FROM *THE JUNGLE* TO HACCP:
A FIRST-HAND VIEW OF THE UNITED STATES MEAT INSPECTION PROCESS

by

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Abstract

Since the advent as the Bureau of Animal Industry in 1884, the United States Department of Agriculture (USDA) has had an evolving role working to protect the U.S. food supply. The agency's role in food safety was redefined by the *Federal Meat Inspection Act* of 1906; and toward the end of the 20th century it replaced its organoleptic approach to inspection with Hazard Analysis and Critical Control Points (HACCP), a much more modern and scientific approach. This summer, I had the chance to experience the USDA Food Safety and Inspection Service (FSIS) from the inside, across the gamut of its responsibilities. These responsibilities have not only grown, but their importance has become increasingly evident over the agency's history. Scrutiny dominated by public opinion, which in turn is often influenced by casuistic reasoning, compounds the complexity of the duties of the FSIS. In the end, the FSIS is an extension of the executive branch of the federal government – a service of, by, and for the nation's citizens.

This summer has granted me a great deal of experience and knowledge regarding food safety in the United States, especially as it relates to the meat industry. I have been able to see the breadth of the jurisdiction of the FSIS, observing small slaughter operations, as well as high-speed pork, poultry, and beef establishments. I have seen new and old processing facilities, an egg powdering plant, and have been challenged to fill the shoes of an Enforcement Investigative and Analysis Officer (EIAO) for a day. The provision of food safety for a nation's food supply is an arduous task requiring a monumental amount of paperwork. The implementation of HACCP has placed responsibility on plants to create a safe product, and has provided a scientific model for them to use. This scientific basis has led to tighter controls and safer product, but can be difficult for smaller establishments to research and evaluate. Nonetheless, food safety plays a vital role in public health and the FSIS is an integral part of that process, impacting the food supply not only of the United States, but the world as well.

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Metta.

CHAPTER 1 - Introduction

Since the advent as the Bureau of Animal Industry in 1884, the United States Department of Agriculture (USDA) has had an evolving role working to protect the U.S. food supply. The agency's role in food safety was redefined by the *Federal Meat Inspection Act* of 1906; and toward the end of the 20th century the agency replaced its organoleptic approach to inspection with Hazard Analysis and Critical Control Points (HACCP), a much more modern and scientific approach. This summer, I had the chance to experience the USDA Food Safety and Inspection Service (FSIS) from the inside, across the gamut of its responsibilities. These responsibilities have not only grown, but their importance has become increasingly evident over the agency's history. Scrutiny dominated by public opinion, which in turn is often influenced by casuistic reasoning, compounds the complexity of the duties of the FSIS. In the end, the FSIS is an extension of the executive branch of the federal government – a service of, by, and for the nation's citizens.

CHAPTER 2 - Meat inspection in the United States

A historical perspective

My prior experience working with the *Frontier* program at Kansas State University encouraged me to pay special attention to the history of the organization I was joining and its place in border security, food security, and trade policy. With recent publications by *Frontier* co-founder Justin Kastner and former *Frontier* student Dwayne Byerly highlighting key events during the dawn of meat inspection in the United States, I began my summer experience by delving into history.

The establishment of the Department of Agriculture by Abraham Lincoln in 1862, followed by the creation of the BAI in 1884, marked the beginning of cooperation among the states regarding meat inspection. Initially, the intent was to protect interstate trade, as well as the nation's ability to export to foreign countries. The agency began with 20 employees and $150,000 ("Agency History"). By the time Upton Sinclair published *The Jungle* – his infamous review of the meat industry and class struggles – in 1906 it was clear that something more needed to be done to ensure the healthfulness of the nation's food supply. The *Federal Meat Inspection Act* (FMIA) of 1906 revolutionized the industry, granting a great deal of power to the USDA. The *Poultry Products Inspection Act* (PPIA) of 1957 added to the scope of the agency, as did the *Egg Products Inspection Act* (EPIA) of 1970 when it was transferred to FSIS jurisdiction in 1995. These three together define its basic jurisdiction today.

Congressional acts form the basis of the mission of the FSIS, beginning with the three empowering acts: the FMIA, PPIA, and EPIA. The *Food Additive Amendment* (FAA) of 1958 augmented the agency's mission by mandating a focus on drug residues in meat. Further amendments to the FMIA (*Wholesome Meat Act* in 1967) and PPIA (1968) further honed the mission. Once these basic acts are expanded and interpreted, they become federal regulations and find their way into the Code of Federal Regulations. As issues arise, the agency further provides regulatory guidance to its employees by the use of permanent directives or short-term notices.

The development of a scientific approach

For nearly a century after the FMIA was passed, the FSIS operated under a command and control system, with the responsibility of ensuring only safe products enter commerce falling squarely on the inspectors' shoulders. However, in 1959 a distant branch of the government began work on a system that would eventually revolutionize food safety worldwide. The National Aeronautics and Space Administration was looking for a way to ensure the safety of "space food." Among their goals was the need for the absolute assurance that food would be free of pathogens. They began work with the Pillsbury Company and the U.S. Army Natick Labs to this end, quickly finding that the then-current methods of organoleptic inspection and product testing were inadequate for such assurance. Dr. Howard Bauman, who headed the project at the Pillsbury Company, noted:

> We quickly found that by using standard methods of quality control there was absolutely no way we could be assured that there wouldn't be a problem. This brought into serious question the then prevailing system of quality control in our plants…If we had to do a great deal of destructive testing to come to a reasonable conclusion that the product was safe to eat, how much were we missing in the way of safety issues by principally testing only the end product and raw materials?
>
> We concluded after extensive evaluation that the only way we could succeed would be to establish control over the entire process, the raw materials, the processing environment and the people involved. (Stevenson 2)

Control over the entire process was not enough, though. There needed to be a plan to recognize and deal with potential food hazards. The scientific Modes of Failure model in use by the Natick Labs provided useful principles:

- Gather knowledge and experience concerning the food product and process
- Predict potential hazards, and how and when in the process they are liable to occur
- If the process is uncontrolled at this point, there is an increased probability of a food safety problem (Stevenson 2)

Thus, the Hazard Analysis and Critical Control Point (HACCP) system was developed. It was an approach that focused on the scientific community's improving understanding of

microbiological and chemical food safety. When the initial hype after its first public presentation in 1971 subsided, though, the plan was all but forgotten for over a decade.

HACCP gained momentum again in 1985 after a strong endorsement by the Subcommittee of the Food Protection Committee of the National Academy of Sciences. Its three principles were expanded to seven in 1989 by the National Advisory Committee on Microbiological Criteria for Foods, and revised in 1992 and 1997. HACCP entered the realm of FSIS in 1996, and in phases from 1998 to 2000 inspected meat and poultry (but not egg product) establishments were required to develop HACCP plans and begin operating under them. In an even greater step into fame, HACCP was adopted by the Codex Alimentarius Committee of Food Hygiene – an international committee of the World Health Organization and United Nations Food and Agriculture Organization. (Stevenson 3)

HACCP effectively puts the responsibility on the establishment to deliver a wholesome and safe product, shifting the FSIS inspectors to a position of verifying that the establishment's process can and is working. However, in the industry HACCP is only one component of ensuring food safety. An establishment's responsibilities begin with Sanitation Performance Standards (SPS), ensuring an environment and facilities capable of producing safe food. Another component required by the FSIS is the implementation of Sanitary Standard Operating Procedures (SSOPs). These give detailed explanations of how the establishment intends to clean the facility and keep it clean. Finally, the HACCP plan comes into play, including supporting documents and prerequisite programs. The actual practice of regulatory HACCP becomes more mandate-bound than theoretical HACCP, but the seven principles remain in place:

1. Conduct a hazard analysis
2. Determine the Critical Control Points (CCPs)
3. Establish critical limits for the CCPs
4. Establish monitoring procedures for the CCPs
5. Establish corrective actions, should the critical limits be exceeded
6. Establish verification procedures to ensure the process is working
7. Establish record-keeping and documentation, allowing a third party (i.e.: FSIS) to verify the process

In the hazard analysis, potential hazards must be accounted for and eliminated, controlled, or minimized. The hazard analysis consists of creating a flow chart of each process in

the establishment, followed by listing all potential hazards step-by-step. There must be an SPS, SSOP, prerequisite program, or CCP associated with each hazard. Each of these must be backed up soundly and scientifically. The establishment – based on its process – must evaluate what it takes to make a safe product, and document how it does so whenever it is running. The FSIS takes on the task of ensuring this is occurring.

The role of the Food Safety and Inspection Service

The FSIS is one of several government agencies associated with protecting the nation's food supply. Within the executive department of the federal government, the Food and Drug Administration (FDA) and the USDA share these responsibilities. While the FDA focuses on non-meat food items, the USDA applies a three-pronged attack.

The USDA Animal and Plant Health Inspection Service (APHIS) strives to protect the health of living animals and elements that impact their wholesomeness as food prior to slaughter. The Agricultural Marketing Service (AMS), also under the USDA, oversees animals going to market. Finally, the USDA FSIS inspects establishments associated with animal slaughter, meat and certain meat products, poultry and poultry products, and egg products (eggs themselves remain under the FDA).

Every organization has a chain of command, and the FSIS is not different. I spent my summer under the Office of Field Operations (OFO) shadowing a Public Health Veterinarian (PHV) around his mini-circuit. Thus, my chain of command was as follows:

Table 2.1 FSIS chain of command: PHV to top

Secretary of Agriculture	Ed Schafer
Under Secretary of Food Safety	Dr. Richard Raymond
FSIS Administrator	Al Almanza
Office of Field Operations	Dr. Kenneth Peterson
Lawrence District Office	(currently empty)
Frontline Supervisor	Dr. Larry Darr
Public Health Veterinarian	Dr. Rob Clarkson

The basis of the agency is in-plant inspection, looking at every animal and every carcass, as well as being in the facility every day of operation. On-line Food Inspectors (FI) are the

backbone of the agency, inspecting carcasses and viscera for any sign of potential foodborne malady. Suspect carcasses, along with the viscera are set aside (railed out) for further inspection by a Public Health Veterinarian (PHV), who makes a final disposition on the carcass. Consumer Safety Inspectors (CSIs) perform the task of ensuring the establishment is following its SPS, SSOPs, and HACCP plans. Any deviation elicits a Noncompliance Report (NR). Further action can potentially be taken to bring about a Food Safety Assessment (FSA) or even to suspend inspection if need be. Food Inspectors and CSIs fall under the supervision of a PHV. Another responsibility under the OFO belongs to the Enforcement, Investigative, and Analysis Officers (EIAOs), who travel from plant to plant to conduct FSAs, comprehensively reviewing each establishment's paperwork and procedures to ensure those procedures will provide food safety. Scientific support for these plans and procedures is key; and documentation that they are being followed is vital. Without it, review by a third party – like the FSIS – is irrelevant and ineffectual.

CHAPTER 3 - The Food Safety and Inspection Service today

Meat inspection in the United States has come a long way since its inception in the mid-19th century – from the gruesome images portrayed in Upton Sinclair's *The Jungle* to today's government-verified and scientifically-based establishment responsibility. The contemporary FSIS has four main foci: food safety, economic integrity (consumer protection), humane treatment of animals, and food defense.

The first focus: food safety

The first two words in the agency's title expose its principal mission: food safety, a mission commonly misunderstood by the layperson. Most people rely on their senses (an organoleptic inspection) to determine if food is fit to eat. As microbiological understanding has improved, though, it has shown that foodborne pathogens rarely cause signs that are organoleptically perceptible. Instead, food that may appear safe can potentially harbor disease-causing organisms. However, food safety concerns are not limited to biological agents. During hazard analysis, establishments list hazards in three categories: biological, chemical, and physical.

Biological hazards

An important attribute of HACCP is its demand for scientific evaluation. This means that food is neither safe nor unsafe just because it appears one way or another. Rather, specific pathogens are researched and assessed for their risk potential based on their likelihood to occur and danger to the consumer. Based on three basic categories of meat products, the FSIS has recognized a handful of pathogens of concern. In raw products and slaughter facilities, *E. coli* O157:H7 and *Salmonella* spp. are the major pathogens to be controlled or eliminated; for heat treated but not fully cooked products, *E. coli* O157:H7 and *Salmonella* spp. are joined by *Clostridium* spp.; and for ready-to-eat products, *Listeria monocytogenes* and *Clostridium* spp. top the list, followed by *Staphylococcus aureus*, *E. coli* O157:H7, and *Salmonella* spp. *Campylobacter* spp. and *Yersinia* spp. have also recently become concerns.

The danger presented by *E. coli* O157:H7 became apparent in the early-1990s with the now-infamous outbreak due to undercooked burgers at Jack In The Box restaurants that resulted in hundreds of human cases and four deaths throughout the Pacific states ("Jack in the Box"). A few years after the incident, *Toxin* by Robin Cook explored a fictional outbreak very similar to the Jack In The Box scenario. Being a novel, it exploited a list of improbable circumstances to incite skepticism and distrust of the American meat processing and supply system. *E. coli* is an ubiquitous bacteria that is readily killed by proper cooking, a shortcoming to which Jack In The Box readily admitted. While *E. coli* O157:H7 is eliminated in the same way, it is known for high morbidity and mortality rates. After the outbreak it became known in raw beef as an adulterant – a legal term used by the FSIS to condemn product.

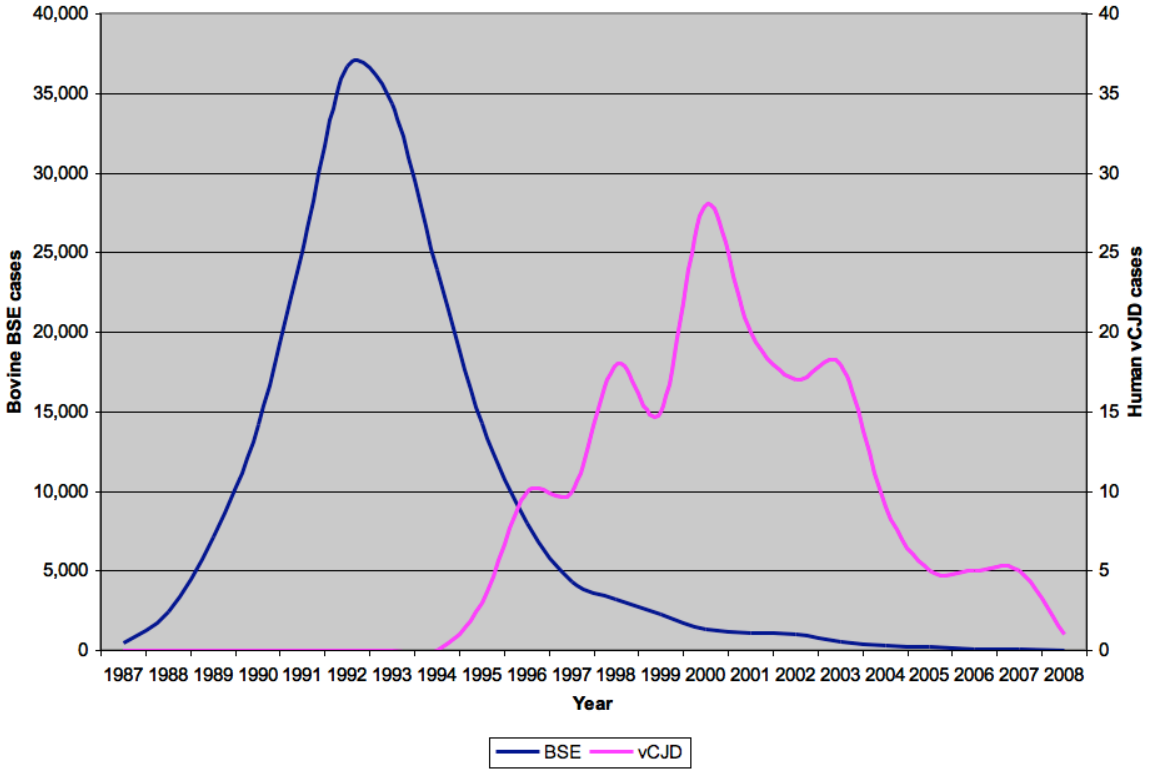
E. coli and *Salmonella* spp. are most scrutinized in not-fully-cooked products due to their susceptibility to a lethality measure – most commonly, cooking. *Clostridium* spp. – a spore-forming microbe – comes into play when temperatures over 80˚F are reached, prompting the organism to form spores that are very resistant to further lethality treatments (US: "Appendix B"). Thus, cooling measures following the heat treatment (whether it involves fully cooking or not) must occur at a quick enough pace that outgrowth does not occur. Finally, *L. monocytogenes* is of great concern for any product labeled ready to eat. The ubiquitous organism's high mortality rate and ability to grow in a wide range of environments make it a particularly elusive and dangerous hazard.

Although the creators of HACCP recognized that product testing is generally a poor method for the assurance of food safety, it can be used to verify the success of HACCP plans. Establishments are annually directed to conduct a series of generic *E. coli* and *Salmonella* tests to evaluate their SSOPs and general cleanliness. There are also random *E. coli* O157:H7 and *L. monocytogenes* tests to ensure the establishment's HACCP system is preventing these particular pathogens from entering commerce.

Another biological hazard that slaughter facilities must address is bovine spongiform encephalopathy (BSE), an epidemic of which ravaged the beef industry in the United Kingdom from 1988 through the turn of the century ("Number of Cases"). Though the mechanism of the disease is still not fully understood, the epidemic illuminated an association between then number of cases in cattle and the number of variant Creutzfeld-Jakob disease (vCJD) in humans (*see* Fig. 3.1). The severity of vCJD as well as the devastating blow BSE can deal to the

agricultural community led to strong legislative action worldwide. Though the incidence of BSE in the United States is extremely low – only two positive tests for domestic cattle reported since 1989 – precautions against it can be found throughout the industry ("Number of Reported"). For the part of the FSIS, specified risk materials (SRMs) have been identified and must be prevented from entering commerce in edible product. For cattle less than 30 months of age, the distal ileum and tonsils fall into this category; and in older cattle the "brain, skull, eyes, trigeminal ganglia, spinal cords, vertebral column (excluding the vertebrae of the tail, the transverse processes of the thoracic and lumbar vertebrae, and the wings of the sacrum), and dorsal root ganglia" are also included (Taylor 1071). Unless paperwork is submitted with cattle at the time of slaughter, age is determined by dentition: if the second set of permanent incisors has erupted, the animal is considered over 30 months (a guideline that errs on the side of caution). Animals that could not rise and walk to slaughter themselves have been marked as suspect since the FMIA of 1906, but the restriction was tightened in 2003 due to BSE: cattle that cannot rise and walk to slaughter are condemned outright (Taylor 1073).

Figure 3.1 Comparison of bovine spongiform encephalopathy cases and human vCJD cases in Great Britain from 1988 to present



(sources: "Number of Cases", "CJD Statistics")

A related recall that occurred during my time with the FSIS had to do with suspected market heads that still had remnants of tonsilar material left in them. Market heads are a niche market, and are generally found in Hispanic markets, where they are boiled to remove any remaining meat for use in tacos. The offending heads were discovered at a distribution center, and a recall from the original plant was issued. It is somewhat difficult to ensure that all tonsilar material is removed, as the tonsils are not clearly defined, but pervade throughout certain regions of tissue. The five sets of importance in the bovine head include the lingual tonsils, pharyngeal tonsils, palatine tonsils, tubal tonsil, and tonsil of the soft palate (Budras 44-47). The recall afforded me the chance to see a recall verification in action. I accompanied an EIAO-trained PHV to a local market where one of the heads had been shipped to ensure the market knew about the recall and that the head had been dealt with properly. The market was aware of the recall, but the head had been consumed before the recall had been issued. As the threat was not considered excessive, no further action was taken.

Chemical hazards

Chemical and physical hazards play a lesser role in hazard analysis than do physical hazards, but it is still vital to account for them. "While chemical hazards are still feared by many consumers and physical hazards are the most commonly identified by consumers, microbiological hazards are the most serious from a public health perspective" (Stevenson 1). Nonetheless, chemical agents contaminating a single batch of ground product has the potential to harm an extraordinary number of people considering today's shipping capabilities. Chemical agents have the potential to be introduced due to cleaning measures and lubricants. Also included in this category are allergens that must be accounted for in labeling. Cheese, for instance, must be listed under the chemical heading in a hazard analysis and dealt with appropriately with labeling or separation and cleaning of product lines.

An important chemical consideration for slaughter facilities is the presence of drug residues. The FAA of 1958 was the beginning of residue testing for the FSIS. If an animal is suspected of having drug residues, either a FAST or STOP test is performed. Animals coming from a local fair are tested, as are those with some sign of potential illness, as they are the most likely candidates to have received treatment recently. For instance, a heifer with enlarged hemal

nodes came into a facility while I was there. Though little is known about the hemal nodes, a FAST test was run (it turned up negative). The FAST test consists of swabs taken from the kidney and liver and left on an agar plate inoculated with *Bacillus megaterium* along with a control disk of neomycin. A clearing in the bacterial lawn surrounding the swab tip would indicate the potential presence of an antimicrobial agent – a drug residue – and samples of the kidney and liver would be sent for further testing at a central laboratory. The carcass would be held until a definitive answer was achieved and its disposition would be decided then.

Physical hazards

Physical hazards can also be introduced during production due to the pervasive use of large machinery, wood and plastic pallets, and loose items potentially dropped by workers. This category can often include lead shot found in cattle due to poor marksmanship on the part of a hunter. All of these must be taken into consideration during the penning of a HACCP plan.

The second focus: economic integrity

Another function of the FSIS is to protect the economic integrity of products entering commerce. Consumer protection beyond food safety includes such things as wholesomeness, proper labeling, inspecting boneless cuts of meat for defects, and verifying net weights to ensure they are a true reflection of what is printed on the packaging. Inspectors frequently sample a series of products, weighing them and checking their labeling for accuracy.

Wholesomeness is related to food microbiology, but without the concern for foodborne pathogens. Rather, the concern regards spoilage bacteria like *Pseudomonas aeroginosa*. These microbes cause a physical change in meat that is detectable by sight and smell, but are not causes of foodborne illness themselves. A well-known practice found in the grocery store is the use of vacuum packaging, which limits the amount of oxygen available to any bacteria that may have remained viable on the product. This decrease in oxygen promotes the growth of anaerobic Gram-positive organisms. These tend to grow much slower, though, and produce acids that act as preservatives to some degree, increasing food shelf life.

The third focus: humane handling

The *Humane Handling Act* of 1978 added the welfare of the animals coming to slaughter to the responsibilities of the FSIS. The APHIS point in a slaughter facility is the end of APHIS

inspection and the beginning of FSIS inspection. At some point thereafter, each animal will be viewed by an inspector both ante-mortem and postmortem. Prior to slaughter, each animal must be treated as humanely as possible, in accordance with 9 CFR 313. Inspectors ensure water is available to the animals at all times, and if they are to be kept over 24 hours food must be made available. Handling prior to slaughter has received a great deal of attention since the recent Hallmark/Westland Meat Packing Co. incident (egregious inhumane treatment was applied to nonambulatory cattle to get them to rise and walk to slaughter), both for the sake of the animals as well as for food safety concerns (Eamich). The use of electronic prods must be limited, and forcibly coercing animals to rise and walk is prohibited. Studies by Dr. Temple Grandin, an expert in animal behavior and handling, have been used to create FSIS training on the appropriate facilities and means of humane handling of animals prior to slaughter (For the Welfare). The agency makes mention of walking surfaces, restricting the amount of slipping and falling allowable before an establishment must reevaluate their floor surfaces. Even the handling of suspect and condemned animals is monitored. Slaughter itself must be a single event, and stunning and slaughter efficacy is closely observed. As the carcass is first hoisted onto the rail, any sign of consciousness must bring about a rapid effort to re-stun the animal. Interestingly, humane slaughter is not addressed in the case of poultry except to indicate that they must not be alive when they enter the scalder.

Special exception is given to cases of religious slaughter like halal and kosher activities. Since stunning is not permitted for some religions, animals may be slaughtered without that step, but it must be done by a well-trained individual who can still bring about death as a single event. I had the chance to observe halal slaughter of goats during my time with the FSIS, as well as differing opinions among FSIS personnel regarding the most humane method of halal slaughter. In this instance, the severing of the carotid arteries was immediately followed by a cut all the way through the atlanto-occipital junction. The worker doing the slaughtering was experienced and quick at making the cut, but back in the FSIS office a discussion arose about ensuring that the slaughter was a single event, and that the two or three additional strokes may unnecessarily prolong that experience for the animal. Though no definitive answer was readily available, when it was brought to his attention, the worker agreed to stop after the first cut.

An issue not addressed as a humane concern by the agency or the industry is Porcine Stress Syndrome (PSS). It is a genetic defect that leads to a severe contraction of the muscles in

pigs when they become stressed. Often, due to being raised in small pens where they get little exercise, when the animals are brought to the slaughter facility and have to walk a great distance they can become stressed. For most that become stressed, that means walking slower and breathing more heavily. For those with PSS, though, their muscles can lock up, causing severe discomfort – in some cases even to the point of snapping the pelvis in two. The genetic nature of the disease indicates that with cooperation within the pork industry, it could be bred out of the animals to prevent further related concerns of humane handling. ("Porcine Stress Syndrome")

The fourth focus: food defense

The final task shouldered by the FSIS is largely a recent issue. Contemporary concerns regarding terrorism and the susceptibility of the nation's food supply have spawned the need for the FSIS to pay special attention to food defense. International agricultural trade is an important boost for the American economy, whether it be in live animals or animal product. Large plants today ship products across the nation and around the globe with great rapidity, providing an ideal vehicle for the dissemination of a weapon of bioterrorism. The contamination of a single batch of ground product in a large plant would have far-reaching ramifications. In her novel *Deadstock*, Kate Iola explores a potential scenario for an attack on the American agricultural sector. While the story she lays out doesn't directly affect food safety, the impact all but obliterates the livestock industry in the United States. Nearly as easily, an attack involving a foodborne pathogen could occur with even broader implications regarding the ability to purchase food safe for consumption, not only crippling the trade of such commodities, but bringing illness and potentially death to entire markets.

With this in mind, the FSIS has developed important procedures to verify that meat slaughter and processing establishments are doing what is necessary to protect their process and products. In-plant inspectors have a series of procedures dedicated to homeland security, from verifying that the water supply is safe to evaluating potential civil unrest in the region.

CHAPTER 4 - Conclusion

This summer has granted me a great deal of experience and knowledge regarding food safety in the United States, especially as it relates to the meat industry. I've been able to see the breadth of the jurisdiction of the FSIS, observing small slaughter operations, as well as high-speed pork, poultry, and beef establishments. I've seen new and old processing facilities, an egg powdering plant, and have been challenged to fill the shoes of an EIAO for a day. The provision of food safety for a nation's food supply is an arduous task requiring a monumental amount of paperwork. The implementation of HACCP has placed responsibility on plants to create a safe product, and has provided a scientific model for them to use. This scientific basis has led to tighter controls and safer product, but can be difficult for smaller establishments to research and evaluate. Nonetheless, food safety plays a vital role in public health and the FSIS is an integral part of that process, impacting the food supply not only of the United States, but the world as well.

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Appendix A - Acronym dictionary

Acronym	Definition
AMS	Agricultural Marketing Service
APHIS	Animal and Plant Health Inspection Service
BAI	Bureau of Animal Industry
BSE	Bovine Spongiform Encephalopathy
CCP	Critical Control Point
CFR	Code of Federal Regulations
CSI	Consumer Safety Inspector (aka Offline inspector)
EIAO	Enforcement Investigation and Analysis Officer
EPIA	*Egg Products Inspection Act* (1970)
FAA	*Food Additive Amendment* (1958)
FAO	Food and Agriculture Organization (UN)
FDA	Food and Drug Administration
FI	Food Inspector (aka Line inspector)
FLS	Frontline Supervisor
FMIA	*Federal Meat Inspection Act* (1906)
FSA	Food Safety Assessment
FSIS	Food Safety and Inspection Service
GMP	Good Management Practice
HACCP	Hazard Analysis and Critical Control Points
LDO	Lawrence District Office
NACMCF	National Advisory Committee on Microbiological Criteria for Foods
NOIE	Notice Of Intended Enforcement
NR	Noncompliance Report
NRTE	Non-ready to eat
NSS	Not shelf stable

OFO	Office of Field Operations
PHV	Public Health Veterinarian
PPIA	*Poultry Products Inspection Act* (1957)
PSS	Porcine Stress Syndrome
RLm	Routine *Listeria monocytogenes* testing
RTE	Ready to eat
SPS	Sanitation Performance Standards
SRM	Specified Risk Materials
SSOP	Sanitation Standard Operating Procedure
USDA	United States Department of Agriculture
vCJD	Variant Creutzfeld-Jakob disease
WHO	World Health Organization
WMA	*Wholesome Meat Act* of 1967

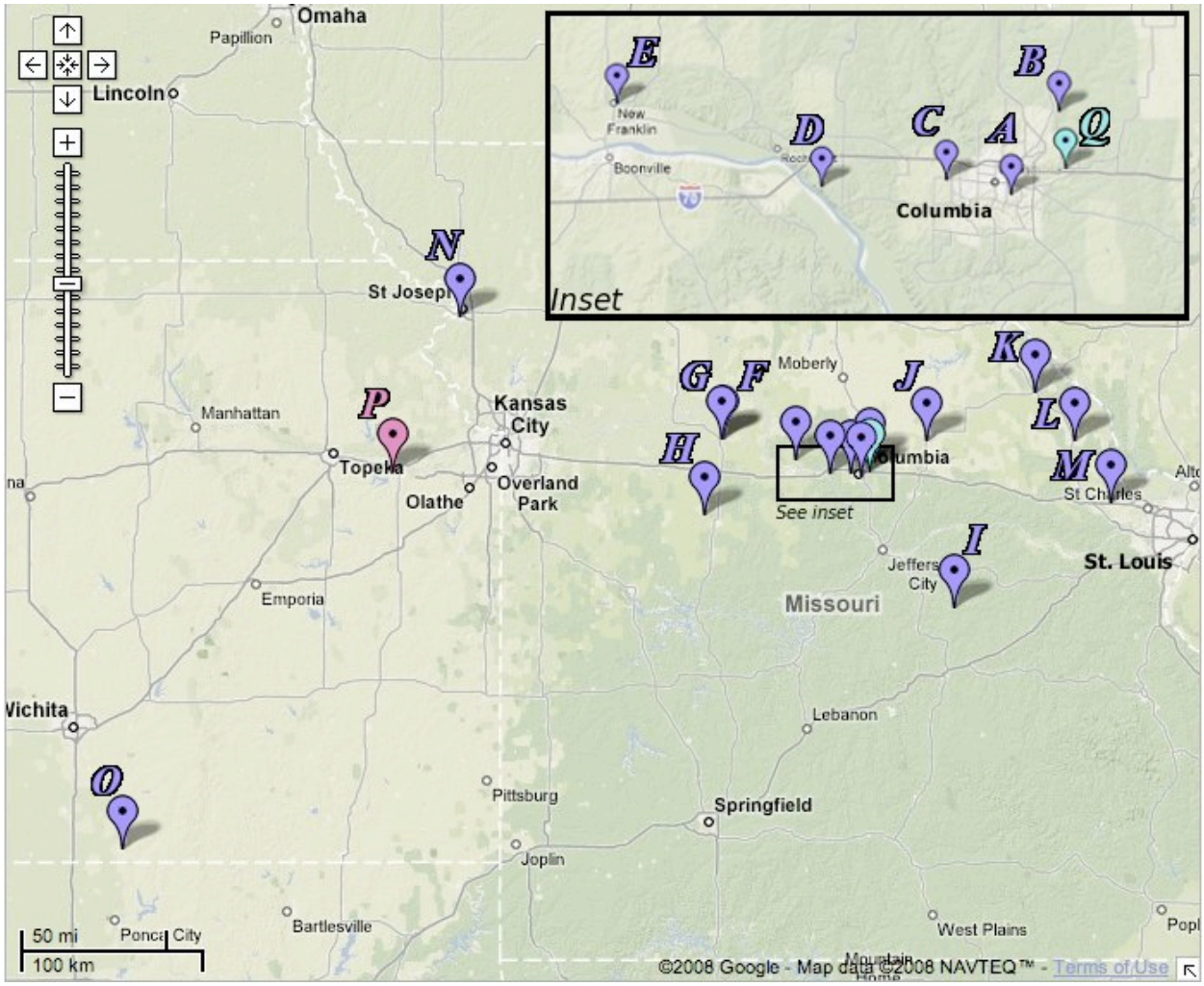
Appendix B - Calendar of events

Date	Day	Events	
25-May-08	Sun.		
26-May-08	Mon.	Holiday	
27-May-08	Tues.	Travel to LDO	
28-May-08	Wed.	LDO orientation	
29-May-08	Thurs.	LDO orientation	
30-May-08	Fri.	LDO orientation	Travel to Columbia
31-May-08	Sat.		
1-Jun-08	Sun.		
2-Jun-08	Mon.	Kraft/Oscar Mayer	
3-Jun-08	Tues.	UMC abbotoir	Kraft/Oscar Mayer
4-Jun-08	Wed.	Kraft/Oscar Mayer	Shakespeare's
5-Jun-08	Thurs.	Kraft/Oscar Mayer	
6-Jun-08	Fri.	Kraft/Oscar Mayer	
7-Jun-08	Sat.		
8-Jun-08	Sun.		
9-Jun-08	Mon.	UMC office	Jenning's
10-Jun-08	Tues.	UMC office	
11-Jun-08	Wed.	UMC office	Jenning's
12-Jun-08	Thurs.	Jenning's	UMC office
13-Jun-08	Fri.	UMC office	Baumgartner's
14-Jun-08	Sat.		
15-Jun-08	Sun.		
16-Jun-08	Mon.	Dawn	UMC office
17-Jun-08	Tues.	Wood's	Schnuk's (?)
18-Jun-08	Wed.	Jenning's	UMC office

19-Jun-08	Thurs.	Travel to St. Joe		
20-Jun-08	Fri.	Triumph		
21-Jun-08	Sat.	Travel to Columbia		
22-Jun-08	Sun.			
23-Jun-08	Mon.	UMC office	Kraft/Oscar Mayer	
24-Jun-08	Tues.	Brown's		
25-Jun-08	Wed.	UMC office		
26-Jun-08	Thurs.	Brown's		
27-Jun-08	Fri.	UMC office (?)		
28-Jun-08	Sat.			
29-Jun-08	Sun.			
30-Jun-08	Mon.	Travel to Sedalia		
1-Jul-08	Tues.	Tyson		
2-Jul-08	Wed.	Tyson		
3-Jul-08	Thurs.	Travel to Columbia		
4-Jul-08	Fri.	Holiday		
5-Jul-08	Sat.			
6-Jul-08	Sun.			
7-Jul-08	Mon.	UMC office		
8-Jul-08	Tues.	Brown's		
9-Jul-08	Wed.	UMC office	Kraft/Oscar Mayer (evening)	
10-Jul-08	Thurs.	Jenning's	ConAgra	Marshall Egg
11-Jul-08	Fri.	UMC office		
12-Jul-08	Sat.			
13-Jul-08	Sun.			
14-Jul-08	Mon.	UMC office		
15-Jul-08	Tues.	Sho-Me		
16-Jul-08	Wed.	Sho-Me		
17-Jul-08	Thurs.	UMC office		
18-Jul-08	Fri.	Kraft/Oscar Mayer		
19-Jul-08	Sat.			

20-Jul-08	Sun.		
21-Jul-08	Mon.	UMC office	
22-Jul-08	Tues.	Travel to LDO	
23-Jul-08	Wed.	LDO	Travel to Arkansas City
24-Jul-08	Thurs.	Creekstone	
25-Jul-08	Fri.	Travel to Columbia	
26-Jul-08	Sat.		
27-Jul-08	Sun.		
28-Jul-08	Mon.	Travel to LDO	
29-Jul-08	Tues.	LDO meeting	
30-Jul-08	Wed.	LDO meeting	
31-Jul-08	Thurs.	LDO meeting	Presentation
1-Aug-08	Fri.	Travel to Manhattan	
2-Aug-08	Sat.		
3-Aug-08	Sun.		
4-Aug-08	Mon.	Final exam	Travel to Columbia
5-Aug-08	Tues.	Sho-Me	
6-Aug-08	Wed.	Sho-Me	
7-Aug-08	Thurs.	Sho-Me	
8-Aug-08	Fri.	Sho-Me	
9-Aug-08	Sat.		
10-Aug-08	Sun.		
11-Aug-08	Mon.	RLm testing	
12-Aug-08	Tues.	Jennings	
13-Aug-08	Wed.	St. Louis lab	
14-Aug-08	Thurs.	Sho-Me	
15-Aug-08	Fri.	Out-process	
16-Aug-08	Sat.		

Appendix C - Map of locations visited



Key	Establishment	Locality	Key	Establishment	Locality
A	UMC office/abattoir/processing	Columbia, MO	I	Sho-Me Livestock	Belle, MO
B	Kraft/Oscar Mayer	Columbia, MO	J	Dawn Food Products	Mexico, MO
C	Shakespeare's Pizza	Columbia, MO	K	Wood's Smoked Meats	Bowling Green, MO
D	Baumgartner's Salt-Cured Hams	Booneville, MO	L	Brown's Smokehouse	Ellsbury, MO
E	Jenning's	New Franklin, MO	M	Schnuck's	St. Charles, MO
F	ConAgra	Marshall, MO	N	Triumph	St. Joseph, MO
G	Marshall Egg Products	Marshall, MO	O	Creekstone	Arkansas City, KS
H	Tyson	Sedalia, MO	P	FSIS Lawrence District Office	Lawrence, KS
			Q	Provided residence: The Links	Columbia, MO