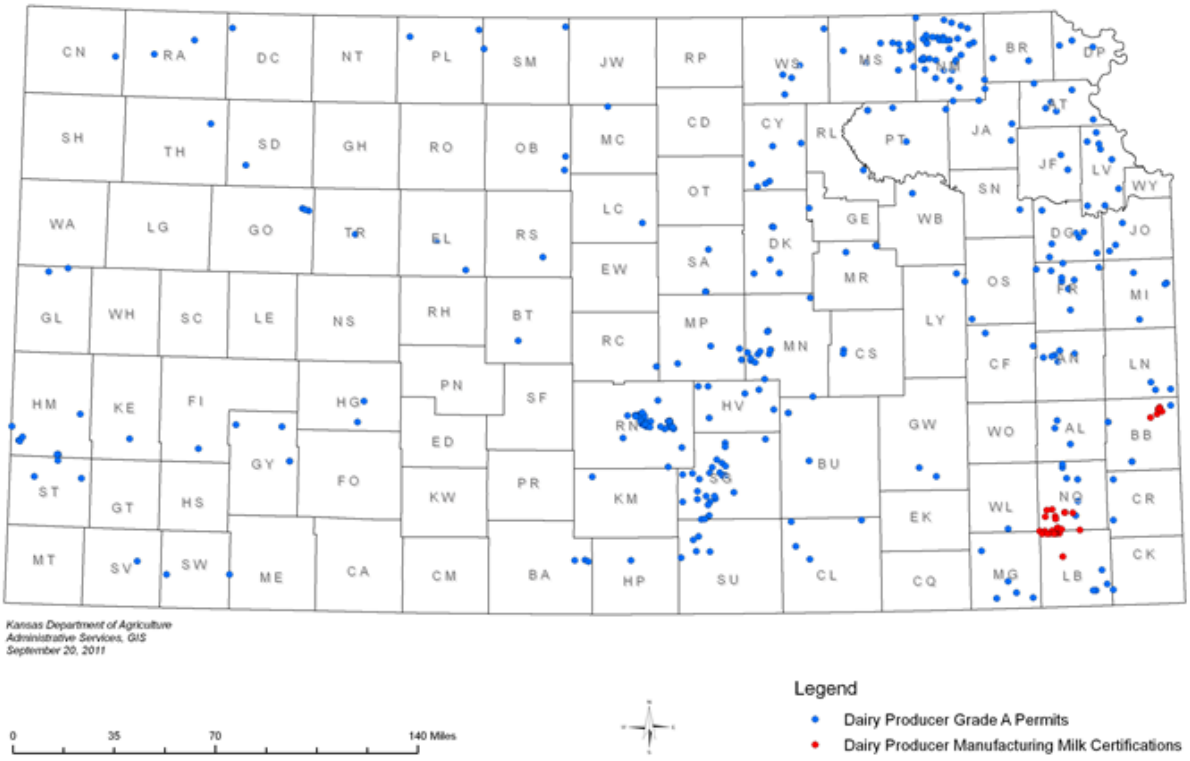

Figure 3.5 Map indicating the locations of dairy farms in Kansas. (KDA, 2018h)

The author and the inspectors also visited a milk processing plant in Junction City for a performance-based inspection. The Junction City plant functions as a comprehensive Small and Medium-Sized Enterprise (SME) business; its products are sold throughout the state. On the production site, there are several noteworthy facilities: a dairy farm, a milking parlor, pasteurizing facilities, and a cold storage facility. A third-generation family of owners is in charge, and they keep the traditional glass milk bottle as their business signature. Figure 3.6 shows the automatic bottling system at the facility. After milking, milk is kept in a cooling tank. The workers bottle milk in a particular order—from cream to whole milk, then whole milk to reduced fat milk, and finally reduced fat milk to flavored milk. All the additives such as flavors are added to the milk before the pasteurization. The author noticed that a few of the inspectors accessed the production site without washing hands and changing shoes or clothes; they only wore a hair net.

Figure 3.6 The automatic bottling system.

The main objective of the inspection is to ensure the sanitary production of safe milk. The KDA inspectors examine the vats, pipeline, and overall infrastructure cleanliness in good hygiene practices. The inspectors reviewed the previous records to see if there were any non-compliance issues and, if so, considers how the company solved the problems. The tests were conducted with concerns for accuracy of equipment and compliance with the standards. They tested the function of the temperature alarm probe, the real-time temperature recorder, the diversion valves, pressure test, and the clean-in-place time gap test.

Figure 3.7 The temperature alarm probe testing with the KDA-calibrated thermometer.

Figure 3.8 An inspector examining the real-time temperature recorder accuracy of the pasteurization system.

The inspected equipment, thermometers, and temperature graph recorder are labelled with official seals as shown in Figure 3.9 and 3.10. If there is any incident requiring the seal to be cut off, the plant manager must report such to the inspectors, so that they can come to re-run the tests.

Figure 3.9 A seal on a vat thermometer.

Figure 3.10 An arrow pointing at a seal on the real-time temperature recorder.

A survey inspection of dairy farms occurred in Reno County, Kansas, at the end of August 2018. The procedure for inspection complies with the mentioned standard as well as the performance-based inspection; however, this inspection is conducted by a supervisor to audit the performance of the inspector in charge in the area. It was an unannounced inspection. They decided to select the farm on the day of inspection; the farmers were not informed prior to the time of visiting.

The inspector examined the cleanliness of the infrastructure, the cleanliness of pipelines and cooling tanks, drug labelling, and chemicals. The inspector in charge collects milk samples once a month while the trained milk truck drivers collect the samples every batch. The milk is tested for antibiotics, somatic cell count, total plate count, pesticides, added water, coliforms, butter fat, and Alkaline phosphatase.

Figure 3.11 An inspector inspecting milk cuffs in a milk parlor.

Figure 3.12 An inspector inspecting animal drugs in use.

3.1.3. Livestock Markets

Livestock markets provide facilities for purchasing and selling livestock. To own and operate a livestock market, an owner needs a license. There are license requirements related to various divisions and bureaus within Kansas: the Kansas Department of Health and Environment; the Department of Revenue; the Department of Commerce; the Department of Wildlife, Parks, and

Tourism; and the Department of Agriculture (KDA, 2017). At the marketplace, there must be a veterinary practitioner in charge on the selling day to do the physical examination, pregnancy status check, and estimation of the animal's age. There are two types of tagging at the livestock market. First, the official metal ear tag (as shown in Figure 3.14) will be clipped on an animal's ear as an identity number; this method is used on 2-year-old or older cattle which are going to be transported across state lines. The second type is a back tag. It will be placed on the back of cattle which are going directly to slaughterhouses across the state lines. Some animals may have both tags for counter-checking. Additionally, the cattle going to an in-state slaughterhouse are not required to be labelled with any official tags.

As far as the author is concerned, the livestock markets are the assembling places of animals from farms. Many livestock markets, however, do not have a biosecurity plan to prevent the dispersion of diseases. The system of livestock market selling is the auction; the caller can call the price by weight, head, or flock depending on the types (bulls, heifers, steers, etc.) or ages of animal. The market will get the commission from the selling price for their operation.

Figure 3.13 A veterinarian doing a pregnancy check.

Figure 3.14 The official silver ear tags.

Figure 3.15 The atmosphere in the auction area.

3.1.4. Meat and Poultry Inspection Program

The Kansas Meat and Poultry Inspection Program has the responsibility for inspecting meat and poultry slaughterhouses and processing plants to ensure that the meat and poultry products are wholesome and safe for human consumption. There are 46 slaughter and processing plants registered with the KDA (KDA, 2018d). The facilities are categorized into two types: inspected and custom operations. The inspected facilities have continuous production which requires constant inspection (KDA, 2018d) while the custom facilities have less frequent production. The custom facilities are visited once a year, and their products cannot be sold to the general public.

The aspects of the inspection cover sanitation of the facilities, animal welfare, and meat wholesomeness. The meat or poultry products produced under the state inspection standards cannot be sold to other states. If the facilities expect to export their products, they are required to have the USDA inspection. However, not every type of animal is under KDA authority. Elk, deer, bison, some breeds of poultry, and rabbits not used for consumption are not regulated by the KDA.

The author visited several local slaughterhouses in Kansas. As far as she experienced, some facilities slaughtered animals of more than one species; however, they managed the cut off time and clean-up of the equipment *before* starting on the next species. She also observed that firearms were used to stun the animals before slaughtering. The KDA inspectors are in charge at the facilities at all times during the operation. They conduct ante-mortem, post-mortem, and processing inspections, as well as sampling. The wholesome carcasses will be marked with an official stamp as shown in Figure 3.17. If an inspector is not confident about a lesion or some other presenting issue, he/she may ask a veterinary inspector in the area for consultation.

Figure 3.16 The example of the Kansas official stamp used on carcasses and packaging. (KDA, 2018d)

Figure 3. 17 A carcass that passed the inspection with the official stamp.

Figure 3.18 A processed product that passed the inspection with the official stamp on the package.

3.1.5. *From the Land of Kansas* Program and International Marketing Programs

Kansas has various types of agricultural products such as crops, meats, live animals, and agricultural processed products. The KDA has a Marketing, Advocacy and Outreach Team that supports Kansas products through a trademark program called "*From the Land of Kansas*." The

program was started in 1988 under the KDA. Interestingly, this program was moved to the Department of Commerce and changed its name to "*Simply Kansas*" in 2005 and remained there for 6 years before returning to the KDA. In 2013, the program was changed back to the original name. The team continually works on advertising *From the Land of Kansas* through local and national media, and by online technologies; meanwhile, the team also collects feedback from the participants and stakeholders to improve the program and meet its needs (KDA, 2018i).

For participation in the *From the Land of Kansas* program, the farmers, producers, or manufacturers have to sign up to be a member. Membership costs range from free to $2,000 annually depending on the benefits (From the Land of Kansas, 2018). In addition, the program provides the online market place on its website so as to assist the non-social media user members. Also, the program collaborates with faculty members from Kansas State University's Department of Animal Science and Industry, who give the members advice and assistance on nutrition, safe food production, and Hazard Analysis and Critical Control Point (HACCP) compliance.

Figure 3.19 The logo of "*From the Land of Kansas*" program (KDA, 2018i)

The International Marketing Program is another effort to expand the Kansas agricultural businesses' reach to a global market. In 2017, Kansas exported agricultural products valued at 3.6 billion dollars. The top three exported products were raw meat (39.6%), cereal grains (31.5%), and oilseed (12.1%), and the top trading partners were Mexico (31.0%), Japan (19.9%), and Canada (9.0%) (KDA, 2018e).

The U.S. Small Business Administration supports this program through a cooperative agreement, sharing funding with KDA. The program not only provides export training and foreign market information, but also aids with travelling expenses to foreign trade shows. Recently, the team travelled to the Pet Food Forum Asia in Bangkok, Thailand (the author's home country) on March 27 – 29, 2018 (KDA, 2018f). The internal statistics show that Kansas and Thailand have a robust trading relationship in oilseeds, agricultural residues, and animal feed. These, respectively, are the highest-value Kansas products exported to Thailand (KDA, 2018e).

3.1.6 Participating in the Kansas Ag Summit

The Kansas Ag Summit is held by the Kansas Department of Agriculture annually. This conference is an important conference for Kansas agriculture, assembling the agricultural public and private sectors, manufacturers, scholars, farmers, and other stakeholders to initiate, deliberate, and encourage many different efforts regarding agriculture in Kansas. The comments, suggestions, and results from the workshops form part of the Agricultural Growth Strategy project. The meeting (attended by the author) was categorized into crops, livestock, food processing, feed and pet food, and agriculture equipment and technology.

a) Session: Animal Health Industry Growth

The Animal Health Industry Growth session's objective was to strengthen the collaboration between public and private partners, support private sectors, and create opportunities in animal

health and production professions in order to serve Kansas as the global center of animal health research and development, academics, and extension activity (Kansas Ag Growth, 2018a). Kansas is one of the leading states in agricultural production. As we know, the main livestock production in Kansas is beef; in addition, dairy production is also gradually increasing. The KDA participates in encouraging Kansas farmers to develop biosecurity plans; 16 dairies and 25 feed yards have engaged to participate in the program (Kansas Ag Growth, 2018b).

To have efficient livestock production, veterinarians play a major role in controlling animal diseases and zoonoses, giving animal treatments, and providing animal health education. While it is important to have veterinarians available in each locality raising animals, the number of veterinarians is not adequate. Veterinarian deficiency occurs in rural areas of Kansas. There are several factors that may cause this problem: unattractive income, a harsh environment, a preference for companion animal practice, etc. Those familiar with public-private partnerships and the academic sectors agreed that this was a critical issue, so a bill encouraging opportunities for students pursuing the veterinary medicine degree with the collaboration of Kansas State University was proposed to the Kansas legislature. In 2006, the bill was signed, and the training program called the Veterinary Training Program for Rural Kansas (VTPRK) has been established and authorized by the Kansas State University College of Veterinary Medicine (Kilgore Megan, 2018). The recruitment targets students residing in rural areas and intending to work in an area of 35,000 people or less; the program recruits five students each year. The selected students receive financial incentives and intensive training programs other than the regular curriculum to support their education and provide them the perspective for working in rural areas (Elmore & White, 2010). After demonstrating initial success, and 7 years of graduated students, the collaboration of the Kansas Veterinary Medical Association, the Kansas Livestock Association, the Kansas Veterinary

Medical Association, and the Kansas Farm Bureau came together to introduce Kansas House Bill No. 2552 on February 12, 2018; this bill requests the State of Kansas to consider the program's expansion by increasing the number of the participants. However, the bill died in Committee on May 4, 2018 (Kansas Legislature, 2018).

Kansas, as an agricultural leader of the United States, launched an agricultural emergency preparedness program called the "Kansas Agriculture Emergency Response Corps (KAERC)." Due to climate change and concerns about foreign animal diseases, both the public and private sectors have concerns covering a wide range of consequences such as animal health, economic losses, food quality and security, and the well-being of humans. The KAERC, established in June 2017, has a goal to protect the state from any agricultural emergency incidents (McBryde, 2017). With the limited number of the KDA and related organization staffs, this project aimed to recruit multi-disciplinary volunteers over the state to prepare for unexpected incidents. The volunteers will be an extension of the state and federal staffs; examples of the positions are appraiser, public educator, cleanup/disinfectant specialist, mapping (GIS) specialist, and warehouse management specialist. They will be trained to understand the emergency response framework (KDA, 2018g). The motivation of the KAERC program was generated during KDA annual biosecurity exercises. There are foreign animal disease outbreak scenarios which have state and federal organizations, producers, farmers, and the other stakeholders playing a role. After several exercises, they revealed what the strengths and weaknesses were so that the program was formed (McBryde, 2017).

Moreover, a federal regulatory approval process for animal health products was one of the most voted-for topics in the animal health growth session. Most people agreed that a regulatory approval process is needed but not be burdensome in terms of effort and time (Kansas Ag Growth, 2018b).

b) Session: Beef Industry Growth

During 2016, 2017, and 2018, the Kansas cattle inventory was 8.48, 8.70, and 8.75 million head, respectively, including all cattle and calves and the cattle and calves on feed (Bounds, 2017; Bounds, 2018; Groskurth, 2016), while the number of cattle and calves and the cattle and calves on feed in the United States during the same period was 105.2, 106.7 and 108.4 million head respectively (National Agricultural Statistics Service, (NASS), 2016, 2017, 2018). Therefore, the cattle in Kansas represent approximately 8% of the total number of cattle in the United States; Kansas ranks third-highest in cattle production after Texas and Nebraska (Myers, 2018). Being the main industry of Kansas, the state economy could be devastatingly affected if there was a foreign animal disease outbreak such as foot and mouth disease (FMD). Traceability was highlighted as a part of any outbreak management tool. CattleTrace is the national pilot project led by Kansas with the collaboration of the Kansas Livestock Association (KLA), Kansas State University (KSU), and the Kansas Department of Agriculture (KDA) (Myers, 2018).

Significantly, the U.S. Department of Agriculture (UDSA) introduced a traceability system in the livestock industry in 2003. The objective of that project was to control and manage infectious animal diseases such as FMD. Later, the U.S. Animal Identification Plan (USAIP) was established associating with USDA's National Animal Identification System (NAIS) in 2004; however, producers resisted the program. In the face of competition with other beef exporting countries, the United States was in need of a good livestock traceability system in order to provide confidence to trade partners (Bickel, 2018). Thereafter, the USDA inaugurated the Animal Disease Traceability program (ADT) in 2013 which still remains in place (Maday, 2018) while the ADT has an exemption for beef cattle younger than 18 months old. Unless they go to exhibitions or recreational events, the identification is needed (USDA, 2018a). The CattleTrace aims to trace the

animals from cow-calf farms to slaughterhouses. With the enthusiasm of Kansas to evolve the livestock industry, the USDA Secretary for Marketing and Regulatory Programs, Greg Ibach, said the USDA gladly becomes a partner of the project (CattleTrace, 2018).

The current implementation efforts involve testing the installed infrastructures and tags applied on the 55,000 cattle. The leaders have chosen the ultra-high-frequency (UHF) system (Maday, 2018) which has the ability to read the tags, hands-free, at around 12 meters (Terso, 2017). The CattleTrace program is a step forward not only for animal traceability in Kansas, but also animal health, food quality, and food security on a national scale.

3.2 Food Safety, Public Health and Animal Welfare, University of Padova, Italy

The "International MObility of VEterinary Students," or iMOVES, program was hosted by the University of Padova, Italy. The program provided opportunities to attend lectures from the UniPD professors, an Australian professor, a European Union veterinary official posted in the United States, faculty members from KSU and Texas A&M, and officials based at a local commercial broiler farm, a high technology cattle slaughterhouse, and an import-export seafood product company.

The Italian seafood facility visited by the author through the iMOVES program is located on a bank in Venice, Italy. The company began its seafood business in the 1960s in the wholesale market. They expanded their market to a large-scale retail market later in the 1980s (Fiorital, 2018) by producing ready-to-eat seafood products. Today, the firm's raw materials are imported from over 70 countries worldwide, but mainly from Ecuador and Brazil, and their products are exported to several countries in the European region. The facilities included a raw material receiving area, cutting area, chilled room, freezers, cooking area, packing area, and loading area. Moreover, they have an in-house laboratory which has the capacity to perform heavy metal, parasitic, and quality control tests. The author observed the fish being imported into and held on ice at the receiving area. Tons of

ice were used for controlling seafood temperature. Histamine fish poisoning knows as a food poisoning problem from seafood which can be prevented by keeping seafood chilled or frozen. Histamine fish poisoning is caused by high levels of histamine in seafood. High levels of histidine—histamine substrate—in some kinds of seafood such as in tuna, mahi mahi, and anchovy are apt to cause the toxin poisoning if bacteria grow. Bacteria can convert histidine into histamine which can trigger allergic reaction if a person receives it in high level. (American Academy of Allergy, Asthma & Immunology, 2018). Therefore, when the raw materials arrive, the company practices an important receiving inspection step accepting only fresh and wholesome products. An employee demonstrated how the company inspected the received seafood products.

Figure 3.20 A company employee demonstrating how to perform seafood inspection at the receiving area.

Figure 3.21 The seafood products kept in chilled or frozen at all time to preserve the quality.

Seafood safety, of course, is just one important public health issue. Other animal protein sources ought to be safe, too. One of these, which the author (a government inspector from Thailand) is familiar with, is poultry. A broiler farm was another place visited during the iMOVEs activities in Italy. It belonged to an integrated company which is in the top 3 of all poultry production businesses in Italy. This farm raises broiler chickens; females and males were in the same house but separated zones. Each house can contain 180,000 birds with a density of 30-39 kilograms per square meter. The chickens are caught at 34 days with all-in all-out management. The weight of the chickens is around 3.2 kilogram in males, and 1.5 kilogram in females at the catching day. Each house had two silos. One contains feed with anti-coccidial drugs, the other contains drug-free feed. The birds are given anti-coccidial drugs at an early age and these could potentially present drug residues in chicken meat if given continuously. Practically, the farmers stop giving any drugs to the chickens at a certain age and use drug-free feed until catching. The farm has benefitted from good landscape management; there were no big trees close to the house and the grass was mowed. The concentrated evaporating system farms required a biosecurity plan

to reduce the risks of loses. As far as the author observed, the farm had good biosecurity practices: visitors changing personnel shoes and clothes or wearing a gown before getting in the farm area. They also had rule restrictions for vehicles. As necessary, only permitted vehicles can get into the farm and must be disinfected before entering. In addition, a boot bath with disinfectants was provided in front of each house entrance.

Figure 3.22 The environment around the broiler farm.

Figure 3.23 The visitors must change or wear covers before entering the farm.
Figure 3.24

Figure 3.24 The environment inside the evaporative broiler housing.

Pest control management items were found throughout the facility's area, and these included rat traps and fly traps. Livestock farming operations always attract pests because of the foul odor, feeds, and manure. Pests are good vectors of animal diseases. Pests not only affect the livestock production, they may also cause nuisances in the surrounding neighborhood.

The company has farm veterinarians who providing animal health care at breeder and broiler farms; however, with the biosecurity plan, they cannot visit the other farms which are not under their responsibility. A practical method to diagnose diseases in farm animals is necropsy. The farm veterinarian demonstrated how to conduct the necropsy examination in chickens and allowed the students to participate in the demonstration. As the farm veterinarian said, the major infectious diseases of this farm were coccidiosis and *E. coli* related infections and they sometimes found *Salmonella* and *Mycoplasma*. Also, poor management could be found as a cause of death in poultry. Necropsy could briefly determine what problems the farm has such as infectious diseases, or management problems.

The last field experience venue of iMOVES was a cattle slaughterhouse. The author visited a high-technology cattle slaughterhouse which was located in the Treviso province of Italy, not far from Venice. This company was established in the 1950s and expanded to have a retail and wholesale business in 1974. Although the business does not own cattle farms, they are a part of a regional cattle cultivation effort that has robust supply-chain practices designed to ensure the satisfactory quality of its meat. All of the cattle come from the area called "Marca Trevigiana" and the Veneto region only. Their products are sold domestically and in other European countries (Colomberotto, 2013).

Before entering the production facility, visitors must wear boots, coverings, and a safety cap. There was a buffer room that provided handwashing and boot scrubbing machines. After entering the production line, the visitors (including the author) had to spray their hands with alcohol and wear gloves. To avoid contamination, visitors walked into the clean area and then forward to unclean areas. After stunning, the cattle are hung up on shackles all along the line to be deskinned, eviscerated, trimmed, aged, and cut until transferred to the temperature-controlled trucks. According to the Council Regulation (EC) No 1099/2009 on the protection of animals at the time of killing, animals must be stunned and not have consciousness or sensibility until death (Council regulation (EC) no 1099/2009 of 24 September 2009 .2009). The captive bolt stunning method was used in this slaughterhouse for animal welfare. Dr. Temple Grandin, an animal behavior specialist, recommends that the proper position of shooting is the center of the crossing imaginary lines between horns and the outer corner of the eyes (Grandin Temple, 2014). This technique prepares a cow to be killed without pain. There was a station for an official inspector to perform a post-mortem inspection of carcasses and offals after evisceration. If the carcass was wholesome, the inspector stamped an inspection-passed indicator on it. Additionally, a barcode tracking system was applied in the process

to trace parts and carcasses back. After aging and cutting as ordered, the carcass parts were conveyed to the loading area at the end of the building which had loading docks connecting to temperature-controlled trucks. The company used excellent technology with impressive hygienic practices.

Figure 3.25 After bleeding, the carcasses will be hung along the process.

Figure 3.26 An official stamp on an inspected-passed carcass.

Figure 3.27 A label with a barcode on a quarter of the carcass.

Figure 3.28 The beef carcasses and parts at the temperature-controlled loading area.

Chapter 4 - Competencies

Student Attainment of MPH Foundational Competencies

The author is grateful for the coursework in the MPH program that helped her prepare to practice (experientially) a number of Council on Education for Public Health (CEPH) and Kansas State University designated competencies. These occurred during the Integrated Learning Experience (ILE) as well as the Applied Practice Experience (APE).[1] Table 4.1 below provides more description about how these competencies were actually practiced, addressed, or obtained during the various field experience activities of the ILE and APE.

Table 4.1 Summary of MPH Foundational Competencies

Number and Competency		**Description**
1.	Apply epidemiological methods to the breadth of settings and situations in public health practice	By participating in several veterinary public health related meetings and trips with the KDA, the author realized that epidemiology is a major component of animal disease control and public health problems. This was especially evident in the observed scrapie surveillance program.
5.	Compare the organization, structure and function of health care, public health and regulatory systems across national and international settings	The author, a native of another country and a governmental employee for a southeast Asian nation-state government, was excited to learn about the differences of federal- and state-level U.S. public health organizations, and how their management of public health programs compared to her work experience in Thailand. This learning was augmented further by the iMOVEs field experience activities in Italy, where the European Union official gave a lecture

[1] For a copy of the APE document, please contact the author or her academic advisor, Dr. Justin Kastner.

		about the international relationship between the EU and various countries.
18.	Select communication strategies for different audiences and sectors	Encountering people at the KDA and experiencing different public and private settings in Italy exposed the author to how different groups develop their strategies of communication. While in in Italy, she was lectured to by professors from Italy, Australia, and the U.S. Moreover, there were various professions and nationalities of people represented during the iMOVEs activities. In addition, the author learned in Kansas about communication; the KDA veterinarians and inspectors modelled how they communicate to their stakeholders.
20.	Describe the importance of cultural competence in communicating public health content	Public health cannot be achieved if there is not good communication. It is not only important to have good communication within public health organizations, but also with stakeholders such as farmers, producers, manufacturers, and the general public to ensure that public health policies are understood, supported, and implemented.
21	Perform effectively on interprofessional teams	The Applied Practice Experience afforded the author several opportunities to interact with scientists, farmers, government workers, fellow students, and other peers in a professional, collaborative environment.

The author, of course, completed core MPH coursework touching on a number of competencies identified in Table 4.2.

Table 4.2 MPH Foundational Competencies and Core Courses in Which They are Taught

22 Public Health Foundational Competencies Course Mapping	MPH 701	MPH 720	MPH 754	MPH 802	MPH 818
Evidence-based Approaches to Public Health					
1. Apply epidemiological methods to the breadth of settings and situations in public health practice	x		x		
2. Select quantitative and qualitative data collection methods appropriate for a given public health context		x	x		
3. Analyze quantitative and qualitative data using biostatistics, informatics, computer-based programming and software, as appropriate	x	x	x		
4. Interpret results of data analysis for public health research, policy or practice	x		x		
Public Health and Health Care Systems					
5. Compare the organization, structure and function of health care, public health and regulatory systems across national and international settings		x			
6. Discuss the means by which structural bias, social inequities and racism undermine health and create challenges to achieving health equity at organizational, community and societal levels					x
Planning and Management to Promote Health					
7. Assess population needs, assets and capacities that affect communities' health		x		x	
8. Apply awareness of cultural values and practices to the design or implementation of public health policies or programs					x
9. Design a population-based policy, program, project or intervention			x		
10. Explain basic principles and tools of budget and resource management		x	x		
11. Select methods to evaluate public health programs	x		x		x
Policy in Public Health					
12. Discuss multiple dimensions of the policy-making process, including the roles of ethics and evidence		x		x	x
13. Propose strategies to identify stakeholders and build coalitions and partnerships for influencing public health outcomes		x		x	
14. Advocate for political, social or economic policies and programs that will improve health in diverse populations					x
15. Evaluate policies for their impact on public health and health equity		x		x	x
Leadership					
16. Apply principles of leadership, governance and management, which include creating a vision, empowering others, fostering collaboration and guiding decision making		x			x
17. Apply negotiation and mediation skills to address organizational or community challenges		x			
Communication					
18. Select communication strategies for different audiences and sectors	DMP 815, FNDH 880 or KIN 796				
19. Communicate audience-appropriate public health content, both in writing and through oral presentation	DMP 815, FNDH 880 or KIN 796				
20. Describe the importance of cultural competence in communicating public health content		x			x

22 Public Health Foundational Competencies Course Mapping	MPH 701	MPH 720	MPH 754	MPH 802	MPH 818
Interprofessional Practice					
21. Perform effectively on interprofessional teams		x			x
Systems Thinking					
22. Apply systems thinking tools to a public health issue				x	

Student Attainment of MPH Emphasis Area Competencies

The author, who focused on Food Safety and Biosecurity for her MPH program, completed Emphasis Area courses that expanded her perspective in food safety, biosecurity, and related areas including, but not limited to, how globalization affects both the food trade and public health, food safety, and food security. During her field experience activities in Kansas and Italy, the author was able to strengthen her knowledge and competencies covered by the KSU Food Safety and Biosecurity emphasis area courses, as shown in Table 4.3 below.

Table 4.3 Summary of MPH Emphasis Area Competencies

MPH Emphasis Area:		
Number and Competency		**Description**
1	Food safety and biosecurity	During work with the KDA, visits to the farms and livestock markets familiarized the author with the KDA's efforts to evaluate appropriate biosecurity practices in local livestock management; similarly, in Italy, visits at a farm, seafood operation, and cattle slaughterhouse broadened her understanding of European regulatory approaches for food safety, biosecurity, and public health.

2	Threats to the food system	The author noticed a few shortcomings of biosecurity and food safety implementation at the sites she visited. These shortcomings (e.g., hygiene, sanitation, and transportation security) gave her opportunities to examine specific threats to the food system and how to scientifically address and prevent them.
3	Food safety laws and regulations	The author experienced the difference of local and national regulations of the United States related to the KDA programs such as the National Scrapie Eradication Program, the meat inspection program, and livestock transportation. Such programs showed the characteristics of the U.S. governmental system which has the federal government at its center along with decentralized state and local governments.
4	Food safety policy and the global food system	The author recognized that concerns about food safety and biosecurity are not limited to only domestic food production, but also to worldwide production and distribution. The drivers of the growth of the international food trade is globalization, the increase of the populations, and the deficiency of food.
5	Multidisciplinary leadership	The author believes that food safety has not been fully recognized and appreciated by the general public in Thailand (where she works in the government). Even though there are a number of Thailand-based public and private organizations committed to food safety, the author notices that food safety problems are reported only intermittently. In contrast, food safety awareness seems higher in Italy and Kansas. As a Thai

		government officer who completed this public health program, the author has been inspired to cultivate a better understanding and appreciation of food in Thailand.

References

9 C.F.R. § 54.2. (2008). *Animals and animal products*. United States

Alabama Department of Agriculture. (2014). Import requirements. Retrieved from http://www.agi.alabama.gov/divisions/animal-industries/import-requirements

American Academy of Allergy, Asthma & Immunology. (2018). Histamine toxicity. Retrieved from https://www.aaaai.org/conditions-and-treatments/related-conditions/histamine-toxicity

Bickel Amy. (2018). Cattle trace pilot project launched in Kansas. Retrieved from http://www.hpj.com/bickel/cattle-trace-pilot-project-launched-in-kansas/article_31a4f395-dfd0-526f-9690-e2acf7cde095.html

Birkun, Alexei.,III. (2016). Histamine toxicity from fish. Retrieved from https://emedicine.medscape.com/article/1009464-overview

Bounds Doug. (2017). *News release: Kansas January 1 cattle inventory.* Manhattan, Kansas: United States Department of Agriculture. Retrieved from https://www.nass.usda.gov/Statistics_by_State/Kansas/Publications/Livestock_Releases/Cattle_Inventory/2017/KS_cattle17.pdf

Buncic, Sava. (2006). *Integrated food safety and veterinary public health*. Wallingford [u.a.]: CABI Pub.

California Department of Food and Agriculture. (2016). Bovine tuberculosis testing information for cattle producers. Retrieved from https://www.cdfa.ca.gov/ahfss/Animal_Health/pdfs/TB/TB_Testing_Fact_Sheet.pdf

Cattle Trace. (2018). USDA offers support of cattle trace. Retrieved from https://www.cattletrace.org/blog/usda-offers-support-of-cattletrace

Colomberotto. (2013). Our story. Retrieved from http://www.colomberottoqualitanellecarni.it/colomberotto/index.php/en/history

House bill no. 2552, Committee on Agriculture Cong. (2018). Retrieved from http://www.kslegislature.org/li/b2017_18/measures/documents/hb2552_00_0000.pdf

Council regulation (EC) no 1099/2009 of 24 September 2009 on the protection of animals at the time of killing. (2009). *Official Journal of the European Union.* 1-30. Retrieved from http://library.wur.nl/WebQuery/groenekennis/1943588

Fiorital. (2018). Fiorital: Who we are. Retrieved from https://www.fiorital.com/chi-siamo/#_chisiamo

From the Land of Kansas. (2018). From the land of Kansas guidelines. Retrieved from https://fromthelandofkansas.com/sites/default/files/FLOK%20Program%20Overview_FINAL_12-29_0.pdf

Grandin Temple. (2014). Recommended captive bolt stunning techniques for cattle. Retrieved from https://www.grandin.com/humane/cap.bolt.tips.html

Groskurth Dean, C. (2016). *News release: Kansas January 1 cattle inventory up 6 percent.* Topeka, KS: Retrieved from https://www.nass.usda.gov/Statistics_by_State/Kansas/Publications/Livestock_Releases/Cattle_Inventory/2016/KS_cattle16.pdf

Illinois Department of Agriculture. (2018). Animal import. Retrieved from https://www2.illinois.gov/sites/agr/Animals/AnimalHealth/Pages/Animal-Import.aspx#h2

Indiana State Board of Animal Health. (2018). Indiana cattle importation rules. Retrieved from https://www.in.gov/boah/files/CattleImportationRules7-2018.pdf

Kansas Ag Growth. (2018a). (2018a). Animal health growth achievements. Paper presented at the *Kansas Ag Summit*,

Kansas Ag Growth. (2018b). (2018b). Animal health industry growth objective, outcomes, and action items. Paper presented at the *Kansas Ag Summit*,

Kansas Department of Agriculture. (2017). Livestock market sales & licensing guide. Retrieved from http://agriculture.ks.gov/docs/default-source/ag-marketing/livestock-market-and-sales.pdf?sfvrsn=0

Kansas Department of Agriculture. (2018a). Division of animal health. Retrieved from https://agriculture.ks.gov/divisions-programs/division-of-animal-health

Kansas Department of Agriculture. (2018b). *Export to foreign market: Historical.* Unpublished manuscript.

Kansas Department of Agriculture. (2018c). General information. Retrieved from http://agriculture.ks.gov/divisions-programs/meat-and-poultry-inspection/general-information

Kansas Department of Agriculture. (2018d). *Inspected slaughter and processing plants.* Manhattan, Kansas: Kansas Department of Agriculture. Retrieved from http://wapp.kda.ks.gov/m-p/inspected.pdf

Kansas Department of Agriculture. (2018e). *International marketing and trade statistics: April 2018*. Manhattan, Kansas: Kansas Department of Agriculture.

Kansas Department of Agriculture. (2018f). International marketing programs. Retrieved from http://agriculture.ks.gov/divisions-programs/agricultural-marketing-advocacy-and-outreach-team/international-marketing-programs2

Kansas Department of Agriculture. (2018g). Kansas agriculture emergency response corps; Retrieved from http://agriculture.ks.gov/divisions-programs/emergency-management/kansas-agriculture-emergency-response-corps

Kansas Department of Agriculture. (2018h). *Kansas dairy farm locations*. Manhattan, Kansas: Kansas Department of Agriculture.

Kansas Department of Agriculture. (2018i). Trademark program history. Retrieved from https://fromthelandofkansas.com/learn-about-us/history

Kansas Department of Agriculture. (2018j). Training opportunities & important dates. Retrieved from http://agriculture.ks.gov/divisions-programs/emergency-management/kansas-agriculture-emergency-response-corps/training

Kansas Legislature. (2018). Hb 2552. Retrieved from http://www.kslegislature.org/li/b2017_18/measures/hb2552/

Kilgore Megan. (2018). *To: House agriculture committee; representative Hoffman, chair*. Lyndon, Kansas: Kansas Veterinary Medical Association.

Maday John. (2018). Disease traceability: Better late than never. Retrieved from https://www.bovinevetonline.com/article/disease-traceability-better-late-never-0

McBryde John. (2017). Kansas takes on an “All-hazards approach” with agriculture emergencies. Retrieved from https://www.farmflavor.com/kansas/kansas-takes-all-hazards-approach-agriculture-emergency/

Myers G. Victoria. (2018). Animal ID gets real: Third-biggest cattle state starts traceability program. Retrieved from https://www.dtnpf.com/agriculture/web/ag/news/livestock/article/2018/07/09/third-biggest-cattle-state-starts

National Agricultural Statistics Service, (NASS). (2016). *Cattle: January 1 cattle inventory up 3 percent.* United States: United States Department of Agriculture. Retrieved from http://usda.mannlib.cornell.edu/usda/nass/Catt/2010s/2016/Catt-01-29-2016.pdf

National Agricultural Statistics Service, (NASS). (2017). *Cattle: January 1 cattle inventory up 2 percent.* United States: United States Department of Agriculture. Retrieved from http://usda.mannlib.cornell.edu/usda/nass/Catt/2010s/2017/Catt-01-31-2017.pdf

National Agricultural Statistics Service, (NASS). (2018). *Cattle: January 1 cattle inventory up 1 percent.* United States: United States Department of Agriculture.

Nebraska Department of Agriculture. (2018). Animal importation regulations. Retrieved from http://www.nda.nebraska.gov/regulations/animal/tilac.html#5

Negro Del Piero (Ed.). (2001). *The University of Padua: Eight centuries of history*. Italy: Signum Padova Editrice.

News Desk. (2018). Newcastle disease in California: More cases reported, quarantine imposed in San Bernardino county and Riverside county. Retrieved from http://outbreaknewstoday.com/newcastle-disease-california-cases-reported-quarantine-imposed-san-bernardino-county-riverside-county-44041/

Terso. (2017). Understanding the differences UHF AND HF RFID technology; Retrieved from https://www.tersosolutions.com/news/understanding-the-differences-between-uhf-and-hf-rfid-technology/

United States Department of Agriculture. (2013). *Kansas meat and poultry inspection Act*. Manhattan, Kansas: USDA.

United States Department of Agriculture. (2016). *Federal meat inspection Act*. United States: USDA.

United States Department of Agriculture. (2017). Scrapie. Retrieved from https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/nvap/NVAP-Reference-Guide/Control-and-Eradication/Scrapie

United States Department of Agriculture. (2018a). Animal disease traceability. Retrieved from https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/SA_Traceability

United States Department of Agriculture. (2018b). National scrapie eradication program. Retrieved from https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/sheep-and-goat-health/national-scrapie-eradication-program/ct_scrapie_home

United States Department of Agriculture. (2018c). Surveillance, preparedness and response services (SPRS)
cattle health center: Bovine tuberculosis and brucellosis surveillance results
monthly reports, federal fiscal year (FY) 2018. Retrieved
from https://www.aphis.usda.gov/animal_health/tb_bruc/downloads/affected_herd_monthly_summary_aug2018.pdf

United States Department of Agriculture. (2018d). USDA confirms virulent Newcastle disease in backyard exhibition birds in California, not a food safety concern. Retrieved from https://www.aphis.usda.gov/aphis/newsroom/news/sa_by_date/sa-2018/vrn

United States Department of Agriculture. (2018e). Virulent Newcastle disease; Retrieved from https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/avian-influenza-disease/vnd

White, B. J., & Elmore, R. G. (2010). Recruitment of veterinarians for rural communities through education: The veterinary training program for rural Kansas. *Online Journal of Rural Research & Policy*, *5*(7) doi:10.4148/ojrrp.v5i7.260

World Organisation for Animal Health, (OIE). (2018). The role of the veterinary services in food safety systems; Retrieved from http://www.oie.int/fileadmin/Home/eng/Health_standards/tahc/current/chapitre_role_vet_serv_food.pdf