

Master of Public Health
Integrative Learning Experience Report

***THE FOOD SAFETY AND INSPECTION SERVICE'S ROLE IN
THE CONTROL OF LISTERIA MONOCYTOGENES***

by

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submitted in partial fulfillment of the requirements for the degree

MASTER OF PUBLIC HEALTH

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FALL 2025

Summary/Abstract

I began my Applied Practical Experience (APE) in April 2025 with the Food Safety and Inspection Service (FSIS) with my preceptor Dr. Gregory Abreu, a Deputy District Manager at FSIS. Dr. Kastner, Dr. Abreu, and I videoconferenced to discuss the field experience and to consider ideas for my APE products. Dr. Abreu identified a need for a presentation to FSIS supervisors about their role in food safety with a focus on the control of *Listeria monocytogenes*. I worked with Dr. Abreu to identify Agency policy to present, and I gave the presentation to the FSIS supervisors in September 2025. I interviewed Dr. Abreu for a career introspective article in the *One Health Newsletter* which helped me consider my future career options. He described his journey through veterinary school, work in a large animal practice, and service in public health with FSIS. Dr. Kastner suggested that I participate in the International Mobility of Veterinary Students & Food Biotechnologists (iMOVES&FB) trip to Italy as part of my APE to help round out my field experience by giving me food safety related insights from within the European Union. I learned about differences in Italian food safety and biosecurity compared to the United States (U.S.). The trip helped to give me a multidisciplinary view of food safety. I included my systems thinking tool in my ILE which describes how I applied thinking tools in my APE products.

Subject Keywords: Food Safety and Inspection Service (FSIS), *Listeria monocytogenes*, meat and poultry, listeriosis,

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Chapter 1 - Literature Review

Food Safety and Inspection Service

Since 2010, I have worked for the Food Safety and Inspection Service (FSIS), which is where I performed my APE. FSIS has a long history of food safety and governmental changes. FSIS is currently under the U.S. Department of Agriculture (USDA), which was founded in 1862 by President Abraham Lincoln (FSIS, 2025). In 1884, the USDA Bureau of Animal Industry (BAI) was created to prevent diseased animals from being used as food (FSIS, 2025). The BAI was tasked with preventing foreign animal diseases from entering the country (FSIS, 2025). In the 1890s, the BAI began to inspect and certify salted pork, bacon, beef, and live cattle for export (FSIS, 2025). On the MeatsPad podcast, Dr. Justin Kastner discussed how Upton Sinclair's 1906 novel, *The Jungle*, impacted the meat industry (Najar, 2023). Dr. Kastner explained that Sinclair wrote the story to highlight the poor treatment of immigrant workers in the meat industry, but Sinclair also included some horror movie-like descriptions of the lack of sanitation (Najar, 2023). The novel captured the attention of the public and politicians, including President Theodore Roosevelt, which led to more governmental regulation of the food industry (Najar, 2023). In 1906, the US government enacted the Pure Food and Drug Act and the Federal Meat Inspection Act (FMIA) (FSIS, 2025). The Pure Food and Drug Act protected the safety of food and drugs, while the FMIA provided for the inspection for food safety of meat and meat products by the BAI (FSIS, 2025). In 1953, the US government transferred the meat inspection duties from the BAI to the Agricultural Research Service (ARS) (FSIS, 2025). In 1957, Congress passed the Poultry Products Inspection Act (PPIA) which similarly regulated poultry products as the FMIA regulated meat products (FSIS, 2025). Meat inspection responsibilities continued to move between different agencies until 1981 when FSIS was created (FSIS, 2025).

In 1993, a large outbreak of foodborne illness was caused by Jack in the Box hamburgers contaminated with *Escherichia coli* O157:H7 (FSIS, 2025). There were more than 600 illnesses and 4 child deaths with many of the patients suffering from hemolytic uremic syndrome (HUS) (Murano, 2018). At the time, FSIS organoleptically inspected meat and poultry products using sight, smell, and touch (FSIS, 2025). Agency officials and stakeholders advocated for a more scientific approach to food safety which led to the adoption of the Pathogen Reduction/HACCP Systems rule in 1996 (FSIS, 1996). The rule focused on the prevention and reduction of pathogens in meat and reinforced that the meat industry is responsible for producing safe food (FSIS, 2025). Since that time, FSIS has continued to

combat foodborne pathogens by testing meat and poultry products for *Listeria monocytogenes*, *Campylobacter*, *Salmonella*, and various serogroups of pathogenic *E. coli* (FSIS, 2025).

FSIS encompasses various departments that handle different aspects of food safety. It operates three laboratories across the country that test meat and poultry products for pathogens, allergens, and drug residues. FSIS has departments that facilitate food safety and trade by reviewing the requirements for different countries for export and import of meat and poultry products. There are departments that evaluate new technologies and develop regulatory policies. The largest department is the Office of Field Operations (OFO) which includes the inspectors that work inside the meat and poultry companies verifying that the companies meet the regulatory requirements and maintain adequate sanitation. I work in OFO as a Frontline Supervisor (FLS). I supervise a team of about 20 field inspectors. I use my experience and research abilities to help guide the inspectors in making regulatory compliance decisions. I help ensure that FSIS meets its statutory requirements from the FMIA and PPIA in that each company receives inspection daily to help protect food safety and the American public.

Background on *Listeria monocytogenes*

Food contaminated with *Listeria monocytogenes* can cause listeriosis which features symptoms of fever, severe headache, neck stiffness, and nausea, while also being the cause of miscarriages and stillbirths (FSIS, 2009). The disease can be fatal in people with weakened immune systems such as infants, the elderly, and people with serious health conditions (FSIS 2009). The Centers for Disease Control and Prevention (CDC) estimates that *L. monocytogenes* annually causes 1,250 illnesses, 1,070 hospitalizations, and 172 deaths (CDC, 2025).

Foods that are commonly contaminated with *L. monocytogenes* include:

- Unpasteurized (raw) milk and dairy products
- Soft cheeses
- Raw fruits and vegetables (such as sprouts)
- Ready-to-eat deli meats and hot dogs
- Refrigerated pâtés or meat spreads
- Refrigerated smoked seafood

(HSS, 2025)

L. monocytogenes is often found in the intestines of animals and in the environment such as in the soil, floors, walls, drains, and food processing equipment (FSIS, 1999). The

pathogen is a hazard in ready-to-eat (RTE) foods since there will be no additional cooking, or lethality step, performed by the processor or consumer. RTE meat and poultry products can become contaminated with *L. monocytogenes* in several ways:

- **Under-processing:** Products may not be cooked to a high enough temperature to kill any *L. monocytogenes* already present in the raw products (FSIS, 2003).
- **Biofilm formation:** *L. monocytogenes* can form biofilms on food processing equipment, making it difficult to remove through normal cleaning and sanitation. Equipment should be designed for easy cleaning to eliminate hard-to-reach areas that could harbor *L. monocytogenes* (FSIS, 2003).
- **Sanitation lapses:** Meat processors need to consider sanitation during operations to prevent environmental or cross-contamination between raw and RTE products (FSIS, 2003).
- **Growth at refrigeration temperatures:** *L. monocytogenes* is a psychrotrophic bacteria which means that it can grow at refrigeration temperatures, allowing the pathogen to increase during the shelf life of products prior to consumption (FSIS, 2003).

History of *Listeria monocytogenes* regulation in FSIS

During the 1980's, health agencies started to recognize that *L. monocytogenes* was causing illnesses through contamination of RTE foods (FSIS 2003). The US Food and Drug Administration (FDA) and FSIS had a zero-tolerance rule for *L. monocytogenes* which meant that there could be no detectable levels of viable pathogen in RTE foods (FSIS, 2003). Between 1989 and 1993, the rate of illness from *L. monocytogenes* declined by 44% (FSIS, 2003). In 1998, the CDC and local health departments detected a large outbreak caused by illness from *L. monocytogenes* (FSIS, 2003). The CDC and FSIS traced the outbreak strain of *L. monocytogenes* to hotdogs produced by an FSIS processing establishment (FSIS, 2003). The CDC reported 101 illnesses, 15 adult deaths, and 6 miscarriages or stillbirths associated with the outbreak (FSIS, 2003). In 1999, FSIS published a notice that meat and poultry establishment needed to reassess their hazard analysis and critical control point (HACCP) plans to ensure that they were adequately addressing *L. monocytogenes* (FSIS, 2003). In 2000, CDC reported another *L. monocytogenes* outbreak resulting in 29 illnesses causing 4 adult deaths and 3 miscarriages or stillbirths (FSIS, 2003). The outbreak was traced back to RTE turkey deli meat from an FSIS-inspected facility (FSIS, 2003).

In 2000, a Presidential directive on *L. monocytogenes* in RTE foods moved the Healthy People 2010 target date for reducing illnesses to 2005 (FSIS, 2003). In response to the directive, the US Department of Health and Human Services (HHS) and the Department of Agriculture (USDA) published an action plan that included consumer, health-care provider, and industry education; increased microbial sampling; enhanced disease surveillance; coordinated research activities; and consideration for new regulations (FSIS, 2003). FSIS announced plans that it would promulgate a rule regarding *L. monocytogenes* (FSIS, 2003).

In 2003, FSIS published the interim final rule "Control of *Listeria monocytogenes* in Ready-to-Eat Meat and Poultry Products" in the *Federal Register* that compelled meat and poultry processors to take action to control the hazard of *Listeria monocytogenes* in the RTE products (FSIS, 2003). The processors would be required to start testing for *L. monocytogenes* or an indicator organism to ensure that they were maintaining adequate sanitation in the post-lethality RTE processing environment (FSIS, 2003). The establishments would need to specify corrective actions and perform them when they receive a positive *L. monocytogenes* or indicator organism test result on food contact surfaces (FSIS, 2003). After multiple positives, the establishments would need to hold and test the finished products for *L. monocytogenes*. FSIS made it clear in the rule that establishments needed to consider *L. monocytogenes* as a hazard reasonably likely to occur in RTE products and take preventative measures (FSIS, 2003). FSIS allowed the public and private companies to comment on the 2001 proposed rule and FSIS included their responses to the comments in the 2003 interim final rule (FSIS, 2003). Multiple commenters said that the proposed testing frequency recommendations were arbitrary, and FSIS agreed with their comments, but kept the recommended frequencies in place (FSIS, 2003).

DEPARTMENT OF AGRICULTURE

Food Safety and Inspection Service

9 CFR Part 430

[Docket No. 97-013F]

RIN 0583-AC46

Control of *Listeria monocytogenes* in Ready-to-Eat Meat and Poultry Products

AGENCY: Food Safety and Inspection Service, USDA.

ACTION: Interim final rule.

SUMMARY: The Food Safety and Inspection Service (FSIS) is amending its regulations to require that official establishments that produce certain ready-to-eat (RTE) meat and poultry products prevent product adulteration by the pathogenic environmental contaminant *Listeria monocytogenes*. In particular, under these regulations, establishments that produce RTE meat and poultry products that are exposed to the environment after lethality treatments and that support the growth of *L. monocytogenes* will be required to have, in their hazard analysis and critical control point (HACCP) plans, or in their sanitation standard operating procedures or other prerequisite programs, controls that prevent product adulteration by *L. monocytogenes*. The establishments must share with FSIS data and information relevant to their

available for public inspection in the Docket Clerk's Office between 8:30 and 4:30 p.m., Monday through Friday.

FOR FURTHER INFORMATION CONTACT: Daniel L. Engeljohn, Ph.D., Acting Assistant Deputy Administrator, Policy Analysis and Formulation, Office of Policy, Program Development, and Evaluation, Food Safety and Inspection Service, U.S. Department of Agriculture (202) 205-0495. Copies of references cited in this document are available in the FSIS Docket Clerk's Office, Room 102, Cotton Annex, 300 12th Street, SW., Washington DC 20250-3700. The Office is open 8:30 a.m. to 4:30 p.m., Monday through Friday.

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transportation, or receiving for transportation in commerce, any adulterated or misbranded meat or poultry product (21 U.S.C. 610, 458).

Under the Acts, a meat or poultry product is adulterated if, among other circumstances, it bears or contains any poisonous or deleterious substance that may render it injurious to health (21 U.S.C. 601(m)(1), 453(g)(1)); if it is for any reason unsound, unhealthful, unwholesome, or unfit for human food (21 U.S.C. 601(m)(3), 453(g)(3); or if it has been prepared, packed, or held under insanitary conditions whereby it may have been rendered injurious to health (21 U.S.C. 601(m)(4), 453(g)(4)). Such a product is misbranded if, among other circumstances, it fails to bear directly or on its container the official inspection legend (e.g., for meat products, "U.S. Inspected and Passed" plus the official establishment number) prescribed in the regulations (21 U.S.C. 601(n)(12), 453(h)(12)). The Acts require FSIS to carry out an inspection of meat, meat food products, and poultry products to ensure that the products are not adulterated (21 U.S.C. 606, 455), and if the products are found upon inspection to be not adulterated, they must bear directly or on their containers the official inspection legend (21 U.S.C. 606, 607, 457).

The Acts give FSIS broad authority to promulgate such rules and regulations as are necessary to carry out the Acts (21 U.S.C. 621, 463). The Acts require FSIS

Figure 1: *Federal Register* excerpt from the promulgation of the 2003 *Listeria* rule.

RTE convenience foods have increased in popularity, which has heightened the importance of preventing *L. monocytogenes* contamination (Kotzekidou, 2016). The initial levels of *L. monocytogenes* in contaminated RTE foods are typically low, but the bacteria can continue to grow in food at refrigeration temperatures (Kotzekidou, 2016). Foods stored for long periods at refrigeration temperatures are of particular concern since the levels of *L. monocytogenes* can rise during storage to those levels that cause illness (Kotzekidou, 2016). The U.S. has a zero-tolerance policy for *L. monocytogenes* in RTE foods (Kotzekidou, 2016). Canada, New Zealand, Australia, and the European Union (EU) prohibit *L. monocytogenes* in RTE food products that can support its growth (Kotzekidou, 2016). However, in contrast to the U.S., they allow some *L. monocytogenes* contamination (<100 CFU/g) in RTE food products that do not support bacterial growth (Kotzekidou, 2016).

Table 1: Non-exhaustive list of meat and poultry products that have caused *L. monocytogenes* outbreaks

Year	Product	Estimated Deaths	Estimated Cases
2025	Prepared pasta meals	6	27
2024	Liverwurst and other deli meats	10	61
2017 – 2018	Polony (South African food similar to bologna)	204	1060
2002	Poultry deli meats	7	46
1998	Hot dogs	14	108

Sources: CDC, 2002; CDC, 2023; Food Safety News, 2023; FSIS, 2025; Graves et. al., 2005

Chapter 2 - Learning Objectives and Project Description

In April 2025, I began my Applied Practical Experience (APE) at FSIS under the guidance of Dr. Gregory Abreu, a Deputy District Manager. I interviewed him for a career introspective article intended for publication in the *One Health Newsletter*. At an FSIS District Office meeting of supervisors, I presented information about the responsibilities of FSIS supervisors regarding various aspects of food safety, with a focus on *Listeria monocytogenes*. Additionally, I participated in the iMOVES&FB trip to Italy as part of my APE, where I gained food safety-related insights from within the European Union.

Learning Objectives

1. Enhance my understanding of the FMIA and PPIA, which grant FSIS the authority to regulate meat and poultry production in the U.S.
2. Increase my knowledge about how FSIS supports enforcement actions against regulated companies.
3. Learn more about the history of *Listeria monocytogenes* regulations in FSIS, as well as food safety regulation in Europe while in Italy with iMOVES&FB.
4. Improve my public speaking and presentation skills.
5. Clarify my career aspirations.

Field Experience Activities

Background

I met Dr. Justin Kastner during my first semester as a graduate student at Kansas State University in the Fall semester of 2022. I took his DMP 816 *Trade and Agricultural Health* course, which focused on agricultural trade between countries and the consideration of food security, animal and plant health, and politics. I also took his course DMP 888 *Globalization, Cooperation, & the Food Trade* which similarly covered cross-border cooperation between countries related to agricultural trade and public health. I learned about the *Agreement on the Application of Sanitary and Phytosanitary Measures* (SPS Agreement), the Three Sisters (Codex Alimentarius, World Organization for Animal Health (WOAH), and the International Plant Protection Convention (IPPC)), and how they relate to my work with imported and exported meat products. I learned about one of Dr. Kastner's favorite subjects—how contagious bovine pleuropneumonia affected the beef trade between the U.S. and Europe in the 1880s. In Dr.

Kastner's DMP 815 *Multidisciplinary Thought and Presentation*, I studied critical thinking, writing, and speaking on subjects related to food and public health. I benefited from one-on-one feedback sessions from Dr. Kastner on my writing. I have used the writing skills from that course throughout the rest of my studies at K-State and in my professional work.

I decided to ask Dr. Kastner to serve as my major professor for my APE since his classes were relevant to my work with FSIS and I enjoyed his teaching style. Dr. Kastner agreed, and I began my search for my other APE committee members. I took two of Dr. Abbey Nutsch's courses, FDSCI 730 *Multidisciplinary Overview of Food Safety and Security* and FDSCI 731 *Food Protection & Defense—Essential Concepts*. I enjoyed the classes and they were relevant to my career, so I asked Dr. Nutsch to serve as one of my committee members. I asked Dr. Valentina Trinetta to serve on my committee since I believe her experience working on food safety and microbiology would be beneficial for my APE.

I worked with Dr. Kastner to find a suitable public health practice organization to complete my APE. I was interested in a topic related to *Listeria monocytogenes* in RTE foods since it had recently caused large outbreaks of listeriosis. In 2024, FSIS found the Boar's Head meat company responsible for an outbreak of listeriosis that killed 10 people and hospitalized 60 people (FSIS 2025). Boar's Head recalled 207,528 pounds of liverwurst and other deli products that may have been contaminated with *L. monocytogenes* (FSIS 2025). I wanted to expand my knowledge on *L. monocytogenes* prevention measures to undergird my work at FSIS to protect public health. I was interested to learn more about when FSIS started to act on *L. monocytogenes* and the history of how they developed the regulations related to *L. monocytogenes*. FSIS was an ideal place for me to perform my APE to more deeply explore the issue of *L. monocytogenes* contamination in meat and poultry products. Dr. Gregory Abreu has valuable experience of regulating RTE establishments. I wanted to glean helpful public health career insights from Dr. Abreu. Dr. Kastner suggested that I interview Dr. Abreu for an article in the *One Health Newsletter*.

I met with Dr. Abreu and explained that I was interested in performing my APE at FSIS with a focus on *L. monocytogenes*. Dr. Abreu identified the need for a presentation to FSIS supervisors related to new policies and procedures. The new policies and procedures relate to the following areas and operations: *Listeria* regulation compliance, enforcement actions, non-compliance documentation, systems thinking, and trend analysis. The presentation would help the supervisors in their roles in preventing *L. monocytogenes* contamination and protecting public health.

Dr. Kastner suggested that I consider participating in the June iMOVES&FB to Italy to learn how other countries address food safety and biosecurity. The trip included a tour of a seafood processing plant, and I was interested to see how it differed from meat and poultry companies. I wanted to learn how the egg laying facility implements biosecurity measures to prevent the spread of highly pathogenic avian influenza. I was excited to partake in the culture, food, and history of Italy.

Career Feature Article

As Deputy District Manager (DDM), Dr. Gregory Abreu oversees the Alameda District, which encompasses California, Arizona, and Nevada. He started his career with FSIS as a public health veterinarian (PHV) at slaughterhouses. He later became a Frontline Supervisor (FLS) and supervised a team of inspectors and PHVs. In his current role as DDM, he uses his experience in slaughter and processing establishments to evaluate the overall food safety system of a company.

I interviewed Dr. Abreu about his career for an article for publication in the *One Health Newsletter* which I have included in Appendix 2 of this report. I learned about how he spent his early years with animals which shaped his future. Dr. Abreu explained that after veterinary school, he worked as a mobile, large animal health practitioner. He primarily provided routine care such as vaccination, lameness treatment, dental health, and management of injuries. He found the job difficult since it was a physically and emotionally demanding job. During the Great Recession around 2010, many people could not afford medical care for their animals, so Dr. Abreu's practice slowed down. He started looking for other work options. A colleague had told him about how he had enjoyed working as a public health veterinarian with FSIS and that it was a stable job since it was a governmental position. I had a similar story in that I had graduated with my bachelor's degree in 2008, and I had a difficult time finding a job due to the recession. I started to look for federal government jobs and that is how I found my job at FSIS in 2010. Dr. Abreu worked for several years as public health veterinarian with responsibilities including animal health, animal welfare, and food safety. He moved on to the role of Frontline Supervisor which is the position that I hold. He explained how he learned more about food safety in different types of products and increased his supervisory skills. He moved to his current position as a Deputy District Manager, and he explained how he uses his leadership skills to guide the large team in protecting public health. I found it interesting how he needs to consider whether the Agency's decisions need to be able to stand up in a court of law.



Figure 2.1: Dr. Gregory Abreu and Timothy Drake

Presentation to FSIS Supervisors

Dr. Abreu guided my exploration of topics for my presentation to FSIS supervisors. Due to the Agency’s renewed focus on *L. monocytogenes*, we decided my presentation should concentrate on the new policies and procedures related to this issue. Dr. Abreu identified a training need in supporting enforcement actions, ensuring compliance with regulations, and analyzing trends. Through my preparation for the presentation, I gained a deeper understanding of these topics.

I explained how inspectors should utilize the “GAD Process” (Gather, Assess, and Determine) to make decisions regarding regulatory compliance. Additionally, I discussed the importance of documenting Memorandums of Interview (MOI) and non-compliance records to support enforcement actions against non-compliant FSIS-inspected companies.

On September 23, 2025, I delivered the presentation at a meeting attended by approximately 20 FSIS supervisors and managers. Dr. Abreu was present and provided additional commentary during the presentation to elaborate on certain topics. The presentation sparked a productive discussion among the group regarding the association of non-compliance records to demonstrate that a company’s corrective actions were ineffective in preventing recurrence of the non-compliance.

After the presentation, I received positive feedback from the group, with several supervisors requesting a copy so they could use the information in work-unit meetings with their employees.



Figure 2.2: Tim Drake presenting at the FSIS supervisor meeting in September 2025.

iMOVES&FB Trip and Newsletter

I participated in the iMOVES&FB trip in June 2025. The iMOVES&FB program included online lectures leading up to a group trip to Italy, covering topics such as food safety in the European Union (EU) and trade considerations for agricultural products between the EU and the US. We also learned about animal welfare in South Africa and seafood-related foodborne illnesses.

The iMOVES&FB group convened in Padova, Italy, on the Agripolis campus of the University of Padova from June 23 to June 27, 2025. Approximately 20 American veterinary and public health students participated, representing Kansas State University, Texas A&M

University, the University of Pennsylvania, and Colorado State University. An additional 20 Italian veterinary students represented the University of Padova in the iMOVES&FB group.

While on campus, we attended a lecture discussing how the living environments of companion animals, both at home and in breeding facilities, affect their welfare. We learned how climate change is increasing aflatoxin levels in animal feed, the effects of these aflatoxins on animals, and prevention strategies. Additionally, we completed a toxicology practical in which we tested lab samples for aflatoxins using the enzyme-linked immunosorbent assay (ELISA) immunoassay method.



Figure 2.3: The K-State iMOVES&FB participants in the laboratory learning about the ELISA technique. (From left Timothy Drake, Jenna Marston, Victoria Neff, Maddie Pike)

The students in the iMOVES&FB program performed necropsies on broiler chickens in the meat lab at the Agripolis campus. These chickens had died during transport to slaughter, and the students identified several causes of death, including pathogenic lesions and injuries. Necropsies are crucial for veterinarians to evaluate deceased poultry, helping to identify potential outbreaks and manage flock health. I conducted a necropsy with the assistance of an Italian student, discovering that the chicken had died from severe hemorrhage following a traumatic injury incurred during transport.



Figure 2.4: The iMOVES&FB students practicing necropsies.

The group visited a laying hen barn dedicated to chicken egg production. Although the farm was in the final stages of construction and did not have any chickens present, a veterinarian from the public health department guided us on a tour of the facility. We observed how the design of the facility aimed to enhance biosecurity. The veterinarian explained the various biosecurity regulations in Italy that help control the spread of Highly Pathogenic Avian Influenza (HPAI). The facility included indoor storage for chicken manure, intended to hold it for a specified number of days in the event of an HPAI outbreak among the flock. Additionally, the facility was highly mechanized for feeding and watering the birds, removing manure, and collecting eggs.



Figure 2.5: Dr. Francesco Galuppo explains biosecurity measures to students during a tour of an Italian laying hen facility

The iMOVES&FB group visited both consumer and wholesale seafood markets in Chioggia, Italy, often referred to as “Little Venice.” These visits provided a comprehensive overview of the aquaculture trade in the region. The markets primarily featured locally caught seafood that had been harvested the same day. We reviewed the labeling requirements for seafood, which mandate that products be labeled with the country of origin, common name,

method of catch, and whether they are farm-raised or wild-caught. I found the labeling particularly interesting, as I frequently verify the labeling requirements for meat and poultry products with the FSIS. Additionally, we learned about conservation efforts for marine wildlife and healthcare initiatives for rhinos in Africa.



Figure 2.6: Fishing boat leaving the docks at Chioggia, Italy.

The students visited a seafood processing plant in Venice that supplies seafood products to both retail and wholesale customers. The company provided insights into how they maintain food safety throughout the entire process of transporting, processing, and packaging the seafood. They have a laboratory where fish samples are tested for histamine, a by-product of improper refrigeration after harvest. The company explained that high levels of histamine can cause foodborne illness through allergic reactions. Additionally, they described how they maintain water quality and temperature for their live shellfish tanks, which are similar in size to swimming pools but shallower.



Figure 2.7: Tim Drake and some other students looking for parasites in fish at the processing facility.

I enjoyed learning more about Italian culture from the University of Padova students, who provided valuable insights into the differences between the US and Italy in terms of culture and university life. I sampled many classic Italian foods, including pasta, pizza, pastries, salami,

prosciutto, gelato, and espresso. We visited the Verona Arena in Verona, an ancient Roman amphitheater built about 2,000 years ago; while there, Dr. Kastner enlightened the group on the historical importance of gladiator cadavers being referenced for human anatomy prior to the practice of dissection. The K-State group spent the weekend in Venice, where we toured St. Mark's Square and Basilica, the Doge's Palace, and the Rialto Bridge. A group of K-State students also took a gondola ride in the Grand Canal to experience Venetian life. At various points, Dr. Kastner discussed the history of trade and public health and their connection to Venice.

Chapter 3 - Reflection on Learning

Work with Dr. Abreu

As indicated in the Field Experience section, Dr. Abreu and I explored the topics together for my presentation. Dr. Abreu explained how, as a senior manager, he takes a higher-level view of food safety issues. He explained how he uses systems thinking to determine if the overall system is functioning to prevent food safety hazards. He needs to think deeply about subjects before making a decision since it could have legal or political implications. I consider how Dr. Abreu would handle a situation when I am making a difficult decision. Dr. Abreu leads by example, by showing his dedication to his work and his team. I am grateful that he was able to help guide me through my APE project with FSIS. His job position of Deputy District Manager (DDM) is the next logical step in my career path. My work with him has allowed me to consider how I would like the position. DDMs make larger decisions that can affect more people or companies than the decisions that I make in my current position. DDMs have greater responsibilities and a more substantial impact on outcomes which invariably comes with an increase in stress. I want to continue to grow in my role while I continue to think about future career opportunities.

iMOVES&FB

I appreciated the cultural learning opportunities offered to me during the iMOVES&FB program in Italy. The Italian students and professors provided me with a more local perspective of the country compared to that of a typical tourist. I learned about various cultural customs, such as how many Italians live with their parents until they enter a long-term relationship or marry. The trip allowed me to appreciate the youth of the Italian and American students, who were mostly in their early 20s and offered me fresh perspectives. I found the history of Italy overwhelming as I walked the streets, imagining the millions of people who had walked those very streets before me over the past hundreds or thousands of years.

I interacted with many veterinarians and veterinary students during the iMOVES&FB trip, which gave me insights into their roles in public health, trade, and animal health. Victoria Neff, a K-State MPH student and veterinarian at the Animal and Plant Health Inspection Service (APHIS), joined us on the trip. She explained how the U.S. and Italy compare in biosecurity measures for controlling HPAI in poultry. For example, biosecurity measures are not required by the government for U.S. producers, while they are mandatory in Italy. She noted that most U.S. producers take biosecurity seriously and may be required to implement these measures by their

customers or as a best practice to prevent business losses. An Italian student taught me how to perform a necropsy on a broiler chicken. I have experience in evaluating chicken for disease since I inspected chickens in a high-speed slaughterhouse for many years. The necropsy was much more thorough and deliberate, considering more potential foreign animal diseases.

Insights as a Mid-Career Professional

In 2022, I decided that I wanted to pursue a master's degree in public health to help me further my career with FSIS. I am always interested in self-improvement, and I have regularly taken college courses since I graduated with my bachelor's degree in 2008. I was an Enforcement, Investigation, and Analysis Officer (EIAO) with FSIS when I started my MPH, so my focus was on learning more about food safety approaches. In July 2023, I became a Frontline Supervisor (FLS), so I began to think more about leadership and communication skills. While working on my MPH, I believe that I have improved my ability to present on public health topics. The MPH degree helped me work on time management since I needed to balance working full-time with my coursework.

I plan to explore joining the U.S. Public Health Service Commissioned Corps (USPHSCC), since I will become eligible to join them with my MPH. They are one of the eight uniformed services of the U.S., but they are classified as noncombatants. They are led by the surgeon general, and their mission is protecting, promoting, and advancing the health and safety of the Nation. I have met several USPHSCC officers that have been placed in jobs within FSIS. I think it would be exciting to work for the foremost public health agency in the country while remaining with FSIS.

44th and 46th *Frontier* Field Trip Experiences

In March 2025, I participated in the 44th *Frontier* Field Trip: "Lessons from the Salton Sea, the Anza-Borrego Desert, and Catalina Island: Floods, Freak Accidents, Falcons, and the Future." Having lived in Southern California for most of my life, I was excited to learn more about the history of the Salton Sea. In the early 1900s, the lake formed from a breach in an irrigation canal from the Colorado River. It has been maintained mainly by agricultural runoff while receiving limited rainfall due to the desert climate. The lake has been shrinking for years, leading to increased salinity and poorer water quality for marine animals. This receding lake has exposed toxic dust which creates public health concerns for residents.

Lake Cahuilla was a large prehistoric lake that covered the area of the Salton Sea, Coachella Valley, and Imperial Valley. The existence of this prehistoric lake is one reason why

the area is agriculturally productive. We saw Native American fish weirs, constructed from strategically placed rocks to trap small fish. These weirs were likely hundreds of years old. They would have been built in the intertidal zone of Lake Cahuilla but are now miles away from the current shore of the Salton Sea. During our tour of the Anza-Borrego Desert, we learned about the native bighorn sheep and how various plants and animals have adapted to living in the desert. Many animals seek shelter during the hottest part of the day in underground burrows, and seeds may lay dormant for years, waiting for sufficient rainfall to bloom.



Figure 3.1: The 44th Frontier Field Trip participants and guides posing at the Salton Sea Visitor Center.

The 44th Frontier Field Trip also took us to Catalina Island, located off the coast of Southern California. We took a “behind-the-scenes” tour of the island, visiting areas restricted to the public. We explored the island's interior, the municipal airport, and the shore on the opposite side from the city of Avalon. We saw bison herds, which were first brought to the island for a movie in the 1920s and have thrived there without any predators. The Catalina Island Conservancy uses birth control to manage the bison population's size and health.



Figure 3.2: Bison grazing on picturesque Catalina Island.

In November 2025, I participated in the 46th *Frontier* Field Trip: "Project Safe: Anticipating a Cascade of Predictable Surprises" in Council Grove, Kansas. We acted out a public health event set in Portland and Astoria, Oregon, in the year 2050. The event presented a mystery that was eventually revealed to be a large earthquake emanating from the Cascadia Subduction Zone (CSZ), located off the coast of the Pacific Northwest. The earthquake created a large tsunami that inundated low-lying coastal areas. These events have the potential to cause mass casualties and major disruptions to everyday life due to heavy damage to infrastructure, homes, and businesses.

Large earthquakes on the CSZ occur infrequently, at a rate of every 300 to 500 years, making it difficult for public health officials to convince the public to adequately prepare for such disasters. The last large earthquake on the CSZ is believed to have occurred in the year 1700. Many people believe that the Native American myth about a battle between the Thunderbird and the Whale describes the devastation resulting from the 1700 event. We also learned about the 2011 earthquake and tsunami in Japan, which caused mass devastation and the Fukushima nuclear disaster. We debated how to best fashion an emergency preparedness kit with limited financial resources. During the trip, I gained insights into emergency preparedness strategies, which enriched my education in public health.



Figure 3.3: The 46th *Frontier* Field Trip group donning some “futuristic” attire.

Courses Relevant to My Field Experience

In my literature review, I considered how *L. monocytogenes* outbreaks have recently been associated with meat and poultry products. I believe that *MPH 754 Introduction to Epidemiology* helped me gain a better understanding of how outbreaks are investigated and how their effects are quantified. I learned that the number of illnesses associated with an outbreak may be severely undercounted, as many infected individuals may not seek medical treatment if their symptoms are mild.

In *FDSCI 730 A Multidisciplinary Overview of Food Safety and Security*, I reviewed a multistate outbreak of *E. coli* O157:H7 that originated from alfalfa sprouts. I learned how public health officials used epidemiological methods to investigate the outbreak's origin. I was better able to understand how investigators would have traced the *L. monocytogenes* outbreaks to their sources.

My coursework for the Professional Interdisciplinary Sciences (PIS) Graduate Certificate helped me appreciate the interdisciplinary approach of the iMOVES&FB program. This program incorporated elements from veterinary medicine, public health, and food science. I learned that climate change is increasing the rate of aflatoxin contamination in animal feed, negatively affecting animal health and thereby reducing the food supply. I considered how interdisciplinary professionals help FSIS protect consumers.

Chapter 4 - Competencies

Student Attainment of MPH Foundational Competencies

Competency 5 - Compare the organization, structure and function of health care, public health and regulatory systems across national and international settings.

The iMOVES&FB trip allowed me to compare biosecurity measures for highly pathogenic avian influenza (HPAI) between Italy and the U.S. I learned about the roles that the European Food Safety Authority (EFSA) and the European Commission (EC) play in food safety in the EU from Dr. Lorenzo Terzi, a former EU regulatory trade official, and other speakers. They spoke to us about how EU trade agreements and how harmonization of food safety rules facilitates trade. I was able to compare the EU regulatory authorities to my experiences in the U.S.

Competency 12 - Discuss multiple dimensions of the policy-making process, including the roles of ethics and evidence.

I reviewed how FSIS creates policy while I prepared my presentation for FSIS supervisors and during my literature review on FSIS regulation of *Listeria monocytogenes*. FSIS must follow multiple steps when creating new rules. For example, FSIS must publish the proposed rule in the *Federal Register* to get comments from stakeholders, including federally inspected meat and poultry establishments and the public. I attended iMOVES lectures that discussed international trade agreements. I learned about how the World Trade Organization's (WTO) SPS Agreement facilitates agricultural trade by helping to protect nations' animal health, plant health, and food safety. I learned about how the European Food Safety Authority (EFSA) and the European Commission (EC) work together on legislation on food safety in the European Union (EU).

Competency 15 - Evaluate policies for their impact on public health and health equity.

I evaluated how FSIS regulations have impacted public health while I worked on my FSIS presentation and did my literature review for my APE. I considered how FSIS rules and regulations have prevented foodborne illness from *Listeria monocytogenes*. I discussed FSIS policies during my presentation to FSIS supervisors.

Competency 19 - Communicate audience-appropriate public health content, both in writing and through oral presentation.

I considered my audiences when I drafted my iMOVES article, career introspective article, and FSIS presentation. My iMOVES article was for the *One Health Newsletter*, so I considered how the reader would likely be interested in a multidisciplinary approach to human and animal health. My career introspective article was about Gregory Aberu, DVM, who transitioned from a career in animal health to public health, so I drafted the article thinking about a potential audience of veterinary students considering their career options after finishing school. I understood that the group of FSIS supervisors had a mix of backgrounds in food safety and years of experience, so I presented them basic and advanced food safety topics.

Competency 22 - Apply systems thinking tools to a public health issue.

I applied systems thinking in my presentation to FSIS supervisors. I described how supervisors should use systems thinking to consider how well a company's overall food safety system is working to prevent foodborne illness. I talked about how to consider the different parts of the food safety programs and how they work together to prevent potential hazards. I emphasized that supervisors need to look at the overall system instead of the individual parts of the food safety system.

Table 4.1 Summary of MPH Foundational Competencies

Number and Competency		Description
5	Compare the organization, structure and function of health care, public health and regulatory systems across national and international settings	The iMOVES trip allowed me to compare legislation for food safety, animal health, and biosecurity between Europe and the U.S.
12	Discuss multiple dimensions of the policy-making process, including the roles of ethics and evidence	I reviewed the policy-making process when I prepared for my presentation to FSIS supervisors.
15	Evaluate policies for their impact on public health and health equity	I assessed how FSIS regulations related to <i>Listeria monocytogenes</i> have helped public health when I prepared for my presentation to FSIS supervisors.
19	Communicate audience-appropriate public health content, both in writing and through oral presentation	I considered my audience when I drafted my newsletter articles and FSIS presentation.
22	Apply systems thinking tools to a public health issue	I discussed systems thinking tools in my presentation to FSIS supervisors.

Table 4.2 MPH Foundational Competencies and Course Taught In

22 Public Health Foundational Competencies Course Mapping	MP H 701	MPH 720	MP H 754	MP H 802	MP H 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	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			x
15. Evaluate policies for their impact on public health and health equity		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					

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

Student Attainment of MPH Emphasis Area Competencies

Table 4.3 Summary of MPH Emphasis Area Competencies

MPH Emphasis Area: Food Safety and Biosecurity		
Number and Competency		Description
1	Food safety and biosecurity: Evaluate solutions appropriate for different food safety, biosecurity, and defense issues in the food production continuum.	During my preparation for my presentation to the FSIS supervisors, I considered food safety solutions for <i>Listeria monocytogenes</i> contamination and other issues. I learned about how to identify trends in regulatory non-compliance that may lead to public health hazards. I learned how FSIS builds cases against companies that are not preventing food safety hazards.
2	Threats to the food system: Examine specific threats to the food system and scientifically investigate how each can be prevented, controlled, and/or mitigated in the food production system.	During my literature review, I considered the threat to public health of <i>Listeria monocytogenes</i> contamination in RTE foods. I learned about control measures that companies can implement to maintain sanitation in the post-lethality environment.
3	Food safety laws and regulations: Differentiate key U.S. food safety regulatory bodies and	During my literature review, I learned that the U.S. government enacted the FMIA to protect public health. I learned about the various agencies tasked in implementing the FMIA prior to the creation of FSIS in 1981. I researched the development of the <i>Listeria</i> Rule by FSIS which was promulgated in 2003.

	their unique legislative authorities, missions, and jurisdictions.	
4	Food safety policy and the global food system: Analyze and distinguish how food safety and governmental biosecurity policies, globalization, and international trade cooperation influence public health.	In lectures leading up to the iMOVES&FB, I learned about international trade cooperation and how it affects public health. In Italy, I discovered how HPAI biosecurity measures differ between the U.S. and Italy. During my literature review, I studied how different countries allow certain levels of <i>Listeria monocytogenes</i> in RTE foods, depending on the risk level, which contrasts with the U.S. zero tolerance policy.
5	Multidisciplinary leadership: Contrast the food safety and biosecurity technical needs of different stakeholders and make judgements as to the appropriate methods of collaboration.	I learned about leadership from my time working with Dr. Gregory Abreu. He taught me about how he considers multiple stakeholders when he is making a potentially controversial decision. In difficult situations, he will consult with employees from various program areas to solicit feedback.

References

Centers for Disease Control and Prevention (CDC). (2002). Outbreak of listeriosis--northeastern United States, 2002. *MMWR. Morbidity and mortality weekly report*, 51(42), 950–951.

Centers for Disease Control and Prevention (CDC). (2023). *Listeria outbreak linked to chicken fettuccine alfredo*. <https://www.cdc.gov/listeria/outbreaks/chicken-fettuccine-alfredo-06-25/index.html>

Centers for Disease Control and Prevention (CDC). (2025). Foodborne illness: Burden of foodborne illness. U.S. Department of Health and Human Services. <https://www.cdc.gov/food-safety/php/data-research/foodborne-illness-burden/index.html>

Food Safety and Inspection Service (FSIS). (1996). Pathogen Reduction; Hazard Analysis and Critical Control Point (HACCP) Systems. *Federal Register*, 61(144), 38806-38989. <https://www.federalregister.gov/documents/1996/07/25/96-17837/pathogen-reduction-hazard-analysis-and-critical-control-point-haccp-systems>

Food Safety and Inspection Service (FSIS). (1999). *Listeria monocytogenes* contamination of ready-to-eat products. *Federal Register*, 64(101), 28006-28012. <https://www.federalregister.gov/documents/1999/05/26/99-13223/listeria-monocytogenes-contamination-of-ready-to-eat-products>

Food Safety and Inspection Service (FSIS). (2003). Control of *Listeria monocytogenes* in ready-to-eat meat and poultry products. *Federal Register*, 68(109), 34208-34233. <https://www.federalregister.gov/documents/2003/06/06/03-14173/control-of-listeria-monocytogenes-in-ready-to-eat-meat-and-poultry-products>

Food Safety and Inspection Service (FSIS). (2009). Draft FSIS comparative risk assessment for *Listeria monocytogenes* in ready-to-eat meat and poultry. *Federal Register*, 74(68), 16580-16581. <https://www.federalregister.gov/documents/2009/04/09/E9-8056/draft-fsis-comparative-risk-assessment-for-listeria-monocytogenes-in-ready-to-eat-meat-and-poultry>

Food Safety and Inspection Service (FSIS). (2025). *Our History*. <https://www.fsis.usda.gov/about-fsis/history>

Food Safety and Inspection Service (FSIS). (2025). *Review of Boar's Head Listeria monocytogenes outbreak* [PDF]. <https://www.fsis.usda.gov/news-events/publications/review-boars-head-listeria-monocytogenes-outbreak-january-2025>

Food Safety News. (2023). *Publisher's platform: It has nearly been six years since over 1,000 people were sickened and over 200 died from listeria-tainted polony in South Africa*.

<https://www.foodsafetynews.com/2023/08/publishers-platform-it-has-nearly-been-six-years-since-over-1000-people-were-sickened-and-over-200-died-from-listeria-tainted-polony-in-south-africa/>

Graves, L. M., Hunter, S. B., Ong, A. R., Schoonmaker-Bopp, D., Hise, K., Kornstein, L., DeWitt, W. E., Hayes, P. S., Dunne, E., Mead, P., & Swaminathan, B. (2005). Microbiological aspects of the investigation that traced the 1998 outbreak of listeriosis in the United States to contaminated hot dogs and establishment of molecular subtyping-based surveillance for *Listeria monocytogenes* in the PulseNet network. *Journal of clinical microbiology*, 43(5), 2350–2355. <https://doi.org/10.1128/JCM.43.5.2350-2355.2005>

Kotzekidou, P. (Ed.). (2016). *Food hygiene and toxicology in ready-to-eat foods*. Academic Press. <https://doi.org/10.1016/C2014-0-01599-7>

Murano, E. A., Cross, H. R., & Riggs, P. K. (2018). The outbreak that changed meat and poultry inspection systems worldwide. *Animal frontiers: the review magazine of animal agriculture*, 8(4), 4–8. <https://doi.org/10.1093/af/vfy017>

Najar, F. (Host). (2023). A Historical Trip through "The Jungle" w/ Dr. Justin Kastner (Ep. 117). *MeatsPad*. <https://www.meatspad.com/episode/cb453630-8c8e-4b40-8187-d570de4dc361>

U.S. Department of Health & Human Services (HSS). (2025). *Bacteria and viruses: Listeria*. FoodSafety.gov. <https://www.foodsafety.gov/food-poisoning/bacteria-and-viruses#listeria>

Appendix 1 – FSIS Presentation

	FRONTLINE SUPERVISOR'S ROLE IN FOOD SAFETY	
		Timothy Drake, FLS Walnut Circuit Alameda District Frontline Supervisor Meeting September 23, 2025

Overview

- FSIS Directive 5000.1 – FLS responsibilities
- GAD Process
- MOI and NR Documentation
- PHR Rate
- FSIS Notice 48-24 – RTE Questionnaires
- FSIS Directive 10,240.4 – Listeria Rule Verification

Red Flags



- High PHR rate
- RTE Questionnaire responses
- Discussions with inspection team
- MOI and NR history
- Plant visits
- Sampling data

GAD Process

1. Gather all available information
2. Assess the significance and meaning of the information gathered
3. Determine whether the information supports a finding of regulatory compliance



(FSIS 2025)

Gather all available information

Review establishment programs, supporting documentation, and records

Observe establishment employees implementing the establishment's programs and procedures

Observe the conditions in the establishment

Observe production and occasionally take measurements as described in HACCP plan

Review relevant Agency information including:
Regulations, Federal Register, Directives, Notices,
Compliance Guidelines, and AskFSIS



(FSIS 2025)

Assess the significance and meaning of the information gathered



Consider what the information says about how the food safety system is functioning to ensure that products are safe and wholesome (not adulterated)

Are conditions in the establishment getting worse over time?

Are the same or similar problems occurring repeatedly?

Is the establishment responding effectively and in a timely manner to problems that do arise?

(FSIS 2025)

Determine whether the information supports a finding of regulatory non-compliance

- Not maintaining sanitary conditions
- Produced or shipped adulterated products
- Food safety system is not effectively controlling the relevant food safety hazards
- Not meeting the requirements in one or more regulations

(FSIS 2025)

Determine whether the information supports a finding of regulatory non-compliance

Consider each piece of information in the context of the overall food safety system

Is there a pattern? e.g. Specific shifts, employees, or products

Is there other information that the system is not functioning? e.g. positive test results



Preventive Controls for Food Safety
Recall Triggers

(FSIS 2025)

FSIS Directive 5000.1 VERIFYING AN ESTABLISHMENT'S FOOD SAFETY SYSTEM



Documenting NRs and MOIs that could be used to support the initiation of an FSA or enforcement action

NRs – document when establishments fail to meet the regulatory requirements

MOIs – show due process and discussions about potential non-compliance

(FSIS 2025)

MOI Writing



An MOI is used to record and convey discussions with establishment management. The MOI is the written summary of an interview.

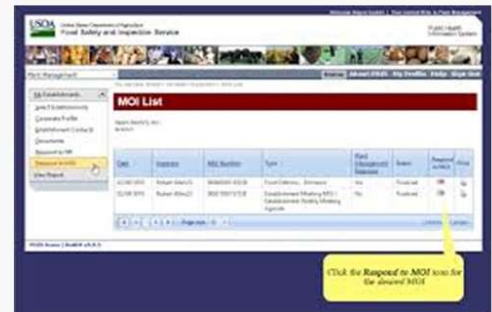
Should include:

- Date of the meeting
- Who was at the meeting
- Summarize critical and relevant information
- Establishment's responses to any questions asked during the meeting

(FSIS 2025)

MOI Writing

- Track the establishment's history of responding to issues/conditions in the establishment that could lead to noncompliance if conditions worsen or if the establishment doesn't act
- E.g., less than perfect execution of prerequisite program. If the situation has been documented in a MOI on numerous occasions, it would be hard for the establishment to say they didn't know the issue/condition could lead to noncompliance.



(FSIS 2025)

NR Documentation



Use clear, concise terms, including the problem, time of occurrence, location, and effect on the product

Clearly explain how IPP's findings support the determination that the establishment did not meet regulatory requirements.

Include the names of relevant establishment programs and citations from the program (if needed)

(FSIS 2025)

Master FSIS NR Writing

- **Plan:** Build a solid foundation by gathering, assessing, and defining the noncompliance event
- **Organize:** Sort out and arrange all your information to assist in writing the NR
- **Write:** Take all the facts you have organized and write to paint a picture of the noncompliance
- **Edit:** Proofread for clarity, grammar, punctuation, and spelling – remember that NR should be understandable to someone who is not familiar with the establishment

(FSIS 2011)

Citing the Correct Regulation



Directives frequently have examples of non-compliance including the regulation

Review the actual wording of the regulation

Avoid adding extra regulations to make an NR “stronger”

Citing an incorrect regulation can lead to successful appeals

FSIS Directive 5000.1

VERIFYING AN ESTABLISHMENT'S FOOD SAFETY SYSTEM

Evaluating Trends for Systemic Problems

- IPP need to determine if an NR is associated with a previous NR
- Consider if NR is associated with other findings such as positive sampling results; deviations identified by the establishment; changes to facility, equipment, or programs
- IPP are to assess the significance of their findings and work with the FLS to determine how the findings affect the overall food safety system

(FSIS 2025)

FSIS Directive 5000.1

VERIFYING AN ESTABLISHMENT'S FOOD SAFETY SYSTEM

Reasons to consider associating an NR:

- Same regulatory citation, type of inspection, close period of time
- NR indicates that establishment's corrective actions were not implemented or did not prevent recurrence
- Repetitive failures of the same aspect of the food safety system
- IPP should discuss findings with the FLS so the FLS can support IPP in assessing the significance of the findings and associations
- IPP should use the weekly meeting to discuss trends with plant management

(FSIS 2025)

FSIS Directive 5000.1 Responding to Systemic Problems

Evaluate Trends to determine if an FSA should be recommended:

- Are the NRs related to immediate food safety concerns?
- Do they indicate ongoing issues with the written food safety programs?
- How much time has elapsed between associated NRs?
- Are there NRs that should have been associated with other NRs?



(FSIS 2025)

FSIS Directive 5000.1 Responding to Systemic Problems

Evaluate Trends to determined if an FSA should be recommended:

- Are there other findings not documented in an NR that are associated with the findings documented in the NR?
- Do the NRs establish that there is a persistent problem in the establishment's approach to addressing noncompliances (e.g., the establishment's procedures led to repeated noncompliances)?
- Need to provide timely feedback to district office personnel

(FSIS 2025)

FSIS Directive 5100.5

PUBLIC HEALTH REGULATIONS AND FSIS RESPONSE TO ELEVATED PUBLIC HEALTH REGULATION NONCOMPLIANCE RATES

Office of Planning, Analysis, and Risk Management (OPARM) updates the list of Public Health Regulations (PHR) annually based on analysis of data on regulatory noncompliances and their association with positive sample results and enforcement actions.

For fiscal year (FY) 2025, there are 67 PHRs which are mostly related to:

- Livestock and Poultry slaughter
- Sanitation Performance Standards (SPS)
- Sanitation Standard Operation Procedures (SSOP)
- Hazard Analysis and Critical Control Points (HACCP)

(FSIS 2019)

FSIS Directive 5100.5

PUBLIC HEALTH REGULATIONS AND FSIS RESPONSE TO ELEVATED PUBLIC HEALTH REGULATION NONCOMPLIANCE RATES

- Each month, OPARM calculates a PHR noncompliance rate for every establishment
- OPARM lists establishments with PHR noncompliance rates at or above the Tier 1 cut point on the monthly Public Health Risk Evaluation (PHRE) schedule report
- EIAOs perform PHREs for these establishments to determine whether an FSA is necessary as directed in FSIS Directive 5100.4, Enforcement, Investigations and Analysis Officer (EIAO) Public Health Risk Evaluation (PHRE) Methodology.

(FSIS 2019)

FSIS Directive 5100.5

PUBLIC HEALTH REGULATIONS AND FSIS RESPONSE TO ELEVATED PUBLIC HEALTH REGULATION NONCOMPLIANCE RATES

FY2025 PHR Cut Points		
Operation Type	Upper Level**	Lower Level**
Processing	3.50%	2.35%
Combination	6.02%	3.71%

** Upper level is the higher threshold at which FSIS will consider the establishment for a Public Health Risk Evaluation. Lower level is the lower threshold at which FSIS inspection personnel will be notified via a PHIS Early Warning Alert that an establishment is at an elevated level.

FSIS Data Analysis and Reporting: Public Health Regulations FY 2025

<https://www.fsis.usda.gov/science-data/scientific-reports/public-health-regulations-phr/fsis-data-analysis>

Accessed April 20, 2025

(FSIS 2019)

FSIS Directive 5100.5

PUBLIC HEALTH REGULATIONS AND FSIS RESPONSE TO ELEVATED PUBLIC HEALTH REGULATION NONCOMPLIANCE RATES

When IPP receive a PHR Early Warning Alert

- Review “PHR Noncompliances for an Establishment” report which includes the past 3 months of NRs associated with the PHR alert to identify any trends
- Discuss analysis and ideas with FLS about any trends of ineffective corrective actions
- Meet with management to discuss the PHR Early Warning Alert, analysis of findings, and IPP planned actions which would be documented in the weekly meeting memorandum of interview (MOI)
- Continue to monitor establishment’s progress in resolving the issues and keep FLS informed



(FSIS 2019)

FSIS Directive 5100.5

PUBLIC HEALTH REGULATIONS AND FSIS RESPONSE TO ELEVATED PUBLIC HEALTH REGULATION NONCOMPLIANCE RATES

When FLS receives a PHR Early Warning Alert

- Review the PHR reports, MOIs, and associated NRs and communicate with IPP to identify noncompliance trends and establishment failures to implement effective corrective actions
- Consider instructing IPP to perform additional directed tasks
- If establishment continues to fail to implement effective corrective actions, discuss with District Office to determine if an FSA is warranted

(FSIS 2019)

FSIS NOTICE 48-24

PUBLIC HEALTH INFORMATION SYSTEM PHYSICAL PLANT MODIFICATION PROFILE QUESTIONNAIRE AND READY-TO-EAT QUESTIONNAIRE TASK

- IPP complete the weekly RTE questionnaire
- Supervisor reviews responses and task completion frequency
- Supervisor ensures that IPP make accurate decisions on responses
- FLS monitors for systemic issues and trends of non-compliance and whether FSA should be recommended



(FSIS 2024)

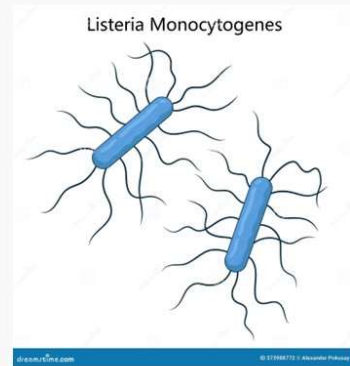
FSIS DIRECTIVE 10,240.4

LISTERIA RULE VERIFICATION ACTIVITIES

Common Lm program Design Non-Compliances

Failure to

- identify all post-lethality FCS
- identify sampling frequency including number of samples collected per quarter/month/week
- identify all RTE processing lines
- have hold and test procedures
- support lotting system



(FSIS 2022)

FSIS DIRECTIVE 10,240.4

LISTERIA RULE VERIFICATION ACTIVITIES

Common Lm program Implementation Non-Compliances

Failure to

- Collect samples at stated frequency
- Increase sample collection during construction
- Collect samples that are representative of routine processing conditions
- Collect samples per directions

(FSIS 2022)

FSIS DIRECTIVE 10,240.4

LISTERIA RULE VERIFICATION ACTIVITIES

Red Flags to Consider for PHRE Recommendation

- In-house testing kits for *Listeria* spp.
- *Listeria* sp. or *Lm* positives – multiple, recurring, systemic or trends
- Failure to perform corrective actions in response to a positive(s)
- Failure to collect samples after corrective action to verify the restoration of sanitary conditions



(FSIS 2022)

FSIS DIRECTIVE 10,240.4

LISTERIA RULE VERIFICATION ACTIVITIES

Red Flags to Consider for PHRE Recommendation

- Failure to follow hold and test procedures
- Corrective actions are ineffective in preventing additional positives
- Systemic sanitation issues such as Pre-Op, SSOP, and SPS
- Failure to support lotting system related to positives (could lead to recall)



(FSIS 2022)

THANK YOU

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References

1. US Department of Agriculture, Food Safety and Inspection Service. FSIS Directive 5000.1 Revision 8 - Verifying an Establishments Food Safety System [Internet]. 2025 Jan 10. [cited August 3, 2025]. Available from: <https://www.fsis.usda.gov/policy/fsis-directives/5000.1>
2. US Department of Agriculture, Food Safety and Inspection Service. FSIS Notice 48-24, Public Health Information System Physical Plant Modification Profile Questionnaire and Ready-To-Eat Questionnaire Task [Internet]. 2024 Dec 17 [cited August 4, 2025]. Available from: https://www.fsis.usda.gov/sites/default/files/media_file/documents/48-24.pdf
3. US Department of Agriculture, Food Safety and Inspection Service. FSIS Directive 5100.5 - Public Health Regulations and FSIS Response to Elevated Public Health Regulation Noncompliance Rates [Internet]. 2019 Sep 25. [cited August 4, 2025]. Available from: <https://www.fsis.usda.gov/policy/fsis-directives/5100.5>

References

4. US Department of Agriculture, Food Safety and Inspection Service. Master FSIS NR Writing. 2011 Jan 20. [cited August 4, 2025]. Available from: https://www.ncagr.gov/meat-poultry-inspection/MasterFSIS_NR_Writing/download?attachment
5. US Department of Agriculture, Food Safety and Inspection Service. Inspection Methods Hybrid (IMH) Class Workbook [Internet]. Washington (DC): US Government Publishing Office; 2025 Jan. [cited August 4, 2025]. Available from: <https://www.fsis.usda.gov/inspection/inspection-training-videos/inspection-mission-training>
6. US Department of Agriculture, Food Safety and Inspection Service. FSIS Directive 10240.4, Revision 4: Listeria Rule Verification Activities. 2022 Mar 25. [cited September 16, 2025]. Available from: <https://www.fsis.usda.gov/policy/fsis-directives/10240.4>

Appendix 2 – Dr. Abreu Career Newsletter Article

Gregory Abreu's: How His Career Journey Led from Veterinary Practice to Public Health

Author

Timothy Drake

Introduction – Public Health Veterinarians and Meat Inspection

Public health veterinarians are essential in meat inspection, playing a critical role in ensuring the safety of meat products. The Federal Meat Inspection Act (FMIA) requires that the U.S. Department of Agriculture's (USDA) Food Safety and Inspection Service (FSIS) inspectors perform post-mortem inspection on 100% of livestock carcasses and parts (i.e. cattle, sheep, swine, and goats) (FMIA, 2005). FSIS veterinarians conduct thorough inspections of the carcass, viscera, and head of animals to prevent diseased animals from entering the food supply (Edwards-Callaway et. al., 2020). They also work to protect animal health by monitoring for foreign animal diseases to prevent their introduction and spread within the U.S. In addition to safeguarding public health, veterinarians oversee animal welfare throughout the production process to ensure humane treatment and reduce stress in livestock.

Early Life and Veterinary Beginnings

Dr. Gregory Abreu is a Deputy District Manager in the Food Safety and Inspection Service (FSIS) within the US Department of Agriculture (USDA). He became interested in livestock early in his life as he grew up on a small hobby ranch while caring for horses, pigs, and cattle; he also participated in 4H throughout his childhood. He attended a small liberal arts college as a pre-med student but quickly changed course to study veterinary medicine after he realized that he would prefer to work with animals rather than people. Later in his career as a veterinarian, he found that working with animal owners was just as important as working on the animals themselves.

Challenges as a Large Animal Veterinarian

After graduating with a Doctorate of Veterinary Medicine (DVM), Dr. Abreu worked as a mobile, large-animal veterinarian. He provided routine preventative medical care, including services such as vaccination, dental care, and pregnancy checks, and diagnosed lameness, sutured injuries, and provided emergency services. To protect herd health, he performed routine exams to monitor for signs of reportable disease, provided vaccinations for Brucellosis, and issued veterinary health certificates. He had a difficult time finding job satisfaction as large animal practice is a physically and emotionally demanding job. There were times when animals would be put down due to a high cost of care which was especially prevalent during the Great Recession around 2010 when people were left without money to care for their horses. Around this time, Dr. Abreu decided to explore other career options. A former coworker had told him about the job duties and benefits for working at FSIS, which is responsible for protecting public health by inspecting meat and poultry products in the U.S.

Transition to Public Health with FSIS

At FSIS, Dr. Abreu has served in multiple roles, including Supervisory Public Health Veterinarian (SPHV), Frontline Supervisor (FLS), and District Deputy Manager (DDM). As an SPHV, his responsibilities included inspecting livestock for signs of reportable foreign animal disease, determining whether animals were safe for consumption, and reviewing humane handling practices. The transition to leadership roles brought broader responsibilities including evaluating the overall effectiveness of food safety systems, supervising a large team, and determining if enforcement actions against meat and poultry companies are warranted and lawful. Dr. Abreu stresses that veterinarians play an important role in protecting public health and ensuring a safe food supply. Dr. Abreu found greater job satisfaction working in public health.

Advice for Veterinary Students

He recommends that veterinary students keep an open mind about potential career options and that they try to visit as many veterinary practices as possible to gain experience in different settings. He recommends that a veterinary student interested in

a public health career try a veterinary practice first to help prevent any potential regret about career decisions later in his or her career. For a successful career in public health, Dr. Abreu advises that some key contributors to success are communication skills, adaptability, and inquisitiveness. Dr. Abreu believes that in the future there will be an increased veterinary focus on emerging diseases as foreign travel continues to increase, and people travel with pets.

References

Edwards-Callaway, L. N., & Calvo-Lorenzo, M. S. (2020). Animal welfare in the U.S. slaughter industry—a focus on fed cattle. *Journal of Animal Science*, 98(4), 1–21.
<https://doi.org/10.1093/jas/skaa040>

Federal Meat Inspection Act (FMIA), 21 U.S.C. §§ 601–695 (2005). Retrieved from
<https://www.govinfo.gov/content/pkg/USCODE-2021-title21/html/USCODE-2021-title21-chap12-subchapl-sec604.htm>

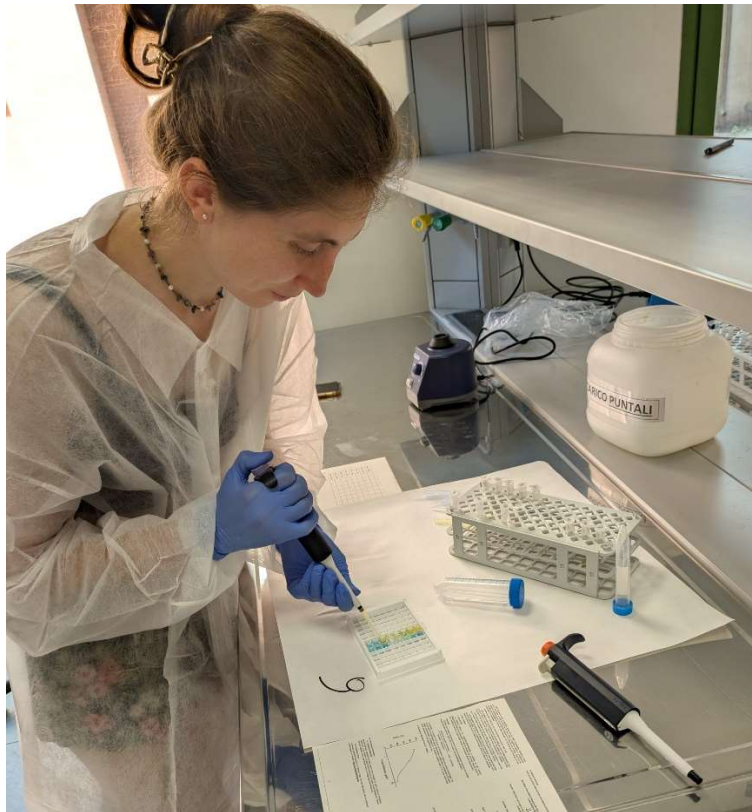
Appendix 3 – iMOVES&FB Newsletter Article

iMOVES Summer 2025: Food Safety, Public Health & Animal Welfare in Italy

Authors:

Timothy Drake (Principal Author), Victoria Neff, Maddie Pike, Jenna Marston

In June 2025, the University of Padua in Italy hosted the International Mobility of Veterinary Students (iMOVES) program which included American veterinary and public health students from Kansas State University, Colorado State University, Texas A&M University, and University of Pennsylvania. The University of Padua was founded over 802 years ago in 1222 and boasts some famous names from history including student Nicolaus Copernicus and professor Galileo Galilei.



Italian veterinary student demonstrating the ELISA testing technique

Maddie Pike, Master of Public Health (MPH) student at K-State, explained that she learned during the iMOVES program how interconnected food safety is with veterinary medicine and other disciplines. As a food safety student attending the iMoves program that was heavily veterinary-focused, she was concerned that her background wouldn't align with the program. She explained that she gained new perspectives on concepts and realized that innovation in this field requires a mosaic of disciplines working together to ensure food is produced safely, animal welfare is protected, and environmental conditions are considered. The iMoves program included work in a laboratory at the University of Padua to learn how to perform enzyme-linked immunosorbent assay (ELISA) immunoassay testing. The group learned how to use ELISA to detect aflatoxins in random samples. The test results could inform decisions across food safety, environmental health, and veterinary science.



The iMOVES students learning how to perform necropsies on chickens

The students in the iMOVES program performed necropsies of broiler chickens in the meat lab at the University of Padova School of Agricultural Sciences and Veterinary Medicine. The chickens had died in transport to slaughter, and the students found various causes of death including pathogenic lesions and injuries. Jenna Marston, K-State Doctor of Veterinary Medicine (DVM) student, explained that learning how to perform necropsies is requisite for future food animal veterinarians to help protect the global food chain. She continued stating that a veterinarian can evaluate poultry that have died to identify potential outbreaks and to help manage flock health.



Dr. Galuppo explains biosecurity measures to students during a tour of an Italian laying hen facility

The group visited a laying-hen barn for the production of chicken eggs which was in the final stages of construction, prior to stocking with animals. Dr. Francesco Galuppo, a veterinarian with Unità Locale Socio-Sanitaria (ULSS), led the students on a tour of the facility. The tour focused on aspects of the design that helped improve the facility's

biosecurity. Dr. Galuppo explained the various Italian biosecurity regulations that the country uses to help control the spread of Highly Pathogenic Avian Influenza (HPAI).



Students learning how to inspect fish for parasites at a commercial seafood processing facility

The iMOVES group visited both consumer and wholesale seafood markets. The visits combined to provide an overview of aquaculture trade, from wholesale markets to consumer markets to processing plants. The markets featured mostly locally caught seafood that had been harvested on the same day. The group explored the food safety aspects and import-export considerations for aquaculture by also touring a seafood processing plant emphasized. The company explained how they maintain food safety throughout the entire process of transporting, processing, and packaging. The company has a laboratory where they test fish samples for histamine which is caused by improper refrigeration after harvest. They explained how high levels of histamine can cause foodborne illness with symptoms similar to allergic reactions.



The K-State iMOVES group taking in the sights of Venice, Italy including the Rialto Bridge. (Back left to right: Jenna Marston, Darragh Mulcahy, Tim Drake, Front left to right: Maggie Martinez, Dr. Ellyn Mulcahy, Maddie Pike, Victoria Neff)

Dr. Victoria Neff, K-State MPH student, explained that everyone enjoyed the opportunities that the iMOVES program provided for discussion with the Italian veterinary and food science students about the differences in regulations, educational programs, and cultural preferences. The K-State group was able spend time appreciate the history of Italy, partake in the great food, and enjoy the hospitality of the Italian people.



Justinian the Great (Dr. Justin Kastner) reenacting one of his favorite scenes from *Mission: Impossible – Dead Reckoning Part One* in Venice, Italy