The Modernization of Poultry Slaughter Inspection and Its Impacts on Industry

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ACRONYMS

BPM - Birds Per Minute

CI - Carcass inspector

FMIA - The Federal Meat Inspection Act

FPS - Finished Product Standards

FPIS - Federal Poultry Inspection Service

FSIS - Food Safety Inspection Service

HACCP/PR HAACP - Inspection Models Project (HIMP) Pathogen Reduction

HIMP HACCP - Inspections Models Project

HMSA - Humane Methods of Slaughter Act

NELS - New Line Speed Inspection System

NPIS - New Poultry Inspection System

NTIS - New Turkey Inspection System

PFDA - The Pure Food and Drug Act

PPIA - Poultry Products Inspection Act

RTC - Ready-to-Cook

SIS - Streamlined Inspection System

SPS - Sanitation Performance Standards

SOPs - Sanitation Standard Operating Procedures

USDA - United States Department of Agriculture

VI - Offline Verification Inspector

ABSTRACT

The United States Department of Agriculture began inspecting poultry in 1957. The system at that time was largely organoleptic by which inspectors would look for visible defects on carcasses to identify and remove carcasses from the processing line. Throughout the last 57 years, the USDA has enacted many regulations to safeguard meat and poultry processing. Processing establishments in the U.S. operate under one of four poultry inspection systems. 2014 marks the year where establishments now have a fifth optional inspection system to operate under should they choose to do so. The New Poultry Inspection System has been 15 years in the making.

INTRODUCTION

Poultry[1] consumption in the United States has more than doubled since the 1960′s. It is estimated that 99 million pounds of poultry will be consumed in 2014 and that this number will continue to increase (National Chicken Council, 2014). Poultry farmers are able to produce this vast number through the use of technology. By controlling environmental parameters, genetic testing, regulating feed and daylight cycles, and using antibiotics allows for a more efficient poultry product to be grown, processed, and sold to consumers. Just as technology has produced a more efficient poultry product, so too has technology allowed the United States Department of Agriculture′s (USDA) Food Safety Inspection Service (FSIS) to regulate the poultry industry and amend regulations to the benefit of producers and consumers alike.

On January 18, 2011, Executive Order 13563 was signed by the President of the United States, Barack Obama to improve regulation and regulatory review. As part of this Order, FSIS proposed a new inspection system for chicken and turkey slaughter establishments that the Agency will implement in phases. The inspection system will offer slaughter plants an optional and additional inspection system to execute. This paper examines the new poultry inspection system in the United States and what it means for the industry.

HISTORY

The Pure Food and Drug Act (PFDA) and the Federal Meat Inspection Act (FMIA) were established as laws in 1906; perhaps as a response to the 1906 novel, *The Jungle,* by Upton Sinclair. *The Jungle* raised concerns about conditions for animals and workers in meat and poultry plants across the United States. During this time; however, the USDA offered a voluntary inspection and grading service to processors through the Federal Poultry Inspection Service (FPIS) (USDA, FSIS History). It wasn′t until 1957, that the first regulations for poultry slaughter inspection were adopted by the U.S. government in response to the rapid growth and demand for ready-to-cook (RTC) whole birds, parts, and further processed products. The Poultry Products Inspection Act (PPIA) ensured that all poultry products shipped in interstate commerce were continuously inspected prior to slaughter; after slaughter; before processing; and, if the poultry was imported, at the point of entry into the United States (USDA, FSIS History).

1958 established the Humane Methods of Slaughter Act (HMSA). HMSA was amended 20 years later and required that all meat inspected by FSIS for human consumption would be produced from humanely slaughtered livestock. 10 years later the Wholesome Meat Act and the Wholesome Poultry Act amended the FMIA and PPIA to address new inspection challenges. States

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[1] Estimate includes broiler chickens and turkeys

were now required to conduct meat and poultry inspection programs "at least equal to" the federal program (USDA, FSIS History).

It took a 1993 outbreak in the Pacific Northwest for FSIS to issue quite possibly the most significant change in regulations in the history of U.S. food inspection. An outbreak of E. coli O157:H7 led to over 400 illnesses and four deaths from contaminated ground beef (USDA, FSIS History). As a result of the outbreak, the Pathogen Reduction/Hazard Analysis and Critical Control Points (PR/HACCP) system was issued and focused on the prevention and reduction of microbial pathogens on raw products (USDA, FSIS History). PR/HACCP is a scientific system that can control potential safety problems in food production. The most important element of the system is that it changed food safety from being largely organoleptic (e.g. sight, touch, and smell) oversight to a technological and science-based inspection system and shifted the industry from being reactive to proactive. By the year 2000, HACCP was implemented in all FSIS and state inspected meat and poultry slaughter and processing establishments in the United States.

PR/HACCP verifies that establishments demonstrate consistent process control for preventing, eliminating, or reducing the contamination of raw meat and poultry products with disease-causing bacteria by setting *Salmonella* performance standards. Slaughter establishments that produce raw products should meet these performance standards. PR/HACCP also includes a sampling program for *Salmonella* for meat and poultry slaughter and grinding facilities (The Pew, 2014). Performance standards and guidance are expressed in terms of the maximum number of *Salmonella*-positive samples acceptable per sample set; or, a standard is a maximum limit on pathogenic contamination found in the raw product (USDA, Progress). The maximum number of positive samples acceptable in a set provides an 80% probability of an establishment passing when it is operating at the standard.

Current regulations do not specify which hazards an establishment must address in the HACCP plan. Each company must identify the hazards and corrective actions on its own. There are seven HACCP principles that outline a HACCP plan (United States Department of Agriculture, Guidebook). The seven principles are:
1.   Conduct a hazard analysis
2.   Identify critical control points
3.   Establish critical limits for each critical control point
4.   Establish monitoring procedures
5.   Establish corrective actions
6.   Establish recordkeeping procedures
7.   Establish verification procedures

BACKGROUND

48 million Americans are sickened each year from contaminated food, resulting in 128,000 hospitalizations and 3,000 deaths (Center for Disease Control, 2011). Of the 9.4 million illnesses caused by known agents, Centers for Disease Control data suggests that over 2 million cases are associated with meat and poultry consumption (The Pew, 2014). *Salmonella* and Norovirus are the top two pathogens contributing to domestically acquired foodborne illnesses.

108 years after the passage of the FMIA, FSIS continues to amend its inspection systems and regulations to safeguard meat and poultry products for consumers. Responding to the Executive Order 13563 to improve regulation and regulatory review, FSIS is amending the poultry products inspection regulations to establish a new inspection system for young chicken and all turkey slaughter establishments (USDA, Modernization).

Over the past 15 years, the USDA's FSIS has sought to modernize poultry inspection in the United States. In October 1999, FSIS took the PR/HAACP system and began the HAACP Inspection Models Project (HIMP). This Project sought to determine whether new government slaughter inspection procedures along with the new plant responsibilities could improve food safety and increase consumer protection (USDA, Evaluation). Before continuing to examine HIMP, it is important to explain the current poultry inspections systems available to the industry.

Poultry companies now operate under one of four inspection systems: Streamline Inspection System (SIS) and the New Line Speed Inspection System (NELS) which can only be used for broilers and cornish game hens, New Turkey Inspection System (NTIS) that is only used for turkeys, and traditional poultry inspection.

Under traditional poultry inspection, federal food safety inspectors spent most of his or her time looking for visual defects that include broken bones and bruises that affect the visual appearance of the carcass, but not necessarily the safety of the carcass (USDA, Infographic). Traditional postmortem inspection procedures require a complete examination of each whole slaughtered bird carcass that is carried out by inspectors (National, 1987). Traditional inspection is used for turkeys when the NTIS is not applicable. For other classes of poultry, Traditional Inspection shall be used when neither the SIS nor the NELS Inspection System is used (USDA, Title 9). SIS, NELS and NTIS are modified versions of traditional poultry inspection.

NELS requires government inspectors to inspect the each bird carcass for condemnation. Establishment workers then only inspect the acceptable birds for trim certain minor defects (National, 1987). Eliminating the need for direct government participation in trimming each carcass reduces inspector time per carcass (National, 1987). NELS should only be used for broilers and cornish game hens if the operator requests the NELS Inspection System, and FSIS determines that the establishment has the intent and capability to operate at line speeds greater than 70 birds
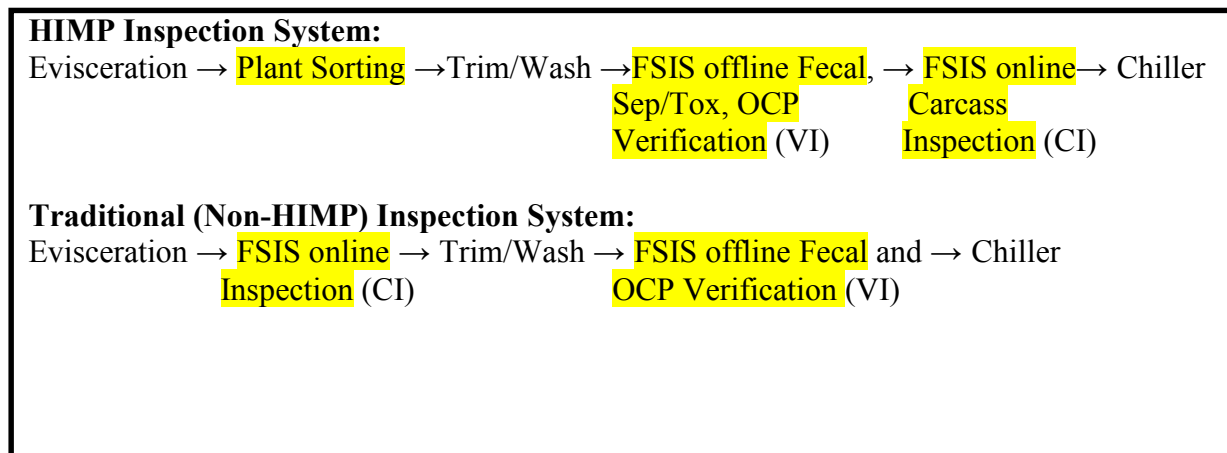
per minute, and meets all the facility requirements in § 381.36(d) (USDA, Title 9). A majority of establishments operating under the NELS system operate at about 90 birds per minute (BPM).

The SIS uses one or two inspectors depending on the size of the establishment. Under the SIS, each inspector examines the entirety of the bird including the outside and inside of the bird. An establishment employee will then identify defects that will need to be trimmed and removed by other play employees (National, 1987). Since establishment employees are responsible for re-moving defects, government inspectors can fully focus on detecting disease and abnormalities. SIS should only be used if the FSIS determines that SIS will increase inspector efficiency, or, the operator requests SIS and the FSIS determines that the system will result in no loss of inspection efficiency (USDA, Title 9). The maximum line speeds under SIS is about 35 BPM under one inspector, and 70 BPM under two inspectors (National, 1987).

Under the NTIS each inspector is paired with an establishment employee. The inspector exam-ines each carcass on the outside and inside of the bird. The inspector deems the carcass as con-demnable or acceptable. The establishment employee makes the carcasses for any defects that will need to be removed by either the establishment employee, or a plant trimmer that is location prior to reinspection (USDA, Title 9).

The four mentioned poultry inspection systems are considered to be traditional methods of be-cause each focuses on removing organoleptic defects from poultry carcasses. HIMP is a modern, science-based system that serves as the basis for the NPIS. It moves the industry from being re-active to proactive in an effort to minimize food safety hazards.

HIMP VERSUS (non-HIMP) TRADITIONAL SLAUGHTER ESTABLISHMENTS

HIMP Inspection System:
Evisceration → Plant Sorting →Trim/Wash →FSIS offline Fecal, → FSIS online→ Chiller
Sep/Tox, OCP   Carcass
Verification (VI)   Inspection (CI)

Traditional (Non-HIMP) Inspection System:
Evisceration → FSIS online → Trim/Wash → FSIS offline Fecal and → Chiller
Inspection (CI)   OCP Verification (VI)

Source: United States Department of Agriculture: Food Safety Inspection Service. Evaluation of HACCP Inspection Models Project (HIMP). August, 2011.

As previously mentioned in a traditional system, federal food safety inspectors spent most of their time looking for obvious organoleptic defects. The modern system uses science-based methods to detect invisible contaminants such as *Salmonella* and *Campylobacter* out of commerce (USDA, Poultry Inspection). The difference between HIMP plants and traditional slaughter plants is that under HIMP, slaughterhouse employees sort carcasses on the slaughter line before they reach USDA inspectors (USDA, Evaluation). One online carcass inspector (CI) and one offline verification inspector (VI) are assigned to a line. Under the HIMP system, the CI inspects carcasses prior to the chiller to ensure the safety of each product. In a traditional inspection system, CI inspects every carcass directly after the separation of the viscera from the interior of the carcass (USDA, Modernization).

Why is this change of shifting CI'S from the beginning of the slaughter line to the end of the slaughter line important? Under the HIMP system, the CIs will now be able to conduct a more efficient and effective online carcass inspection than online inspectors do under the current inspection systems. Since the CIs are presented with carcasses that have already been sorted, washed and trimmed by establishment employees, the carcasses are much more likely to pass inspection by the CI. Under HIMP, the carcass sorting occurs at the beginning of the line system. This is where, as previously mentioned, the carcasses will be sorted, washed, and trimmed by establishment employees, so that when they reach the CI or carcass online inspector, the carcasses will most likely pass inspection. This allows the CI to verify that the establishment employees are effectively sorting carcasses and that the establishment is compliant with preventing insanitary conditions. The figure below compares the HIMP inspection system to the traditional inspection system.

The VI, under the NPIS, will ensure that proper food safety inspection activities are conducted by the establishment. Under previous inspection systems, one VI covered multiple evisceration lines. Under NPIS, one VI will be assigned to each evisceration line. VIs will be able to complete a higher number of offline inspection tasks (USDA, Slaughter). More specifically, VIs will conduct carcass verification checks on carcass samples collected. This ensures that the establishment is effectively sorting carcasses and most importantly, to confirm that that the establishment is complying with the USDA's zero visible fecal tolerance as well as other performance standards (USDA, Modernization). In addition, the VIs will also verify compliance of sanitation standard operating procedures (SOPs), sanitation performance standards (SPS), and HACCP regulatory requirements. The overall goal is to ensure that the establishment is meeting regulatory requirements and is effectively preventing contamination by enteric[2] pathogens and fecal material throughout the entire slaughter and dressing process (USDA, Modernization).

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[2] Enteric: Of, relating to, or affecting the intestines. Source: Merriam-Webster, http://www.merriam-webster.com/dictionary/enteric

HIMP SYSTEM EVALUATION

An evaluation about HIMP establishments versus non-HIMP establishments was published in 2011. As of 2011, there are 20 young chicken; 5 young turkey and 5 market hog slaughter establishments that participate under the HIMP system. The report evaluated the findings of young chicken slaughter establishments across the United States[3] under the HIMP program, and compared them with established HIMP performance standards, or with two comparison sets: the first set is 64 non-HIMP establishments with operating characteristics similar to HIMP establishments; the second set is all (176) non-HIMP establishments that operated during the 5 years of the study (USDA, Evaluation).The 64 non-HIMP comparison establishments have an average line speed of 115 bpm, while the average line speeds at the 20 young chicken HIMP establishments have an average line speed of 131 bpm (USDA, Evaluation).

RESULTS OF HIMP VERSUS NON-HIMP ESTABLISHMENTS

The evaluation noted the importance of assessing whether the FSIS inspectors in HIMP young chicken slaughter establishments can make the proper determination as to whether a product can 'bear the mark of inspection' (USDA, Poultry). Data showed that the CI found 125 carcasses affected with septicemia/Toxemia and 26,815 carcasses with visible fecal contamination proving that the CI in HIMP establishment can effectively identify contaminated carcasses (USDA, Evaluation).

FSIS off-line VI checks showed that fewer than 8 per 1 million carcasses processed in HIMP establishments have septicemia/toxemia. Furthermore, fewer than 8 per ten thousand carcasses processed in HIMP establishments have visible fecal contamination (USDA, Evaluation). These outcomes are lower than baseline non-HIMP establishments.

In HIMP establishments, fewer inspectors conduct online carcass inspection. Many may see this as a negative result of HIMP slaughterhouse procedures, but in fact, this allows for FSIS inspectors to conduct more offline food safety related inspections. According to the study, in HIMP establishments, FSIS inspectors perform 1.6 times more of the 11 offline verification inspection requirements (USDA, Evaluation).

Under non-HIMP inspection systems, establishment employees cannot proactively dispose of adulterated carcasses, but under HIMP, employees are able to dispose of carcasses before they reach the FSIS online inspector at the end of the line. Not only does this relieve the FSIS inspector of removing carcasses at the end of the line to focus on other inspection requirements, but it allows for establishment employees to proactively sort adulterated carcasses from entering the line with healthy carcasses. Data showed that rates of septicemia/toxemia and visible fecal contamination were below levels set by the HIMP performance standards; thus shifting the role of

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[3] Geographic distribution of establishments were found in: Alabama, Arkansas, Georgia, North Carolina, South Carolina, Mississippi, Tennessee, West Virginia. Source: Evaluation, 2011, http://www.fsis.usda.gov/shared/PDF/Evaluation_HACCP_HIMP.pdf

carcass sorting to the establishment will continue to be more effective for removing contaminated carcasses from the processing line (USDA, Modernization).

As previously mentioned, in a traditional system, FSIS inspectors spent most of their time looking for organoleptic defects such as bruises or broken bones that affect the appearance of the product, but not usually the safety. Since FSIS inspectors will conduct offline science-based methods to detect pathogens such as *Salmonella* and *Camplyobacter*, it is estimated that up to 5,000 illnesses will be prevented annually (USDA, Poultry).

FSIS inspectors must perform eight inspection procedures to comply with sanitation standard operating procedures. The evaluation found that in CY2010, FSIS inspectors performed about 2.8 more offline procedures in HIMP establishments than non-HIMP establishments (USDA, Evaluation).

In HIMP establishments, off-line verification checks for fecal contamination occur four times more frequently than traditional inspection procedures. Additionally, the visible fecal material found on carcasses in HIMP establishments is half of that found in non-HIMP establishments (USDA, Evaluation). It has been proven that fecal contamination of carcasses is the primary catalyst for contamination by pathogens and therefore, pathogen prevalence in HIMP plants should be lower than non-HIMP plants.

THE NEW POULTRY INSPECTION SYSTEM (NPIS)
The NPIS offers establishments a fifth option by which this science-based system was developed under a 15-year pilot proving that it is the best inspection system for ensuring food safety thus far (USDA, Slaughter).

As previously mentioned, CIs that previously assisted companies sort carcasses in traditional systems will be stationed at the end of the processing line prior to the chilling stage, and after plant employees have sorted the carcasses (USDA, Poultry). Each inspection line will now have one off-line inspector to conduct food safety verification activities. Food safety activities include: microbial testing, examining plant and equipment sanitation, checking plant records, and observing companies' employees and equipment at work to asses overall process control (USDA, Poultry).

A crucial requirement under NPIS will require all poultry companies to prevent *Salmonella* and *Camplyobacter* contamination rather than addressing contamination after it occurs (USDA, Slaughter). All facilities will be required to perform its own microbiological testing at two points in the production process. This will show that the establishment's procedures for preventing contamination from *Salmonella* and *Camplyobacter* are effective (USDA, Slaughter).

Young chicken and turkey slaughter establishments will initially have until February 23, 2015 to notify the plant's district office as to whether it chooses to enact the NPIS, or keep its current inspection system (USDA, Modernization). However, any young chicken and turkey slaughter establishments will still be able to notify FSIS of their intent to change to the NPIS after February 2015 should they decide to switch to the new inspection system. The initial implementation wave will include establishments that notified FSIS prior to February 23, 2015 (USDA, Modernization). FSIS will use a computerized ranking system to identify the schedule for NPIS implementation in establishments. The ranking system will consider factors including past performance, FSIS staffing needs, the location of establishment in relation to other federally-inspected establishments.

According to the Federal Register notice there are four key elements of the NPIS: 1) Establishment personnel are now required to remove unacceptable parts and carcasses before the birds are presented to the FSIS carcass inspector; 2) FSIS agency resources will shift to conduct more offline inspection activities resulting in one offline verification inspector per line per shirt reducing the number of online inspectors to one; 3) authorize young chicken slaughter establishments to operate at a maximum line speed of 140 BPM; and 4) replace the Finished Product Standards (FPS), that apply to establishments that continue to operate under Streamline Inspection System (SIS), New Line Speed Inspection System (NELS), and New Turkey Inspection System (NTIS) with a requirement that establishments that operate under the NPIS maintain records to document that products resulting from their slaughter operations meet the definition of ready-to-cook (RTC) poultry (USDA, Modernization).

Key Element One: *Establishment personnel are now required to remove unacceptable parts and carcasses before the birds are presented to the FSIS carcass inspector.*
Sorting activities will be carried out by the establishment personnel instead of FSIS inspectors. The online inspectors who previously helped companies sort poultry carcasses based mostly on organoleptic factors will be stationed at the end of the slaughter process after the plant employees have conducted sorting procedures. Sorting procedures will be verified by FSIS inspectors (USDA, Slaughter).

Key Element Two: *FSIS agency resources will shift to conduct more offline inspection activities resulting in one offline verification inspector per line per shirt reducing the number of online inspectors to one.*
Although NPIS is reducing the number of inspectors, it does not jeopardize the safety of meat and poultry processed in the United States. The online CIs and offline VIs will work collaboratively to not only ensure that proper online inspection of carcasses identifies unacceptable carcasses, but to conduct carcass verification checks on carcass samples collected.

Key Element Three: *Replacing the Finished Product Standards (FPS), which will apply to establishments that continue operating under SIS, NELS, and NTIS, with a requirement that*

establishments that operate under the NPIS maintain records to document that the products re-sulting from their slaughter operations meet the definition of ready-to-cook (RTC)poultry[4].
Prior to NPIS, establishments did not have to include time and temperature of the product in its HACCP or SSOP plans. However, with NPIS, establishments now have to document that the product meets RTC poultry standards.

Key Element Four: *Authorize young chicken slaughter establishments to operate at a maximum line speed of 140 BPM.*
Line speeds are determined by a variety of conditions including the establishments equipment, facilities, bird size, flock conditions, and its ability to maintain process control when operating at a given line speed. Line speed under current inspection systems is 140 bpm for young chickens (Modernization, USDA). Although HIMP establishments are authorized to operate at 175 bpm, young chicken HIMP establishments operate at line speeds of 131 bpm (Modernization, USDA). It should be noted that FSIS originally proposed to increase line speeds from 140 BPM to 175 bpm, however, due to consumer and industry concerns, FSIS has since rescinded that proposal as of August 2014.

CONCLUSION

NPIS is a way for FSIS to streamline poultry inspection in the United States in an effort to facili-tate pathogen reduction in chicken and other poultry products. It allows FSIS to improve the ef-fectiveness of poultry slaughter inspection; efficiently use the Agency's personnel resources; and, remove burdensome regulations in poultry slaughterhouses across the United States. It in-creases the monitoring of establishments by the industry and allows FSIS to streamline its over-sight and verification activities. The favorable results of the evaluation have a positive impact on the industry.

In fact, NPIS provides establishments more control over the slaughter process. Establishments can reconfigure and consolidate lines based on space, operating speeds, and output. There is more flexibility to develop and establish new technologies for evisceration and sorting (USDA, Modernization). The establishment does, however, need to work with FSIS to accommodate FSIS inspection methodologies (USDA, Modernization).

The data from the Agency's Hazard Analysis and Critical Control Point Systems (HACCP)-Based Inspection Models Project (HIMP) evaluation was used to inform FSIS for the NPIS. It

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[4] Ready-to-cook poultry at 9 CFR 381.1 is defined as any slaughtered poultry free from protruding pinfeathers and vestigial feathers (hair or down), from which the head, feet, crop, oil gland, trachea, esophagus, entrails, and lungs have been removed, and from which the mature reproductive organs and kidneys may have been removed, and with or without the giblets, and which is suitable for cooking without need of further processing. Ready-to-cook poultry also means any cut-up or disjointed portion of poultry or other parts of poultry, such as reproductive organs, head, or feet that are suitable for cooking without need of further processing. Source: USDA, Mod-ernization. http://www.gpo.gov/fdsys/pkg/FR-2011-11-03/html/2011-28525.htm

supported the notion for increased offline inspection activities by FSIS personnel who can use their resources to perform activities directly related to food safety. This in turn leads to a reduction in pathogens and a greater compliance with HACCP regulations.

The data found in the HIMP establishment evaluation confirms equal or lower *Salmonella* positive rates than in non-HIMP establishments. Carcass inspection is conducted much more efficiently under HIMP than under the non-HIMP inspection systems because establishment personnel have already sorted (i.e. removed from the evisceration line), trimmed, and reprocessed the carcasses, thereby removing most visible defects, before the online carcass inspector appraises them (USDA, Evaluation).

Even though NPIS is optional, some components of the modernization system are mandatory for poultry establishments, however. For example, there is new pathogen control and testing requirements on all poultry facilities regardless of the system they choose to operate under (Poultry, USDA). Additionally, all poultry facilities will be required to document actions for controlling *Salmonella* and *Campylobacter* among other food safety hazards (Poultry, USDA). Not only is the NPIS scientifically proven to reduce food-borne pathogens it is a voluntary system providing the industry a fifth inspection system to continue detect and control pathogens.

CITATIONS

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