Master of Public Health

Integrative Learning Experience Report

FOOD SAFETY AWARENESS AND FOOD SECURITY CHALLENGES AMONG HOSPITAL LABORATORY EMPLOYEES, AND A COMPARATIVE REVIEW OF U.S. AND EU HISTAMINE REGULATIONS IN SEAFOOD

by

Kelli Shoemaker, MT (ASCP)

MPH Candidate

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Graduate Committee:
Dr. Justin Kastner
Dr. Ellyn Mulcahy
Dr. Abbey Nutsch

Public Health Agency Site:
Irwin Army Community Hospital (IACH)
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Supplementary field experience work with the international MObility of VEterinary Students & Food Biotechnologists (iMOVES&FB) program, University of Padova, Italy (June 2026)

Site Preceptor:
Jeongwon Suk, 1LT, MLS (ASCP)^{CM}, MBA – IACH Laboratory Manager

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Manhattan, Kansas

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Abstract

This Applied Practical Experience (APE) examined food safety and food security knowledge and awareness among military and civilian laboratory employees at Irwin Army Community Hospital (IACH), Fort Riley, KS, and compared histamine regulations for the United States (U.S.) and the European Union (EU). This APE sought to increase resiliency and readiness among staff through targeted education on basic food safety guidelines and food security resources, and to better understand the differences between U.S. and EU histamine rules. The investigator explored the consequences of unsafe practices and poor access to nutritious food, which can lead to sickness and absenteeism, decreasing resiliency and readiness.

Activities conducted at IACH included a food safety questionnaire and food security assessment; this tested personnel knowledge on both topics and assessed their individual or family food security. A PowerPoint presentation was subsequently delivered to educate personnel on food safety and food security topics. This presentation included government and local food security resources available to both civilians and the military and addressed the stigmas associated with assistance programs. A handout containing food safety information and food security resources was given to all personnel. During the APE, the investigator created a process flow diagram comparing U.S. and EU regulatory policies regarding histamine levels in fish and fishery products and included histamine information within the PowerPoint presentation.

The significance of this work lies in its contribution to department readiness and resiliency. Of the 30 eligible participants, 19 completed the questionnaire and food security survey. Survey results identified knowledge gaps related to food storage temperatures, food labeling, refrigerator organization, and safe thawing practices. In addition, results identified that 26% of participants had low or very low food security, and 68% did not know whom to contact for food assistance. By presenting this information in an engaging format and providing resources for food-insecure individuals, personnel were empowered with the knowledge to use safer food practices and attain nutritious food. The APE ultimately showed that basic food safety and food security program knowledge was lacking among personnel. These findings support the value of targeted educational programs to improve food safety awareness, increase knowledge of food assistance resources, and strengthen workforce readiness and resiliency.

Subject Keywords: Food safety, preventive controls, hazard analysis, good manufacturing practices, food security, communication, systems thinking

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Chapter 1 - Literature Review

1.1 History of Food Safety

Food safety is a core public health concern because contaminated foods can cause illness, hospitalization, and death. The Centers for Disease Control and Prevention (CDC) estimates that each year in the United States, foodborne illness sickens 48 million people, hospitalizes 128,000, and kills 3,000 (Centers for Disease Control and Prevention, 2026). Alongside unintentional contamination, intentional deception for profit has plagued (and still plagues) food systems; from the atrocities of the 19th-century meat packing industry (exposed by Upton Sinclair's *The Jungle*) to 20th-century food ingredient hazards, too often profit and poor safety standards have compromised health (Food Safety and Inspection Service, 2026b). Today, the U.S. Food and Drug Administration (FDA) is rightfully concerned about economically motivated adulteration (EMA)—intentionally leaving out, substituting, or adding ingredients to make a product appear more valuable (U.S. Food and Drug Administration, 2026). Although food safety incidents and food fraud differ in intent, both can undermine consumer trust and create serious health risks when adulterants introduce toxins, allergens, or pathogens.

In the mid-19th century, farming and ranching were central to the U.S. economy, with roughly half of all workers employed in agriculture. Despite their importance, farmers had limited access to scientific information about diseases, soil conditions, seeds, or weather patterns (Hurt, 1994). President Abraham Lincoln, who grew up in a farming family, recognized the need for federal support to strengthen agricultural productivity and rural livelihoods. In response, Congress established the Department of Agriculture, which President Lincoln signed into law in May 1862 (U.S. Department of Agriculture, 2026).

During this same period, food adulteration was widespread because no national standards existed to regulate food purity or safety. In 1883, Harvey W. Wiley, M.D., was appointed chief chemist at the USDA and made it his goal to raise public awareness of food adulteration and to campaign for the establishment of the Pure Food and Drugs Act and food-processing standards (Food Safety and Inspection Service, 2026b). In the 1880's, regulations requiring quarantining imported livestock were transferred from the Treasury Department to the USDA Bureau of Animal Industry, and the Interstate Commerce Act was established (Food Safety and Inspection Service, 2026b). In 1906, a novel called *The Jungle* was published, causing an uproar among the

public as it depicted in detail the filthy conditions in the stockyards and meat-packing plants. This led to the passage of the Pure Food and Drugs Act and the Federal Meat Inspection Act (FMIA) in 1906, which required the USDA to perform meat inspections before slaughter and after slaughter (Food Safety and Inspection Service, 2026b). The Federal Poultry Inspection Act (FPIA) was passed in 1957 and followed the FMIA inspection requirements for importation and plant inspections but also required that products be accurately labeled and plants to be sanitary. This law was mainly focused on preventing adulteration and misbranding (Food Safety and Inspection Service, 2026b). This was shortly followed by the Humane Methods of Slaughter Act and the Egg Products Inspection Act (Food Safety and Inspection Service, 2026a). The FPIA was updated, and a new law called the Federal Poultry Products Inspection Act (FPPIA) was introduced in 1967. This law included prohibited acts, criminal penalties, administrative detention, seizure and condemnation, as well as import controls. It also provided a mechanism for federal-state cooperation and allowed the USDA FSIS to require states to use the federal guidelines when their own programs fell below the federal standard (Food Safety and Inspection Service, 2023).

Within the U.S., Hazard Analysis and Critical Control Points (HACCP), a guideline that focuses on preventing contamination rather than relying on post-production testing, was developed by NASA in the 1960s; this was not required by food processors/manufacturers until the USDA adopted the regulation in 1996, except in seafood, where HACCP became a regulation requirement in late 1995. Originally, HACCP was applied to only meat, poultry, and seafood, but it has since been updated to include numerous other animal and produce products (Weinroth et al., 2018). The introduction of HACCP, along with the Codex Alimentarius by the World Health Organization (WHO) and the Food and Agriculture Organization of the United Nations (FAO), aligned food safety regulations and trade requirements across international borders and ensured fair trade practices (United States Department of Agriculture, 2026a). In 2011, the Food Safety Modernization Act (FSMA) was signed into law, requiring HACCP in food safety management and emphasizing the importance of preventive controls. With the implementation of the FSMA in the U.S. in 2011, foodborne illnesses dropped by 20% (Weinroth et al., 2018). The FSMA is updated continuously as new information or safety measures are introduced. Prior to a final rule being published, stakeholders can comment and provide feedback (Grover et al., 2016).

Outbreaks and intoxication incidents from the mid-1800s to the present have helped shape modern hazard-specific controls, including monitoring for bacterial contamination and chemical hazards such as histamine. Histamine control in fish and fishery products illustrates how food safety systems differ across regulatory frameworks, particularly between the United States and the European Union.

1.2 Comparison of U.S. and EU Histamine Testing Guidelines in Scombrotoxin-producing Fish and Fishery Products

Histamine, also known as scombrotoxin, forms when gram-negative bacteria grow and produce the enzyme histidine decarboxylase, which converts the naturally occurring histidine in certain fish into histamine. This is more commonly caused by temperature abuse and spoilage. Once histamine is produced, it cannot be inactivated by heating (cooking) or freezing. Increased histamine levels can trigger an anaphylactic-like reaction in individuals who consume the fish. After harvest, fish should be rapidly cooled to freezing to reduce the risk of further histamine formation (U.S. Food and Drug Administration, 2022).

The U.S. and the EU both have guidelines/regulations on the allowable amount of histamine in fish, but there are some major differences. The U.S. histamine limits are guidance, not a law, and are therefore nonbinding and unenforceable. Instead, histamine is controlled through Current Good Manufacturing Practices (CGMPs) (21 CFR part 117, subpart B) and the Seafood HACCP (21 CFR 123), which are legally required. Companies must comply with the Fish and Fishery Products Hazards and Controls guidance for testing and histamine ppm limits (U.S. Food and Drug Administration, 2022). If histamine is detected at ≥200 ppm, then the lot is considered chemically adulterated under the FD&C Act and cannot be placed on the market. If histamine is found at 35 ppm but <200 ppm, the lot shows signs of decomposition and mishandling but is not considered adulterated and can still be placed on the market (U.S. Food and Drug Administration, 2024). The FDA may, in the case of decomposition and mishandling, request an inspection of the facility, audit the CGMPs and HACCP records, and require corrective actions, but does not seize the product or declare it adulterated. Companies follow the U.S. guidance because the FDA can impose penalties and fines for noncompliance with the required seafood HACCP guidance (U.S. Food and Drug Administration, 2022). So, while U.S. companies are legally required to control histamine through HACCP, they are not legally

required to meet FDA's specific histamine ppm limit because FDA's histamine levels are guidance, not regulation.

The regulation of histamine is mandatory in the EU. Limits on histamine are legally binding and enforceable under Regulation (EC) No 2073/2005 – Microbiological Criteria for Foodstuffs. Histamine is considered a process hygiene indicator, not a contaminant. The regulation includes a mandatory ppm limit and a sampling plan (European Commission, 2005). Companies must sample nine specimens from each lot. No more than two specimens may be between 100 ppm and 200 ppm, and no sample may exceed 200 ppm. If the set limits are exceeded, then the entire lot is rejected and cannot be placed on the market (European Commission, 2005). Companies must comply with the regulations or risk punitive action.

1.3 History of Food Security Within the U.S.

In the early 20th century, industry and urbanization brought more individuals and families to cities. Previously, farming was one of the primary jobs for most Americans, and most families grew their own food and used the proceeds from their harvests to purchase goods and services. Neighbors and small local communities worked together to support families or individuals who may have fallen on hard times or had needs they were unable to meet. With the move to a more urban setting, individuals relied more on a steady income to purchase food and provide for their families, and lacked community support when times got tough. This lack of food security became especially prevalent during the Great Depression (Social Security Administration, n.d.). The Great Depression led the government to provide states with loans and grants to fund direct relief and work relief for needy individuals/families. This further led to special federal emergency relief and public works programs. In 1935, President Franklin D. Roosevelt signed the Social Security Act into law. This act established additional grants that enabled states to expand and strengthen maternal and child health and welfare services, which eventually became the Aid to Families With Dependent Children program (Social Security Administration, n.d.).

The first food stamp program was established in 1939 amid widespread unemployment and ended in 1943. In 1961, a pilot food stamp program was enacted. This program required individuals to purchase stamps that could then be used to purchase consumables (Food and Nutrition Administration, 2025). They would receive bonus stamps on top of their purchased stamps for free, representing the actual nutritional assistance the government believed they

needed but could not afford. The pilot program lasted through 1964 and had spread to areas in 22 states. The food stamp program became permanent with the passage of the Food Stamp Act in 1964, and states were required to develop a plan of operation and eligibility standards (Food and Nutrition Administration, 2025). Numerous Food and Agricultural Acts have been passed since the Food Stamp Act was introduced in 1964. All of these have led to changes within the program. In 2008, the program was renamed the Supplemental Nutrition Assistance Program (SNAP) to help de-stigmatize the use of food stamps (Food and Nutrition Administration, 2025).

With the introduction of food stamps, policymakers recognized an additional nutritional need among low-income pregnant women and preschool children. A pilot program was established in 1972 and named the Special Supplemental Food Program for Women, Infants, and Children (WIC). WIC became a permanent program through legislation in 1975. The program was eventually expanded to include postpartum women up to 6 months after delivery and children up to age 5 (U.S. Department of Agriculture, 2026b).

The definition and understanding of food security have evolved throughout the years. This is especially evident in the literature and in legislative changes. Food security is more than just simply having food. It includes access, availability, affordability, nutrition, and stability (Anthem, 2025). SNAP and WIC remain core federal nutrition assistance programs for individuals and families. Free school meals for qualifying low-income children give access to nutritious meals year-round. Community food banks and nutrition programs are available for individuals in need.

Federal and local food assistance programs are critical, as food insecurity affects health outcomes, increasing the risk of chronic diseases and stress, and, particularly in children, impairing brain development and concentration (Anthem, 2025). This is why food security remains an important issue for public health education and prevention, especially when individuals may not recognize that they are food insecure or have limited awareness of which programs are available to them.

1.4 An Investigative Focus on Food Safety and Security among Hospital Laboratorians: Motivation, Purpose, Location, and Questions

The military is a strategic force that protects United States citizens and our allies. Irwin Army Community Hospital (IACH), a military base hospital at Fort Riley, Kansas, was chosen

as the site for the investigator's Applied Practical Experience (APE). The investigator focused on food safety and security knowledge and education for laboratory personnel within the hospital, as IACH currently employs the investigator as the laboratory's microbiology supervisor. Active-duty soldiers in the department are primarily lower-enlisted members of the military, earning between $30,000 and $45,000 (Defense Finance and Accounting Service, 2025). Civilian laboratory workers' annual salaries begin at $35,000 and increase depending on position within the department, education level, and years of service (U.S. Office of Personnel Management, 2026).

Resiliency, a core component of military readiness, is especially important for military members and their families. A lack of food safety knowledge can cause soldiers and their dependents to become ill, undermining their readiness for deployment. Increasing this knowledge in areas where individuals lack increases resiliency within the units. Food security also affects readiness. A soldier who is not getting enough nutritional food can fail physical fitness requirements, experience negative health outcomes and increased stress, leading to being marked as undeployable. This also applies to their civilian counterparts, as adverse health outcomes from inadequate food safety or security can lead to missed work time, staffing shortages, and reduced overall laboratory capabilities, delaying results that may be needed for deployment or prompt treatment. The investigator was motivated by all of these issues.

The purpose of the investigator's APE was to evaluate basic knowledge of food safety and food security among laboratory personnel. This information would then be used to create and give a presentation to educate personnel on food safety practices, explain what food security is, and provide resources to individuals who may be experiencing food insecurity. This gain in knowledge would then increase resiliency and readiness within the laboratory department. Under the guidance of First Lieutenant (1LT) Jeonwong Suk, the investigator pursued three analytical questions. These include the following:

1. What food safety topics were most frequently misunderstood by laboratory personnel?
2. What level of food security or food insecurity existed among participating laboratory personnel as measured by the USDA U.S. Adult Food Security Survey Model?

3. How can targeted educational interventions help address identified deficiencies in food safety knowledge and food security awareness among laboratory staff?

Chapter 2 - Learning Objectives and Project Description

2.1 Objectives

- **Objective 1 –** Develop and administer a questionnaire to assess laboratory personnel's knowledge of food safety practices and awareness of food security concepts and resources.
- **Objective 2 –** Analyze questionnaire and food security survey data to identify knowledge gaps and inform the development of an audience-appropriate educational presentation and handout.
- **Objective 3 –** Gain multidisciplinary breadth in the following areas: food safety, food security, One Health, readiness, and resilience in the military.
- **Objective 4 –** Grow in writing skills
- **Objective 5 –** Grow in international and global awareness

2.2 Project Description



Figure 1: Irwin Army Community Hospital

The investigator began the Applied Practical Experience (APE) in January 2026 at Irwin Army Community Hospital (IACH), where the investigator works in the Pathology (laboratory) Department under the supervision of preceptor 1LT Jeongwon Suk, Laboratory Manager. Between January and April 2026, the investigator collaborated with 1LT Suk. The investigator consulted their major professor, Dr. Justin Kastner, via email to develop a questionnaire assessing laboratory personnel's knowledge of food safety and food security. The project also incorporated the USDA U.S. Adult Food Security Survey Model to evaluate participants' food security status. Participation in both assessments was anonymous and voluntary.

The questionnaire was finalized in April 2026, and the investigator collaborated with Dr. Kastner to secure IRB approval for the survey administration. Once the IRB approved the study, the questionnaire was distributed to laboratory personnel. Participants were informed that completion was voluntary and that completed surveys could be returned to the investigator. Of



Figure 2: Food Safety and Food Security Presentation

the 30 eligible individuals, 19 completed both the food safety questionnaire and food security survey.

After data collection, responses were compiled and analyzed to identify where food safety knowledge was limited or commonly misunderstood. The food security surveys were scored according to the USDA U.S. Adult Food Security Survey Model scoring guideline to determine the level of food insecurity among participants. Findings from both assessments were summarized and presented in a PowerPoint presentation delivered to the workplace community of IACH in early June 2026. During the presentation, participants were encouraged to ask questions and engage in discussions regarding food safety and food security concepts. Educational explanations were provided to reinforce correct information and address misconceptions identified through survey results. A pamphlet on food safety and food security resources was provided to all personnel.

This project provided valuable insight into gaps in food safety knowledge among adults and highlighted the ongoing challenges of food insecurity and limited awareness of available resources within the community.

During the APE, the investigator also examined how histamine regulation differs between the U.S. and the EU. Part of this research included participation in the international MObility of VEterinary Students & Food Biotechnologists (iMOVES&FB) program hosted by the University of Padova, located in northeast Italy. During this program, the investigator participated in two days of integrated online learning, which was presented on the Zoom platform by college professors and public health professionals. In late June 2026, the investigator then traveled with other students to Padova and other locations in northeast Italy for in-person classes and field excursions. During the iMOVES&FB in-person experience, the investigator visited the Fiorital headquarters in Venice, Italy. Fiorital is a seafood packaging, processing, and wholesale international trade company. They specialize in local and international procurement of fresh fish. These fish then become a part of four separate product lines (Fresh, Frozen, DYP®, and packaged ‘Ready to’) and are shipped to EU vendors and international locations (Fiorital, n.d.). During the tour, the investigator observed histamine testing on recently received fresh tuna. As explained on-site by Professor Valerio Giaccone, every tuna received is tested for histamine levels. Visual

examination of fish for parasites was also performed. In compliance with EU policy, food businesses must ensure that fish products have been visually inspected for parasites (European Commission, 2011). The knowledge gained during the trip was helpful in the investigator's understanding of EU histamine policy and was used to create a process flow diagram (portfolio product 4; see chapter 3 and appendix 3) comparing EU and U.S. histamine policy.

2.3 Methods

To create multiple portfolio products, the investigator used a number of methods during the APE. These included the following:

1. Consult food safety and security literature to create a questionnaire on knowledge of food safety and food security topics that may be misunderstood or unknown.
2. Synthesize survey results and relevant food safety guidelines to create a presentation and pamphlet handout on food safety and food security.
3. Use creative software (Canva) to create a process flow diagram.

These methods complemented other workflows in which the investigator was involved. For example, the APE required both organizational and relational skillsets as well as, in the case of the iMOVES&FB program, pre-travel planning and logistics.

Chapter 3 - Products and Results

3.1 Applied Practical Experience Products

This APE yielded three portfolio products to advance laboratorians' understanding of food safety and food security, and a fourth portfolio product to deepen understanding of differences in histamine regulation between the U.S. and the EU. These products appear in Appendix 3.

Product 1 – Food Safety and Security Questionnaire with data compilation

This questionnaire was developed using USDA, CDC, and other resources. Basic food safety practices and knowledge of food security were used to create questions designed to test the laboratorians' preconceptions and knowledge. The Economic Research Service, part of the USDA, provided a food security survey that was incorporated into the questionnaire and helped the investigator understand the prevalence of food insecurity among the questionnaire participants. This data was then compiled and used to create a PowerPoint presentation to educate laboratorians on food safety and food security.

Product 2 – Food Safety and Food Security PowerPoint Presentation

A PowerPoint presentation on basic food safety practices and food security knowledge was created and presented to the laboratory staff and hospital community on June 2, 2026. This presentation included audience engagement and training on proper food safety and security practices. Government and local food security programs were included, as well as contact information for when help was needed. Each section of the presentation (food safety practices and food security) ended with a key-point summary, and the audience was given the chance to ask questions.

Product 3 – Food Safety and Food Security Pamphlet

A pamphlet with food safety information and food security resources was created and presented to the laboratory staff and hospital community after the presentation. This pamphlet included topics in food safety that respondents frequently misunderstood or for which knowledge was limited. Food security was also addressed by providing resources available to military and

civilians and reiterating that requiring food assistance is not a weakness, nor does it mean you're lazy, but is a sign of strength, as every person deserves access to nutritious food.

Product 4 – Histamine Regulation (EU versus U.S. Policy) Process Flow Diagram

Histamine regulations in the EU and the U.S. were investigated through literature and regulatory reviews. The investigator then used Canva to create a visual illustration in the form of a process flow diagram. The creation of the process flow diagram ensured a greater understanding of histamine regulations and how they differ between the EU and the U.S.

3.2 Findings from Analytical Questions

Question 1: What food safety and food security topics were most frequently misunderstood by laboratory personnel?

The proper storage temperature for refrigerated and frozen foods was frequently misunderstood. Most individuals did not know what the appropriate temperatures for the refrigerator and freezer should be to prevent bacterial proliferation and food spoilage. Food labels, such as Best-by or Use-by, showed confusion among the participants. Individuals considered the dates to be expiration dates, requiring disposal after the listed date. Participants were also unaware of the proper placement of food in the refrigerator. Every respondent identified the door shelves for items such as eggs, butter, and milk. The most shocking misunderstanding about food safety was about thawing frozen meat. Sixty-three percent of answers were incorrect, meaning a majority of respondents are thawing their meat in an unsafe manner.

Question 2: What level of food security or food insecurity existed among participating laboratory personnel as measured by the USDA U.S. Adult Food Security Survey Model?

Twenty-six percent of participants had a low or very low food security status based on the USDA U.S. Adult Food Security Survey Model scoring system. Sixty-eight percent of respondents did not know whom to contact for assistance with food or other necessities. The investigator's findings correspond with other studies that point to "[a]n estimated 24% of our

nation's active-duty service members and their families are food insecure" (Feeding Missouri, n.d.). The level of food security among laboratorians was in line with the estimation of food security among active-duty service members.

Question 3: How can targeted educational interventions help address identified deficiencies in food safety knowledge and food security awareness among laboratory staff?

The questionnaire results enabled the identification and targeted addressing of specific gaps in food safety and food security knowledge. The PowerPoint presentation focused on topics most frequently misunderstood by participants, including proper refrigerator and freezer temperatures, safe methods for thawing frozen meat, interpretation of food date labels, and correct food storage practices. The presentation also provided information regarding food security, including available federal, military, and community resources for individuals experiencing food insecurity. By tailoring the educational content to deficiencies identified through the questionnaire and food security survey, the intervention provided participants with practical information directly relevant to their needs. Providing a pamphlet with educational information on identified food safety deficiencies and resources for food security gave personnel a take-home resource they could refer to in their households. This targeted approach increased awareness of safe food-handling practices, corrected common misconceptions, and improved knowledge of resources available to individuals and families experiencing food insecurity.

Chapter 4 - Discussion

4.1 Interpretation of Results of the APE

By sampling the knowledge of the investigation participants, the investigator was able to pinpoint what gaps may exist in food safety and food security awareness. This was then used to tailor the presentation to those knowledge gaps, as well as provide a refresher course on food safety and resources for food security. It also allowed the investigator to dispel some of the stigma associated with the use of food security programs.

The findings of the investigator's APE show that workplace-based educational programs can possibly be an effective method for addressing both food safety knowledge gaps and food security awareness among workplace personnel, but there would need to be a larger, more diverse group of participants, as well as a post-intervention assessment conducted in order to generalize the findings to other groups, such as military populations or the general public.

4.2 Limitations of the APE

This APE did have limitations. The sample size was small, as only 19 laboratory personnel completed the questionnaire and food security survey. This limits the ability to generalize the findings to the general public or other healthcare and military populations. The project was also conducted within a single department at Irwin Army Community Hospital. Since participants came from one workplace and share similar professional backgrounds, the results may not be representative of other populations or settings.

The questionnaire and food security survey relied on participant self-reporting. Responses may have been influenced by recall bias, misunderstanding of questions, or a desire to provide socially acceptable answers. Participation was voluntary, which may have introduced selection bias. Individuals with a greater interest in food safety, nutrition, or public health topics may have been more likely to participate than those with less interest.

A follow-up questionnaire or post-test was not administered to measure any changes in knowledge or awareness after the presentation. Therefore, the effectiveness of the presentation in improving food safety or food security knowledge could not be objectively evaluated. The survey was also conducted over a limited period of time (May-June). Long-term retention of the information presented, and any behavioral changes could not be assessed.

4.3 Future Directions for Food Safety and Security

Food safety is an ever-evolving entity. With the internet, countries can be notified of any outbreaks or issues in a supply chain almost immediately. Technology has advanced rapidly, allowing testing for chemicals and drugs that previously could not be assessed. As climates change, communities have to adapt what products they grow and produce. This change in climate also may cause species of fish, mammals, etc. to shift migration patterns, habitats, or die. This may decrease the availability of food in certain regions due to declining crop yields (Centers for Disease Control and Prevention, 2024). Parasites, bacteria, fungi, and insects can adapt or mutate to make pesticides, antifungals, antibacterials, and antiparasitic treatments ineffective. Limitations on the amount of a chemical within a food may need to change as more research is obtained on levels that may be harmful to humans. Therefore, control measures may need to be modified or new measures enacted to protect the food supply (Duchenne-Moutien & Neetoo, 2021). The key point is that countries throughout the world must continue to work together to keep the food supply chain safe.

Food security is an especially poignant subject within the U.S., as there have recently been a number of changes to federal food assistance programs. These changes have resulted in a large number of individuals being removed from these programs (Food and Nutrition Administration, 2026). This is potentially leading towards a more food-insecure population, which could increase healthcare costs and mental health problems. This also affects education, as a child that does not receive nutritious food will have decreased brain development, overall health, and productivity at school. Unfortunately, this is a topic that will require further research on the effects of the changes in federal food assistance programs. Hopefully, researchers will be able to use that data to institute any changes that can positively impact food security within the U.S.

4.4 Noteworthy Coursework and Experiential Learning

The MPH coursework directly supported the products the investigator produced during the APE by furnishing them with the analytical, communication, and assessment skills required to complete the project tasks. Through MPH 754, MPH 701, DMP 815, and DMP 888, the investigator gained experience reviewing and paraphrasing peer-reviewed literature, identifying bias, calculating statistics, and evaluating the reliability of investigation results. MPH 818, MPH

720, and DMP 710 provided the investigator with the resources needed to interact with stakeholders, assess community factors, and prepare a plan to address identified deficiencies. Food safety and security topics were supported by FDSCI 600, FDSCI 730, and FDSCI 731, as well as the elective FDSCI 690, where the investigator learned about hazard analysis and critical control points (HACCP), which are key food safety requirements for food producers, manufacturers, and retailers. MPH 802, DMP 816, and DMP 844 increased the investigator's knowledge of global environmental factors that may impact food systems, as well as trade requirements and agreements between countries, which the investigator used to research histamine regulations. Together, these classes led to a greater understanding of public health issues, evaluations, literature reviews, and investigations used to improve food safety outcomes, and they directly supported the creation of the APE deliverables included in the appendix.

Experiential learning during the investigator's time as a graduate student at Kansas State improved knowledge and allowed the investigator to examine real-world scenarios. The investigator participated in four *Frontier* Field Trips (FFTs). Two FFTs took place in Council Grove, Kansas. These field trips were set as mysterious outbreaks where participants used clues provided by role-playing simulations to identify the causative organism and how the outbreak occurred. Participants worked in groups, met with current public/medical health professionals, and discussed key points that led to the identification of the outbreak source, as well as policies instituted after the outbreak to prevent this event from occurring again. This extracurricular experience assisted the investigator's understanding of outbreak response dynamics and impacts to public health.

The third FFT took place in California. This FFT explored the challenges in conservation management and public health responses to water and land contamination by the byproducts of manufacturing and agriculture. The FFT group first visited the Anza-Borrego Desert State Park and the nearby Salton Sea. Within the Anza-Borrego Desert State Park, students enjoyed a presentation by the Anza-Borrego Desert Research Center staff and talks on how animal health and welfare, such as the Desert Bighorn Sheep and Desert Great Tortoise, are monitored. Per UC Irvine Desert Reserves Director Kirsten Dutcher, the Anza-Borrego Desert has one of the lowest amounts of rainfall per year within the U.S.; therefore, conservationists must carefully monitor the desert climate to ensure that local wildlife and plants thrive and flourish for future generations. A local historian guided the group to the Salton Sea, where they learned from a park

ranger about its history and the decisions that influenced why the sea is receding and increasing in salinity. These decisions have led to an increase in respiratory issues within the local communities, as the dust left behind after the recession of the water is contaminated with chemicals from agricultural runoff and bacteria. Interestingly, the sea is also a vital food source for millions of migratory birds (Doede & DeGuzman, 2020). The salinification of the sea has caused fish die-offs, which directly impacts the birds and their habitats. The area surrounding the Salton Sea contains geothermal energy, which can be seen in some fields as mud pots. The extraction of this geothermal energy creates an abundance of hazardous waste in the form of brine. This brine contains silica and metals such as iron. Currently, there is no plan in place for extracting the silica and iron for use in other industries. This hazardous waste is disposed of in landfills (California Department of Toxic Substances Control, 2025).



Figure 3: The Salton Sea

The student group next visited a DDT dumping site and discussed the Superfund cleanup that the government instituted to reduce the pollution in the affected area. DDT was also discussed during the ferry ride to Catalina Island, as some of the barrels of DDT were dumped in the ocean and now contain holes allowing the DDT to continue to seep into the surrounding sea. This directly affected wildlife on Catalina Island, in particular Bald Eagles, causing a decrease in native populations. Catalina Island represents how, through conservation and wildlife management, a depleted population of native animals and plants can rebound and thrive, as there are 60 species of plants and animals that are found nowhere else in the world. Local conservancy employees are removing non-native plants and animals to allow the regrowth and revitalization of local flora and fauna, as well as protect habitat spaces (Catalina Island Conservancy, 2026). Overall, the California-based FFT emphasized the importance of biodiversity, a key pillar of environmental and public health.

A fourth FFT took the investigator and other students to multiple locations over 2 days. These included a visit to the Herington, Kansas Reservoir, where flooding used to be a common occurrence. Discussions included how critical infrastructure was engineered and implemented to limit downstream flooding, improving the landscape for families and farmers in future generations. Some historical and current farms were also visited, and students learned about

agricultural history as well as current regenerative agricultural practices and conservation. A lunch-and-learn was provided by the Agri Trails Coop, which researches how much and what kind of seeds to order, as well as total costs for farmers. They work directly with the farmers to ensure that the purchased product is the best fit for their farms and the local environment. Since this is a farmer-owned business, the farmers themselves have a stake in how well the coop performs. Success of the crops then leads to greater local support and strengthening of communities. The final stop was research at the Dwight D. Eisenhower Presidential Library. Students were able to request archived information from the library to help them with their studies or personal interest. The FFT group toured the climate-controlled archive and visited the museum before the completion of the field trip.

The investigator's final experiential learning trip occurred with the iMOVES&FB 2026 program, sponsored by the University of Padova in Padova, Italy. This trip introduced and provided further knowledge on EU policy and practices in relation to food safety as well as historical information relating to Italy and food safety. It also provided students the opportunity to interact with peers from other countries and develop a shared understanding of food safety topics and how they relate to each country and worldwide. During the program, the investigator attended lectures and participated in two necropsies and a toxicology class. The first necropsy had students determine the freshness of fish and identify whether Anisakis worms were present in freshly caught fish. The second necropsy involved deceased broiler chickens. Students performed dissections to determine a potential cause of death. The toxicology lab had students performing an ELISA test to identify increased levels of histamine between different samples. Histamine testing was also observed at Fiorital. These hands-on and lecture activities supported the investigator’s understanding of local public health programs and activities to mitigate potential zoonotic and chemical foodborne risks to the public. The investigator was also able to visit a local fish market and the Italian company Fiorital, which processes and ships fish products worldwide. This trip broadened the investigator's perspective and increased their knowledge of food safety issues regarding a range of products.



Figure 4: The investigator performs ELISA testing for Histamine.

All of these trips, along with coursework, culminated in a multidisciplinary education, fostering insight into disease investigation, food safety regulations, trade, and conservation. These experiences also reinforced concepts relating to the One Health framework as the areas everyone lives, works, and grows are directly related to the local environment and policies in place; these, in turn, affect the population's health and well-being.

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Appendix 1 - Synthesis and/or Integration of Competencies

Table A.1 Synthesis and Integration of Competencies

Competency	**Description of Synthesis and Integration**
Apply a systems thinking tool to visually represent a public health issue in a format other than standard narrative – Foundational Competency 22	During June 2026, the investigator produced a process flow diagram, using the program Canva, which visually demonstrated the difference in U.S. and EU histamine regulations. This systems thinking tool allowed the investigator to attain a better understanding of the differences in regulations between the U.S. and EU.
Propose strategies to identify relevant communities and individuals, and build coalitions and partnerships for influencing public health outcomes – Foundational Competency 13	During the APE, the investigator identified a workplace community with potential food safety and food security needs, consulted with key stakeholders to develop assessment tools, identify available assistance programs, and create an educational intervention designed to improve awareness and connect participants to resources. The developed strategies were then used to strengthen partnerships between the participants and community resources to improve public health outcomes.
Multidisciplinary Leadership – FSB Emphasis Area Competency 5	During the APE, the investigator exercised multidisciplinary leadership by collaborating with military, academic, workplace, and international food safety stakeholders to address food safety, food security, and regulatory issues. The investigator assessed the needs of military and civilian laboratorians, worked with the IACH preceptor and major professor to develop and interpret a questionnaire, and created educational products tailored to a non-academic workplace audience. Through the iMOVES&FB program, the investigator also compared U.S. and EU histamine policies and observed seafood safety practices in Italy. These activities required the investigator to contrast stakeholder needs, select appropriate methods of collaboration, and translate

	technical food safety and biosecurity information (drawn from multiple academic disciplines) into practical education and resources that supported readiness, resiliency, and public health.

During the investigator's APE, these two foundational competencies and one FSB emphasis area competency shaped the creation and delivery of the educational interventions provided to participants, as well as the products produced. The investigator utilized Foundational Competency 13 and FSB Competency 5 when collaborating with the investigator's military sponsor, 1LT Suk, and major professor, Dr. Kastner. The investigator used these competencies to identify questions about food safety and food security where participants might lack foundational knowledge and to develop a questionnaire to assess their awareness of basic food safety and food security. The returned questionnaires were then assessed and used to create a PowerPoint presentation on topics relating to food safety where individuals lacked knowledge, as well as a refresher on basic food safety practices. The food security questions were assessed, and information on food security was added to the PowerPoint slides; a pamphlet with food safety and food security information was also created and distributed after the presentation.

The investigator emphasized Foundational Competency 13 and FSB Competency 5 by presenting the PowerPoint presentation in person and educating participants on food safety and food security. During the presentation, the audience was encouraged to ask questions, and the investigator asked the audience questions to increase engagement. The investigator discussed the food safety and food security results during the presentation. Participants were alerted to resources available for individuals and families experiencing food insecurity and on reducing the stigma associated with utilizing these resources. A pamphlet with information on misunderstood and limited food safety knowledge, with additional information on food security resources, was handed out to personnel.

The investigator's study on differences in histamine regulations between the U.S. and EU, through literature and in-person demonstrations in Italy, demonstrated the use of Foundational Competency 22 and FSB Competency 5. The creation of a process flow diagram on the difference between U.S. and EU regulations was used to increase the investigator's knowledge and understanding of key differences, utilizing Foundational Competency 22.

The above competencies were integral in the creation of the investigator's food safety and food security presentation, as well as understanding of histamine regulations. The created products advanced knowledge and provided participants with resources that are available to increase the department's resiliency and readiness, which is integral to supporting military missions.

Appendix 2 - Demonstration of Competency Attainment

Table A.2 Attainment of Competencies

Practice-Based Products that Demonstrate Competency Attainment			
Specific Product		**Competency Addressed**	
1	Food Safety and Security Questionnaire with data compilation (IRB-13843: Committee on Research Involving Human Subjects; Submitted by Kelli Shoemaker and Dr. Justin Kastner 05/19/2026; Approved by IRB Committee 05/26/2026)	7	Create a questionnaire to assess basic knowledge of food safety and food security among laboratorians.
		13	Identify food security programs available to military and non-military populations and any barriers that may exist.
2	Food Safety and Food Security PowerPoint Presentation	13	Identify any misconceptions or gaps in knowledge on food safety and food security by compiling the data from the questionnaires.
		19	Present a PowerPoint presentation on food safety and security to laboratorians on relevant topics identified in the questionnaire as areas of knowledge gaps.
3	Food Safety and Food Security Pamphlet	19	Create and hand out a take-home pamphlet that addresses misconceptions or gaps in knowledge in food safety and resources for food security programs.
4	Histamine Regulation (EU versus U.S. Policy) Process Flow Diagram	21	Research EU histamine regulations and the differences between U.S. and EU policies.
		22	Create a process flow diagram visually showing the differences between EU and U.S. histamine regulations.

Foundational Competency 7 – Assess population needs, assets, and capacities that affect communities' health

During the APE, the investigator researched literature on recommended food safety practices and spoke with the military preceptor, 1LT Suk, and the major professor, Dr. Kastner. The knowledge gained from the research was used to develop a questionnaire to assess participant food safety and food security knowledge and screen for food insecurity. The

questionnaire was then handed out to participants, and the questionnaires returned to the investigator were assessed.

Foundational Competency 13 – Propose strategies to identify relevant communities and individuals, and build coalitions and partnerships for influencing public health outcomes

Data collected from questionnaire answers were used to identify any food safety and food security knowledge gaps within the military and civilian participants. Research on food security program availability was commenced, and government as well as local community programs available for food-insecure individuals and families were identified. The in-person presentation highlighted the resources and personnel available to help military and civilian community members facing food safety or food security challenges.

Foundational Competency 19 – Communicate audience-appropriate public health content, both in writing and through oral presentation, to a non-academic, non-peer audience with attention to factors such as literacy and health literacy.

The investigator used food safety and food security research obtained through a literature review and built on that information by generating results from a questionnaire; these were used to create a PowerPoint presentation for a non-academic audience. This presentation included basic food safety knowledge and areas identified within the questionnaire as gaps in food safety and food security education. The presentation was presented to personnel at IACH, and food safety and food security topics were discussed with an emphasis on identified gaps in knowledge and resources available for food-insecure individuals. Personnel were encouraged to ask questions and engage with the investigator. A pamphlet was distributed to personnel; this reiterated food safety topics that were most misunderstood or had gaps in knowledge and food security resources.

Foundational Competency 21 – Integrate perspectives from other sectors and/or professions to promote or advance population health.

In preparation for the trip to Italy, the iMOVES&FB program presented a lecture on regulations relating to fish and fishery products in the EU. One of the topics discussed was histamine. As histamine levels are a critical food safety marker for temperature abuse and

spoilage in fish and fishery products, the investigator was curious about the differences between U.S. and EU histamine regulations. Regulations were located through government websites, and a comparison of U.S. and EU regulations was completed. The investigator observed histamine testing in Italy during the iMOVES&FB program, further gaining perspective on the similarities and differences in regulations between the U.S. and EU. It also reinforced the investigator's understanding of why histamine regulations are important for consumers' food safety.

Foundational Competency 22 – Apply a systems thinking tool to visually represent a public health issue in a format other than standard narrative.

To better understand the differences between the U.S. and EU histamine regulations, the investigator chose to create a visual representation in the form of a process flow diagram. The creation of this systems thinking tool allowed the investigator to gain a greater understanding of the similarities and differences between U.S. and EU regulations.

Appendix 3 – Portfolio Products

Appendix 3 features the totality of portfolio products (listed below, and sequentially following) for Kelli Shoemaker's APE.

Product 1: Food Safety and Security Questionnaire with data compilation

Product 2: Food Safety and Food Security PowerPoint Presentation

Product 3: Food Safety and Food Security Pamphlet

Product 4: Histamine Regulation (EU versus U.S. Policy) Process Flow Diagram

Portfolio Product # 1

Kelli Shoemaker-APE/ILI Questionnaire.
MPH-Food Safety and Biosecurity
Kansas State University

Food Safety and Food Insecurity Questionnaire

Please answer the following questions without research (Google, etc.). This is just to get a rough idea of what knowledge you currently have about food safety and food insecurity.

Date: _____

Food Safety Questions

1. Can you tell me, in your own words, what the following statements or phrases mean on food packaging? Your best guess is fine if you are unsure.

    a. Best-by or Best Before

    b. Use-by

    c. Freeze-by

    d. Sell-by

2. What temperature should your home fridge and/or freezer be kept at to protect most foods from bacterial proliferation and/or spoilage?

3. Does your refrigerator and/or freezer have a thermometer that you use to monitor the internal temperatures?

4. What is the most important hygiene step to prevent foodborne illness?

5. Should you share cutting boards and utensils between raw meats and vegetables? Why or why not?

6. How do you clean your cutting boards after use? When should you replace your cutting boards?

7. How do you thaw your frozen meats? Examples: Microwave, refrigerator, running under warm water in the sink, etc.

8. Do you own a food thermometer?

9. Which of the following is useful in determining when a burger is done?

    a. Time on the grill

    b. Internal temperature

    c. Internal color

10. What bacteria and viruses have you heard of that cause foodborne illness? Can any of them proliferate at refrigerated temperatures?

11. Do you know the difference between foodborne infection and foodborne intoxication? If yes, please explain.

12. Pregnant women should not consume cold luncheon/deli meats. True or False

13. Place these food products in your refrigerator where you think they should be best stored for safety. Your choices for refrigerator placement are: top shelf (T), middle shelf (M), bottom shelf (B), drawers (D), and door shelves (S).

    a. Ready to eat items _____
    b. Leftovers _____
    c. Fruits _____
    d. Vegetables _____
    e. Dairy products _____
    f. Eggs _____
    g. Raw Meat and fish _____

Food Insecurity Questions

1. Do you know what food insecurity is? If so, please explain.

2. What government programs are available for individuals to apply for assistance if they are experiencing food insecurity?

    a) What local (non-governmental) programs or locations are available to apply to and/or receive assistance for individuals/families experiencing food insecurity?

3. Who can you reach out to if you need assistance with food or necessities and are unsure of how to receive that assistance?

The following questions are used to evaluate your household's food insecurity. There will be several statement questions. Please tell me if these statements are often true, sometimes true, or never true for you or your household within the last 12 months. Circle your answer.

1. "(I/We) worried whether (my/our) food would run out before (I/we) got money to buy more." Was that often true, sometimes true, or never true for (you/your household) in the last 12 months?
   Often true

   Sometimes true

   Never true

2. "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more." Was that often, sometimes, or never true for (you/your household) in the last 12 months?
   Often true

   Sometimes true

   Never true

3. "(I/we) could not afford to eat balanced meals." Was that often, sometimes, or never true for (you/your household) in the last 12 months?
   Often true

   Sometimes true

   Never true

Note: the following questions are yes-or-no. Please circle your response.

4. In the last 12 months, did (you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

   Yes

   No

   a. If you answered yes to question #4, please answer the following question. If you answered no, continue to question #5.

      How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

      Almost every month

      Some months but not every month

      Only 1 or 2 months

5. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?
   Yes

   No

6. In the last 12 months, were you ever hungry but didn't eat because there wasn't enough money for food?

   Yes

   No

7. In the last 12 months, did you lose weight because there wasn't enough money for food?

   Yes

   No

8. In the last 12 months, did (you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?

   Yes

   No

   a. If you answered yes to question #8, please answer the following question and circle your answer. If you answered no, then you are done with the survey.

      How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

      Almost every month

      Some months, but not every month

      Only 1 or 2 months

Thank you for taking the time to complete this survey. I appreciate your participation in my research as I work on completing my master's degree. Please return to Ms. Shoemaker.

KANSAS STATE UNIVERSITY | Office of Research Integrity, Compliance and Security

TO: Justin Kastner
Diagnostic Medicine/Pathobiology

Proposal Number: IRB-13843

FROM: Lisa Rubin, Chair
Committee on Research Involving Human Subjects

SUBJECT: Clearance for Non-Research Class Project

DATE: 05/26/2026

RE: "Survey of food safety and food insecurity knowledge amongst soldiers and civilians in the Fort Riley community."

The Office of Research Integrity, Compliance and Security (ORICS) has reviewed the proposal identified above and has determined that it is **Non-Research.** As described, the project does not meet the criteria in 45 CFR 46 for the definition of "research" involving human subjects, and therefore does not require review by the Committee for Research Involving Human Subjects (IRB). This letter constitutes clearance for your class project to proceed.

This clearance applies only to the project identified above. Be advised, this clearance does not authorize the "development or contributing to generalized knowledge" as stated in 45 CFR 46. Any changes or modifications made to the activity that would change the project's Non-Research status must be approved by the URCO prior to implementation and may disqualify the proposal from its Non-Research status.

The ORICS/IRB strongly suggests that all persons involved in the class project complete the IRB training at http://k-state.edu/research/comply/irb/training. After evaluating the individual projects, it is ultimately your responsibility to determine which students should complete the suggested training modules.

Adverse events involving participants should be reported immediately to the Office of Research Integrity, Compliance and Security. Feel free to contact our office if you have any questions.

Electronically signed by Lisa Rubin on 05/26/2026 12:29 PM ET

203 Fairchild Hall, 1601 Vattier St., Manhattan, KS 66506 | 785-532-3224 | fax: 785-532-3278 | comply@k-state.edu

APE Questionnaire Data Compilation:

Food Safety

Question #1

a. **Best by or best before: The product will be of the best quality or flavor by or before this date**

Best by or best before Answers	Total
Correct Answer	9
Partially Correct Answer	1
Incorrect Answer or Do not Know/Did not Answer	9

b. **Use-by: The last date recommended for the use of the product while at peak quality.**

Use-by Answers	Total
Correct Answer	0
Partially Correct Answer	3
Incorrect Answer or Do not Know/Did not Answer	16

c. **Freeze by: The last date to freeze a product (such as meat or poultry) to maintain its peak quality, flavor, and texture**.

Freeze by Answers	Total
Correct Answer	5
Partially Correct Answer	13
Incorrect Answer or Do not Know/Did not Answer	1

d. **Sell by: This tells the store how long to display the product for sale for inventory management.**

Sell by Answers	Total
Correct Answer	3
Partially Correct Answer	13
Incorrect Answer or Do not Know/Did not Answer	3

Question # 2.

a) **Refrigerator temperature (≤40°F (Ideal = 35-40°F); 4°C)**

Refrigerator Temperature Answers	Total
Correct Answer	7
Partially Correct Answer	5
Incorrect Answer or Do not Know/Did not Answer	7

b) **Freezer temperature (0°F, -18°C)**

Freezer Temperature Answers	Total
Correct Answer	4
Partially Correct Answer	0
Incorrect Answer or Do not Know/Did not Answer	15

Question # 3

Does your refrigerator and/or freezer have a thermometer that you use to monitor the internal temperatures?

Refrigerator and/or Freezer Thermometer Answers	Total
Yes, I have a thermometer	7
No, I do not have a thermometer	12
LCD on Front	2
Has but does not monitor	2

Question # 4

What is the most important hygiene step to prevent foodborne illness?

The most important hygiene step answer	Total
Hand washing (Correct)	16
Other (Incorrect)	3

Question # 5

Should you share cutting boards and utensils between raw meats and vegetables?

Should you share cutting boards between raw meats and vegetables? Answers	Total
No (Correct)	17
Yes (Incorrect) or any answer other than No.	2
Why or why not? Answers	
Could cause cross-contamination (Correct)	15
No answer; ok to share or nothing about causing cross-contamination (Incorrect)	4

Question # 6

How do you clean your cutting boards after use? Note: Several individuals said soap and water, but did not mention hot water (I did include them in the correct answers)—a handful mentioned using vinegar for cleaning.

How do you clean your cutting boards after use? Answers	Total
Hot soapy water/dishwasher/diluted bleach (Correct)	14
All other answers (Incorrect)	5

When should you replace your cutting boards? (A decent number of individuals mentioned replacing boards either every 6 months or a year. I did not consider those as correct answers.)

When should you replace your cutting boards? Answers	Total
When excessively worn, hard-to-clean grooves (Correct)	6
All other answers (Incorrect)	13

Question # 7

How do you thaw your frozen meats? Individuals who mentioned an incorrect answer along with a correct answer were marked as incorrect.

How do you thaw your frozen meats? Answers	Total
Refrigerator/Cold water/Microwave (Correct)	7
All other answers (Incorrect)	12

Question # 8

Do you own a food thermometer?

Do you own a food thermometer? Answers	Total
Yes	11
No	8

Question # 9

Which of the following is useful in determining when a burger is done?

Which of the following is useful in determining when a burger is done? Answers	Total
Time on the grill (Incorrect)	1
Internal temperature (Correct)	12
Internal color (Incorrect)	1
Choose 2 or more options (Incorrect)	5

Question # 10

What bacteria or viruses have you heard of that cause foodborne illness?

What bacteria or viruses have you heard of that cause foodborne illness? Answers	Total
Name 1 or more bacteria or viruses that cause foodborne illness (Correct)	18
Cannot name any viruses or bacteria (Incorrect)	1

Can any of them proliferate at refrigerated temperatures?

Can any of them proliferate at refrigerated temperatures? Answers	Total
Yes, and named 1 or more bacteria/viruses (Correct)	2
Yes, but did not name any bacteria/viruses (Correct)	2
Did not know/Did not answer/No (Incorrect)	15

Question # 11

Do you know the difference between foodborne infection and foodborne intoxication? If yes, please explain.

Do you know the difference between foodborne infection and foodborne intoxication? Answers	Total
Yes	5
No	14
Explanation for Yes answers	
Correct or mostly correct explanation	3
Incorrect explanation, or did not know	2

Question # 12

Pregnant women should not consume cold luncheon/deli meats.

Pregnant women should not consume cold luncheon/deli meats. Answers	Total
True (Correct)	13
False (Incorrect)	6

Question # 13

Place these food products where you think they should be best stored for safety.

Where should these food products be best stored for safety? Answers	Correct Answers	Incorrect Answers
Ready to Eat Items (T)	9	10
Leftovers (T)	9	10
Fruits (D)	14	5
Vegetables (D)	16	3
Dairy products (M)	10	9
Eggs (M)	9	10
Raw meat and fish (B)	14	5

T = Top shelf
M = Middle Shelf
B = Bottom Shelf
D = Drawers
S = Door shelves
Interestingly, several individuals put the door shelves where they would store their eggs, dairy products, and RTE foods.

Food Insecurity

Question #1

Do you know what food insecurity is? If so, please explain.

Do you know what food insecurity is? Answers	Total
Yes	10
No	9
Explanation for Yes answers	
Correct or mostly correct explanation	10
Incorrect explanation, or did not know	0

Question # 2

What government programs are available to apply for assistance if experiencing food insecurity?

What government programs are available to apply for food insecurity assistance? Answers	Total
Name 1 or more programs available for food-insecure individuals (Correct)	15
Cannot name any programs available for food-insecure individuals (Incorrect)	4

What local (non-government) programs or locations are available to apply to and receive assistance from for food-insecure individuals/families?

What local non-government programs are available to apply for food insecurity assistance? Answers	Total
Name 1 or more programs available for food-insecure individuals (Correct)	11
Cannot name any programs available for food-insecure individuals (Incorrect)	8

Question # 3

Who can you reach out to if you need assistance with food or other necessities and are unsure how to access them?

Who can you reach out to if you need assistance with food or other necessities and are unsure how to access them? Answers	Total

Name 1 or more individuals/people to reach out to (Correct)	6
Cannot name any individuals/people to reach out to (Incorrect)	13

Food Insecurity Assessment:

Responses of "yes," "often," "sometimes," "almost every month," and "some months but not every month" are coded as affirmative. The sum of affirmative responses to the 10 questions in the Adult Food Security Scale is the household's raw score on the scale. Food security status is assigned as follows:

- Raw score zero—High food security among adults
- Raw score 1-2—Marginal food security among adults
- Raw score 3-5—Low food security among adults
- Raw score 6-10—Very low food security among adults

Food Insecurity Score for Respondents:

Food Security Status	Respondents' Food Insecurity Score (19 respondents)
Raw score zero = High Food security	12
Raw score 1-2 = Marginal food security	2
Raw score 3-5 = Low food security	4
Raw score 6-10 = Very low food security	1

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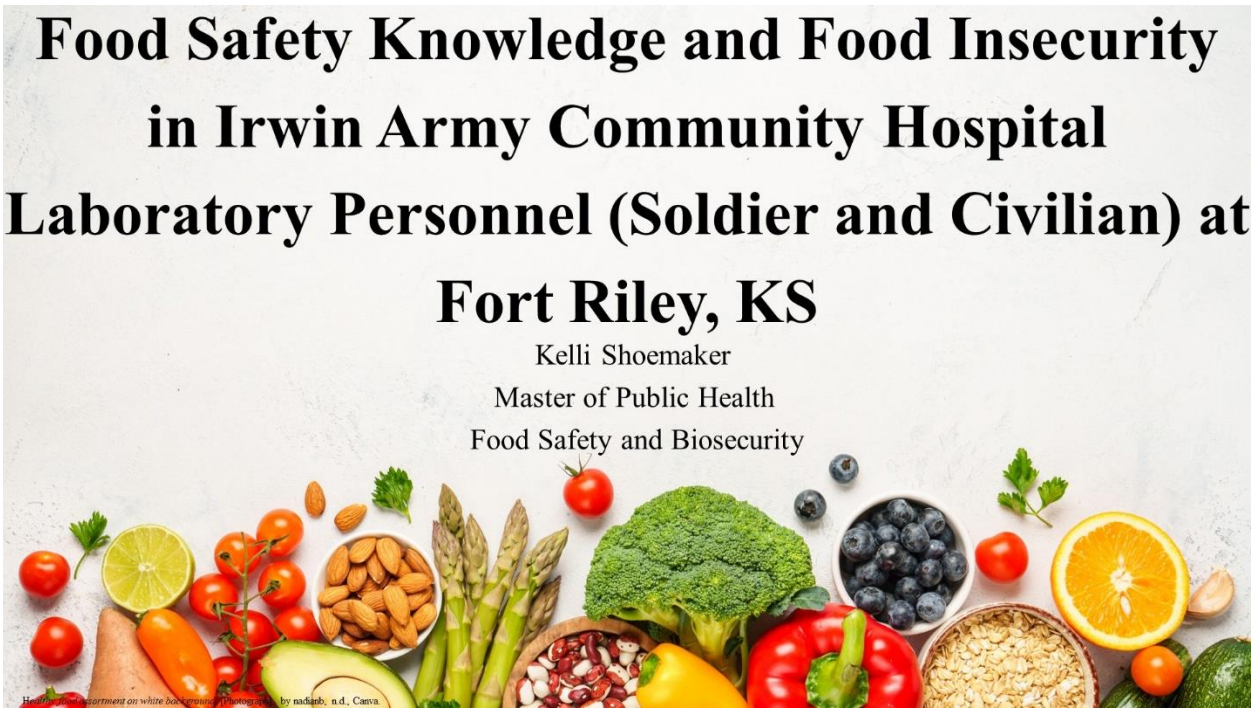
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Portfolio Product # 2:





Food packaging phrases, what do they mean?

Best by or Best before

This phrase means that the product will be of the best flavor or quality by the date listed. It does not mean that the product cannot be purchased or consumed after the date listed.

Use-by

The last date recommended of use of the product while at peak quality. This is not a discard date.
Note: This does not apply to infant formula. Discard formula after the use-by date.

Freeze-by

This is the date that food should be frozen to maintain peak quality

Sell-by

This date tells the supplier how long to display the product for sale for inventory management purposes

None of these packaging phrases are expiration dates, aside from infant formula. As long as there's no signs of spoilage, foods are still acceptable to consume after their best by, best before, use-by, freeze-by and sell-by dates.

(Food Safety and Inspection Service, 2025)

What kind of cutting board do you use?

Which type is better?

Plastic



Colorful plastic cutting boards in store [Photograph], by sergeyryzhov, n.d., Canva.

Glass



Murrey Home glass cutting board for kitchen counter. From 8 best tempered glass cutting boards, reviewed & tested by experts!, by Cooking Panda, 2026.

Wood



Colorful cutting board with fresh ingredients. [Photograph], by oliveira, L., n.d., Pexels.

The correct answer is.....



Happy family cooking together on home kitchen [Photograph], by deniskomarov, n.d., Canva.

Whether you choose wood, a porous surface, or a non-porous surface such as plastic, glass, marble, or pyroceramic is a personal choice, and neither is better than the other.

(Food Safety and Inspection Service, 2024a)

Clean your cutting boards after each use!

Methods include:

1. Wash in hot water with soap. Rinse with clear water, then air-dry or pat dry with clean paper towels.
2. Use the dishwasher. Nonporous plastic or glass boards, as well as solid wood boards, can be cleaned in the dishwasher.
3. You may also sanitize your board with a solution of 1 tablespoon of unscented chlorine bleach to 1 gallon of water. Flood the surface of your board with the diluted bleach solution and allow it to sit for a few minutes. Rinse the board with clean water and dry it.

Replace your cutting boards when they become excessively worn or develop deep grooves.

So why is it important that we don't use a cutting board to dice our vegetables or fruits that we just used to cut up raw meat?

Cross-contamination!!!!!!!!!

Meats are generally cooked at higher temperatures than produce. If the meat you just cut up on the cutting board is contaminated with *Salmonella* spp., *E. coli* O157:H7, *Campylobacter* spp., etc., then you've just covered your produce with those bacteria, and the produce will likely not be cooked to high enough temperatures to kill the organism. You're welcoming food-borne illness into your mouth and gut. Hello gastroenteritis!

(Food Safety and Inspection Service, 2024a)

What are the safest methods to thaw your frozen meats and produce?

1. Thaw in the refrigerator. Note: most foods require 1-2 days to thaw completely, and large meat items such as turkey, ham, etc. may take longer. It is best to plan thawing 1 day for every 5 lbs. of weight.

2. Thaw in a cold-water bath. Place food into a leak-proof bag and immerse in cold water. Change the water every 30 minutes. Once thawed, cook immediately.

3. Defrost using the microwave. Once meat is defrosted, cook immediately, as it may have already warmed enough to begin cooking in certain areas.

Note: Frozen meat and poultry may be cooked immediately while still frozen. You should adjust the cooking time to add 50% more time than the instructions/recipe state for thawed meat and poultry.

Never leave your food on the counter to thaw!

(Food Safety and Inspection Service, 2013)

What is the minimal internal temperature that you should cook your food to?

Safe Minimum Internal Temperature Chart	
As measured with a food thermometer	
Food	**°F (°C)**
Beef, Pork, Veal, and Lamb (roast, steaks, and chops)	145 °F (62.8 °C) with a 3-minute "rest time" after removal from the heat source
Ground Meats	160 °F (71.1 °C)
Poultry (whole, parts, or ground)	165 °F (73.9 °C)
Eggs and egg dishes	160 °F (71.1 °C) Cook eggs until both the yolk and the white are firm. Scrambled eggs should not be runny.
Leftovers	165 °F (73.9 °C)
Fin Fish	145 °F (62.8 °C)

Figure 1. *Safe minimum internal temperature chart.* From *Kitchen companion: Your safe food handbook* (p. 19), by U.S. Department of Agriculture, Food Safety and Inspection Service, 2020.

Internal color of the meat and cooking time are not safe indicators of whether your meat product is cooked properly! Food thermometers are a must for every household.

(Food Safety and Inspection Service, 2024b)

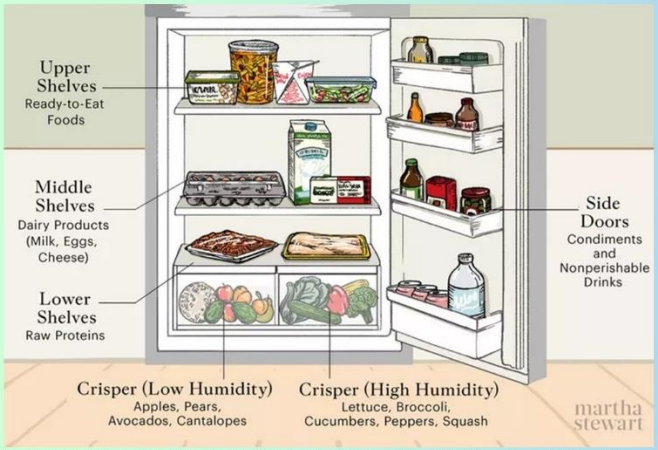


Meat thermometer in turkey [Photograph], by SimplyCreativePhotography, n.d., Canva.



Grilled sausages on barbecue with digital meat thermometer showing temperature. [Photograph], by dmitrynaumov, n.d., Canva.

Storage practices for foods



Your Section-by-Section Guide to Storing Foods in the Fridge, From the Upper Shelves to the Crisper Drawers [Photograph], by Canaan, G., n.d., Martha Stewart.

Refrigerator temperature

≤40°F (Ideal = 35-40°F); 4°C

Freezer Temperature

0°F; -18°C

(U.S. Department of Agriculture, Food Safety and Inspection Service, 2020)



Fridge refrigerator freezer thermometer (3 pack) [Photograph], by Amazon.com, n.d.



2 pack refrigerator freezer thermometer large dial analog thermometer [Photograph], by Amazon.com, n.d.

Food Infection versus Food Intoxication

What's the difference?

Food Infection

Bacteria or viruses multiply within the digestive tract after consumption. Symptoms arise due to your immune system responding to the foreign invader.

Cooking food to recommended temperatures can kill the bacteria/virus and prevent infection.

Symptoms, such as, diarrhea (bloody in some cases), stomach cramps, vomiting, and fever appear anywhere from 6 hours to 10 days after infection.

Common Bacteria/Viruses associated with Food Infection:

Salmonella species
Campylobacter species
Shigella species
STEC
Listeria monocytogenes
Norovirus

Food Intoxication

Bacteria have already multiplied in the food and released toxins into it.

These toxins are not destroyed by cooking/baking

Symptoms, such as nausea, vomiting, stomach cramps, and diarrhea appear rapidly, sometimes within 30 minutes after consumption.

Bacteria associated with Food Intoxication:

Staphylococcus spp.
Bacillus cereus
Clostridium perfringens
Enterobacterales (Histamine)
*Clostridium botulinum**

***Affects the nervous system and requires treatment to prevent death**

(Harrigan & Park, 1991)

Let's talk about *Listeria monocytogenes*

Should pregnant women consume cold luncheon/deli meats?

NO!

Listeria can spread in food processing facilities and be hard to remove, causing foods to become contaminated. *Listeria* can grow/proliferate in the refrigerator.

The good news is *Listeria* can be killed by heating foods to 165°F or until steaming.

Listeria infection during pregnancy can lead to:
Miscarriage
Stillbirth
Premature delivery
Infection of the newborn
1 in 4 pregnant women who become infected with *Listeria* lose their pregnancy or baby shortly after birth.

Foods associated with *Listeria* infections:
Soft cheeses and raw milk, yogurt, or ice cream
Luncheon/deli meats
Hotdogs
Premade deli salads
Refrigerated smoked fish, pate, or meat spreads
Sprouts
Cut melons

(CDC, 2024a)

Histamine (Scombroid) Poisoning

This is one of the most common fish-associated food poisonings



Fresh tuna steaks. [Photograph], by Patryk_Kosmider, n.d., Canva.

Symptoms can start within a few minutes to an hour after consumption and include:
Flushing of the face
Headache
Heart palpitations
Blurred vision
Stomach cramps and diarrhea
Swelling of the tongue and throat
Difficulty breathing



Canned sardines. [Photograph], by nito100, n.d., Canva.

Histamine poisoning is caused by improper refrigeration.
Cooking, smoking, and freezing the fish do not prevent this poisoning.

(CDC, 2023)

What Are the 3 Most Common Causes of Foodborne Intoxication and Infection?

1. Temperature

Follow food safety guidelines for refrigeration/freezer storage and cook foods to appropriate temperatures.

Improper food storage is the most common cause of foodborne intoxication.

2. Hand Hygiene

Wash your hands prior to handling food and after handling raw meat.

The fecal-oral route of transmission is one of the most common causes of foodborne infection.

3. Cross-Contamination

Using the same cutting board or counter to prepare produce that was just used to cut raw meat, poultry, or seafood without cleaning/sanitizing the cutting board or knife prior to preparing the produce.

(CDC, 2026)

Food Safety Review Key Points

- ✓ Wash your hands with soap and hot water before cooking, during cooking, and after cooking.
- ✓ Use separate cutting boards for raw meat and other food items. If unable, wash/sanitize your cutting board with hot, soapy water after using it for raw meat and before preparing vegetables or fruits.
- ✓ Keep food stored at proper temperatures and thaw meat appropriately to minimize the risk of bacterial proliferation
- ✓ Cook meats to the recommended time and temperatures to kill bacteria/viruses.

Use a food thermometer!

What is Food Security?

Food security exists when all people at all times have physical and economic access to sufficient food to meet their dietary needs for a productive and healthy life.

AVAILABILITY of quantities of food of appropriate quality, supplied to domestic production or imports;
ACCESS by households and individuals to adequate resources to acquire appropriate food for a nutritious diet; and
UTILIZATION of food through adequate diet, water, sanitation, and healthcare.

(U.S. Department of Agriculture, U.S. Department of State, & U.S. Agency for International Development, 1996)



Black woman with insecurities. [Photograph], by SeventyFour, n.d., Canva.



An apple on a dry cracked earth soil. [Photograph], by Kevin, J., n.d., Canva.

Factors that can cause food insecurity include:

1. Income
2. High cost of living
3. Community
4. Chronic health conditions
5. Systemic barriers

The Social Determinants of Health



Figure 2. The five social determinants of health. Adapted from *Social determinants of health*, by Centers for Disease Control and Prevention, 2024 (https://www.cdc.gov/public-health-gateway/php/about/social-determinants-of-health.html).

(CDC, 2024b)

Effects of Food Insecurity

1. Physical Health
2. Mental Health
3. Well-being
4. School and work

(Feeding America, 2026)

Food Insecurity Survey Results

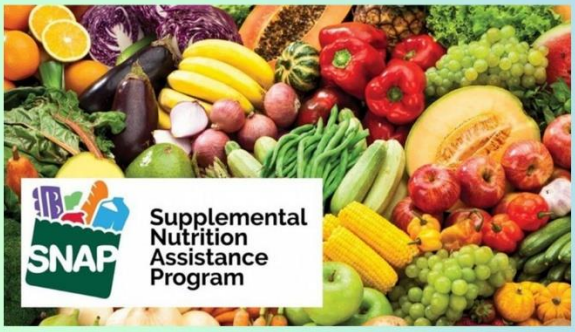
- 26% of laboratory respondents to the survey have either low food security or very low food security
- 68% of respondents did not know whom to contact for food assistance or other necessities when unsure how to access assistance.



Figure 3. Image illustrating food insecurity among active-duty military families. From Hunger beyond the headlines: Food insecurity among military families, by Feeding Missouri, n.d. (https://feedingmissouri.org/hunger-beyond-the-headlines-food-insecurity-among-military-families).

- 78.9% of respondents were able to name at least 1 government program available to food-insecure individuals.
- 57.9% of respondents were able to name at least one non-government, local program available to food-insecure individuals.

Government Programs Available for Food-Insecure Individuals and Families



Supplemental Nutrition Assistance Program (SNAP). [Photograph]. by QuickTaxUS, n.d.



WIC nutrition. [Photograph]. by Lawrence-Douglas County Public Health, n.d.

Junction City KS, DCF Offices | DCFOffices.org

Manhattan KS, DCF Offices | DCFOffices.org

Women, Infants, and Children (WIC) Nutrition Services | Riley County Official Website

Geary County Public Health Department | Geary County, KS

Local Food Banks for Food-Insecure Individuals and Families

Riley County and Fort Riley Residents

Flint Hills
BREADBASKET
A NON-PROFIT FOOD PANTRY

Flint Hills Breadbasket [Logo]. by Flint Hills Breadbasket, n.d.

Geary County and Fort Riley Residents

GEARY COUNTY
FOOD PANTRY

Geary County Food Pantry [Logo]. by Geary County Food Pantry, n.d.

If you're unsure how to get assistance, who can you talk to for help?

- Military Leadership
- Chaplain
- Physician
- Local Health Department
- Trusted Friend or Family Member

Food insecurity can happen to anyone. Asking for help is not a weakness, and food assistance does not imply that you're lazy or unemployed. Note: In 2024, 83.7% of SNAP recipients were employed (U.S. Department of Agriculture, Food and Nutrition Service, 2025).

https://www.militaryonesource.mil/resources/millife-guides/food-security-resources-and-support-programs/

Food Insecurity Key Points

- ✓ Food insecurity can happen to anyone.
- ✓ A lack of nutritious, safe food affects overall health (mental and physical), well-being, and productivity at school or work.
- ✓ Help is available if you or your family are food insecure. Don't be afraid to reach out and ask for assistance.
- ✓ Government and local programs are available to assist individuals and families with procuring safe, nutritious food. *Note* These programs are generally income-based.
- ✓ Reaching out for help to nourish yourself and your loved ones—whether your children, spouse, or elderly parent—is a sign of strength, not weakness. Nutritious food is essential for brain development, overall health, and well-being, and every person deserves access to it.

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Thank you for your time

Any questions?

Kelli Shoemaker
Graduate Student, Master of Public Health
Food Safety and Biosecurity
Kansas State University

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Portfolio Product # 3

Increase your food safety knowledge

What do the following statements/phrases mean on food packaging?

Best-by or Best before

This phrase means that the product will be of the best flavor or quality by the date listed. It does not mean that the product cannot be purchased or consumed after the date listed.

Use-by

The last date recommended of use of the product while at peak quality. This is not a discard date. **Note: This does not apply to infant formula. Discard formula after the use-by date.**

Freeze-by

This is the date that food should be frozen to maintain peak quality

Sell-by

This date tells the supplier how long to display the product for sale for inventory management purposes



Minimum internal cooking temperatures for safe food consumption





Safe Minimum Internal Temperature Chart

As measured with a food thermometer

Food	°F (°C)
Beef, Pork, Veal, and Lamb (roast, steaks, and chops)	145 °F (62.8 °C) with a 3-minute "rest time" after removal from the heat source
Ground Meats	160 °F (71.1 °C)
Poultry (whole, parts, or ground)	165 °F (73.9 °C)
Eggs and egg dishes	160 °F (71.1 °C) Cook eggs until both the yolk and the white are firm. Scrambled eggs should not be runny.
Leftovers	165 °F (73.9 °C)
Fin Fish	145 °F (62.8 °C)

NOTE: The internal color of the meat and cooking time are not safe indicators of whether your meat product is cooked properly!

Food thermometers are a must for every household.

Storage practices for foods

Refrigerator temperature

≤40°F (Ideal = 35-40°F); 4°C

Freezer temperature

0°F; -18°C

Refrigerator Storage Guide

Upper Shelves
Ready to eat foods

Middle Shelves
Dairy Products (Milk, Eggs, Cheese)

Lower Shelves
Raw Proteins

Door Shelves
Condiments and Nonperishable drinks

Crisper Drawer (Low Humidity)
Apples, Pears, Avocados, Cantaloupe

Crisper Drawer (High Humidity)
Lettuce, Broccoli, Cucumbers, Peppers, Squash

What are the safest methods to thaw your frozen meat and produce?

1. Thaw in the refrigerator. Note: Most foods require 1-2 days to thaw completely, and large meat items such as turkey, ham, etc. may take longer. It is best to plan thawing 1 day for every 5 lbs. of weight

2. Thaw in a cold-water bath. Place food into a leak-proof bag and immerse in cold water. Change the water every 30 minutes. Once thawed, cook immediately.

3. Defrost using the microwave. Once meat is defrosted, cook immediately, as it may have already warmed enough to begin cooking in certain areas.

Never leave your food on the counter to thaw!

Do you struggle to afford food and sometimes worry about feeding yourself or family members?

If the answer to this question is yes, then you may have food insecurity.



https://www.militaryonesource.mil/resources/millife-guides/food-security-resources-and-support-programs/



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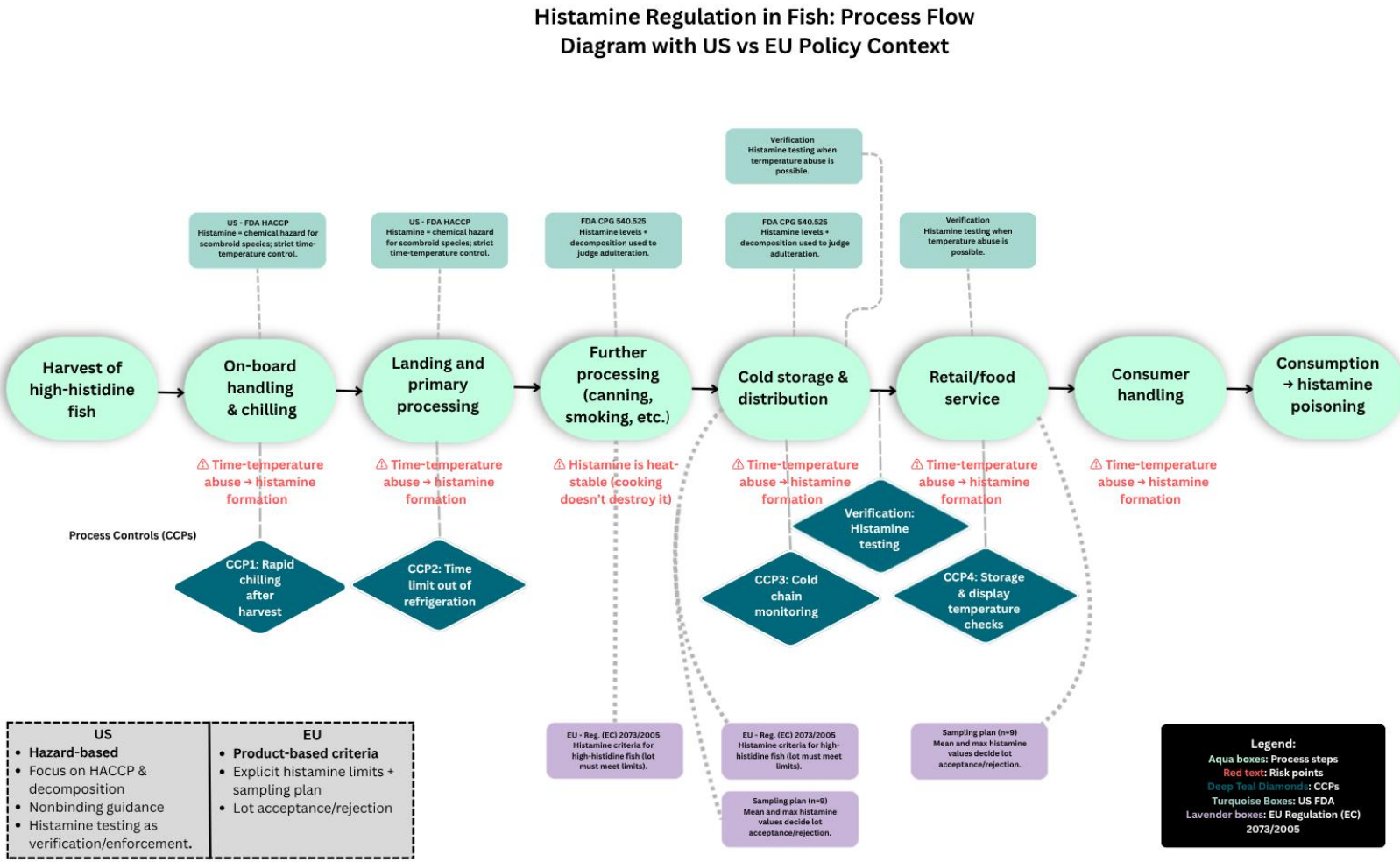
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