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Introduction to HACCP for Meat and Poultry Processors

The Hazard Analysis Critical Control Point (HACCP) concept is a systematic, science based process control system for food safety. This concept forms the basic structure of a preventative system for the safe production of meat products. Note that the key to this system is that it is a preventative approach to producing the safest possible meat products for human consumption. This means that potential biological, physical or chemical food safety hazards, whether they naturally occur in food, are contributed by the environment, or are generated by a deviation in the production process, are prevented, eliminated or reduced to produce safe meat products.

USDA FSIS Final Rule

On July 25, 1996, the United States Department of Agriculture Food Safety and Inspection Service (USDA FSIS) mandated requirements in efforts to reduce the occurrence and numbers of pathogens on meat and poultry products, reduce the incidence of foodborne illness associated with consuming these products, and provide a framework for modernization of the meat and poultry inspection system. The new regulations required establishment of four new programs, three as pathogen reduction measures and one for HACCP. The first program required that each

History of HACCP

HACCP began in 1959 when the Pillsbury Company cooperated with the U.S. Army Natick Laboratories, the National Aeronautics and Space Administration (NASA), and the U.S. Air Force Space Laboratory Project Group to ensure the safety of food to be used for the space program. They used a system of analysis that had been developed by Natick called the "Modes of Failure" which was adapted and has since evolved into the concept we now understand as HACCP. In 1971, HACCP was first presented to the public at the National Conference of Food Protection. Following the publication of a report in 1985 by the National Academy of Sciences, "An Evaluation of the Role of Microbiological Criteria for Foods and Food Ingredients", HACCP received more recognition by the industry as a food safety concept.

establishment develop and implement written sanitation standard operating procedures (SSOP's). Next, regular microbial testing for generic *E. coli* was required for slaughter establishments to verify the adequacy of a plants' process controls for the prevention and removal of fecal contamination and associated bacteria. All slaughter plants and plants that produced raw ground products were required to meet pathogen reduction performance standards for *Salmonella* for the third program. Lastly, all meat and poultry plants were directed to develop and implement HACCP programs.

USDA FSIS established dates for implementing these programs in plants. All inspected establishments implemented sanitation SOP's and

E. coli process control testing by January 27, 1997. In large establishments, defined as all establishments with 500 or more employees, HACCP programs were implemented by January 26, 1998. Smaller establishments, defined as all establishments with 10 or more employees but fewer than 500, had HACCP in place by January 25, 1999. In very small establishments, defined as all establishments with fewer than 10 employees or annual sales of less than \$2.5 million, HACCP was implemented by January 25, 2000. *Salmonella* Pathogen Reduction Performance Standards began simultaneously with applicability dates for HACCP implementation. Sanitation SOP's, and *E. coli* and *Salmonella* testing will not be described here.



Principles of HACCP

How can the HACCP concept be employed in a facility? First, it is important to become familiar with the seven principles of HACCP:

1. Conduct a hazard analysis. Using the flow diagram, which is a list of steps describing how a product is produced, identify where actual and potential hazards could occur.
2. Identify critical control points (CCPs). CCPs are points at which controls can be put in place to prevent, eliminate or reduce a food safety hazard.
3. Establish critical limits for preventative measures associated with each identified CCP.
4. Establish CCP monitoring requirements. Procedures should be established that use the results of monitoring to adjust the process and maintain control.
5. Establish corrective actions. Corrective actions are implemented when monitoring indicates that deviations have occurred.
6. Establish record-keeping procedures for each CCP.
7. Establish procedures to verify that the HACCP system is working correctly.

HACCP Implementation

These principles must be used to develop HACCP plans that address every product processed by a facility. A single HACCP plan may encompass multiple products within a single processing category provided that any required features of the plan that are unique to a specific product are clearly marked in the plan. Establishments may also develop a single HACCP plan for a single product that passes through multiple processing categories. FSIS specifically requires that establishments develop HACCP plans that fall into the following processing categories:

1. Slaughter-all species
2. Raw product-ground
Examples: ground pork, ground beef, ground poultry, fresh sausages, meat and poultry patties, whole hog sausage
3. Raw product-not ground
Examples: primal cuts, tenderized cuts with no microbial inhibitors (pork tenderloin with solution), boneless cuts, seasoned cuts and parts
4. Thermally processed-commercially sterile
Examples: canned products such as vienna sausage, meals ready to eat, canned lard, low acid canned foods, hermetically sealed products such as dinners or entrees
5. Not heat treated-shelf stable
Examples: dry cured pork, prosciutto, pickled pigs feet and ears, country hams, pepperoni, dry salami, summer sausage
6. Heat treated-shelf stable
Examples: meat and poultry jerky, popped pork skins, snack sticks, meat bases for soups
7. Fully cooked-not shelf stable
Examples: hams, hot dogs, wieners, cooked roast beef, cooked corned

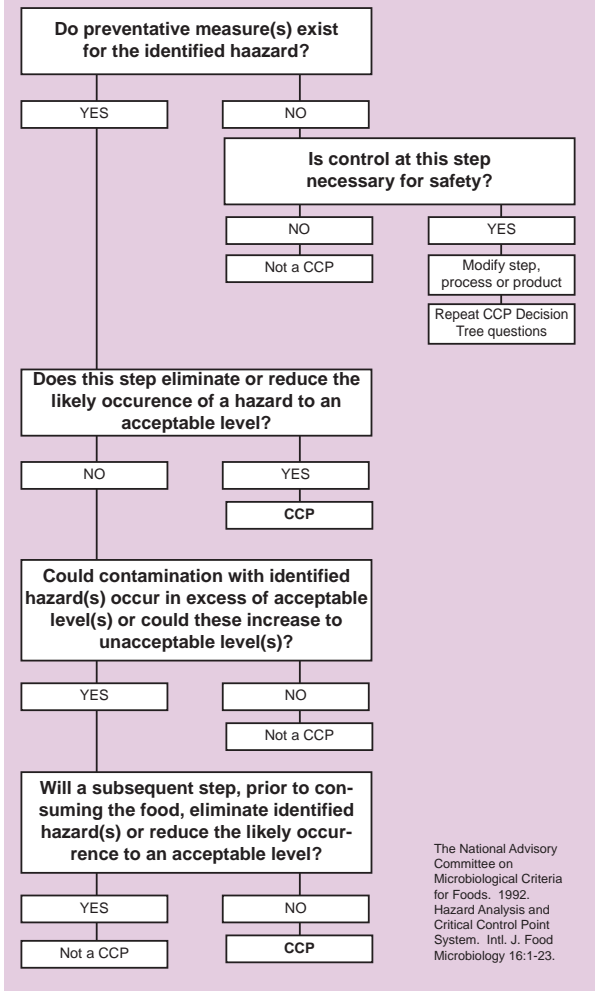
beef, prepared dinners, pastrami, turkey bacon, meat and poultry salads, meat and poultry loaves, poultry sausage

8. Heat treated but not fully cooked-not shelf stable
Examples: bacon, smoked sausages, partially cooked patties, products with batter and breading set but not fully cooked, low temperature rendered products
9. Product with secondary inhibitors-not shelf stable
Examples: uncooked cured pork products, uncooked cured corned beef, uncooked roast beef, cured beef tongue, low pH products

Before a HACCP plan can be developed, management must be committed to the program. HACCP is an important tool for delivering value to customers. Not only do you want to market quality products to your customer, you want to be assured that your products are as safe as possible. First, a HACCP team needs to be assembled. This should include people who are actually involved in making products as well as management and, if they are on staff, quality control personnel.

Once a product has been identified, the product will need to be characterized by listing the product formulation, the processing techniques, whether the product is marketed refrigerated, frozen or is shelf-stable, and the intended use. A flow chart describing the manufacturing process must be developed. From this flow chart, potential biological, physical and chemical hazards that could occur at each processing point are identified. This is the hazard analysis. Next, CCPs are selected from the steps on the flow chart where potential hazards were identified. CCPs are points, steps or procedures where some form of control can be applied and a food safety hazard can be prevented, eliminated or reduced. Examples of control tech-

Figure 1. CCP Decision Tree



niques include temperature, pH, water activity, processing time and moisture content. Using the CCP decision tree (Figure 1) can help identify whether a potential hazard is a CCP.

For each CCP identified, critical limits or acceptable values must be defined. For example, if a product is thermally processed, the length of time at a specific internal temperature may be the critical limit. It is very important to select your critical limit based on information from scientific literature, validation research or government regulations and include this information as supporting documentation for your HACCP plan.

Monitoring requirements are then established for each CCP. This is used to determine if a deviation occurs from a set critical limit. If temperature was a critical limit for a CCP, a temperature measuring/recording device would be needed to monitor product temperature. If a deviation from the critical limit occurs, corrective actions must be initiated to fix or remedy the problem. USDA requires four criteria be part of any corrective action. These are:

1. The cause of the deviation is identified and eliminated.
2. The CCP will be under control after the corrective action is taken.
3. Measures to prevent recurrence are established.

4. No product that is injurious to health or otherwise adulterated as a result of the deviation enters commerce.

If a product cannot be salvaged due to a deviation in a critical limit, the product may need to be disposed of or destroyed.

Records of a HACCP plan need to be kept on file in the facility. These records must include:

1. A written hazard analysis, including all supporting documentation; and
 - A flow chart describing the steps of each process and product

flow in the establishment.

- Intended use or consumers of the finished product.

2. The written HACCP plan, including:

- Decision making documents associated with the selection and development of CCP's and critical limits.
- Documents supporting monitoring and verification procedures selected and the frequency of those procedures.

3. Records documenting the monitoring of CCP's and their critical limits.

- These must include the actual data collected at each CCP, whether it be times, temperatures or other quantifiable values as defined by the establishment's HACCP plan.

- Records documenting the calibration of process-monitoring instruments such as thermometers, pH meters and scales.

- It is recommended to include employee training records that pertain to CCP's and the HACCP plan.

4. Records documenting corrective actions.

- The record must include all actions taken in response to a deviation including:

- a. The deviation that was identified.
- b. How the CCP will be under control after the corrective action is taken.
- c. The reason for holding the product, the date and time of the hold, the amount of product involved, the disposition and/or release of the product, and the name of the individual who made the disposition decision.
- d. Actions taken to prevent the deviation from recurring.

5. Documents identifying verification procedures and the results (actual data) collected from those procedures.

USDA FSIS requires that a written HACCP plan include all decision making documents and supporting documentation used in the development of a HACCP plan. HACCP records for slaughter activities and refrigerated product must be maintained for one year, while records for frozen, preserved, or shelf-stable products must be stored for two years. All HACCP records must be maintained on-site for a minimum of six months. After six months, records may be stored off-site providing they can be retrieved within 24 hours if requested by inspection authorities.

To assure that a HACCP plan is effective, it will need to be verified that the program works. The records for a HACCP plan must be reviewed before shipping product to be sure the HACCP program is being followed. This check is called preshipment review. Other ongoing verification activities include, but are not limited to, the calibration of process-monitoring instruments such as thermometers and pH meters, and direct observations of monitoring activities and corrective actions. Other verification procedures should be built into a HACCP plan as well. All establishments are required to reassess their HACCP plans annually, when an unforeseen hazard occurs, or whenever any changes occur that could affect the hazard analysis or alter the HACCP plan. Changes may be need to be made to a program if ingredients, processing procedures or equipment are modified or changed. This may also require selecting or changing CCPs to control a processing step, if necessary.

References and Resources

International HACCP Alliance
URL <http://haccpalliance.org/>
The International HACCP Alliance was developed on March 25, 1994 to provide a uniform program to assure safer meat and poultry products. It is housed within the Department of Animal Science at Texas A&M University. This site links to HACCP related hot topics, alliance news lines, training activities, food industry news, board room and food safety.

Pearson, A.M. and T.R. Dutson, Eds; HACCP in Meat, Poultry and Fish Processing. Advances in Meat Research Series, Volume 10. Blackie Academic & Professional, an imprint of Chapman & Hall, New York, NY, 1995.

USDA/FDA Foodborne Illness Education Center
URL <http://www.nal.usda.gov/fnic/foodborne/foodborn.htm>
From this site, a database listing HACCP training programs, HACCP training resources such as manuals, videos, and books, and HACCP consultants can be obtained. Meat and poultry, seafood, retail, foodservice and other areas of the food industry are included. The gateway for government foodsafety information is also located at this site.

USDA FSIS: A guidebook for the preparation of HACCP plans and 13 generic HACCP models are available from the USDA
URL <http://www.fsis.usda.gov/oa/haccp/models.htm>

USDA FSIS Pathogen Reduction/HACCP & HACCP Implementation Home Page, Updated January 08, 2001
URL <http://www.fsis.usda.gov/oa/haccp/imphaccp.htm>

FSIS has links from this frequently updated site to government HACCP resources and information including general information, generic HACCP models, guidance documents, HACCP implementation updates, HACCP-based inspection models project and additional resources.

USDA FSIS Pathogen Reduction; Hazard Analysis and Critical Control Point (HACCP) Systems; Final Rule. Federal Register 61 (144):38806-38989; 1996.
URL http://www.fsis.usda.gov/oa/fr/haccp_rule.htm

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