

# HACCP (HAZARD ANALYSIS CRITICAL CONTROL POINT)



## BASICS

### OVERVIEW

- Hazard Analysis Critical Control Point (HACCP) is a food safety management system designed to identify and control critical points in food production, manufacturing, and preparation, at which food safety may be affected.
- HACCP systems are designed to prevent or eliminate food safety hazards prior to their introduction into the food product.
- The principles of HACCP are applicable to all phases of food production, including husbandry and management practices and are well suited to management of pre-harvest safety hazards.
- HACCP segregates hazards into four categories: physical (foreign objects, bone fragments, etc.), chemical (naturally occurring chemicals – mycotoxins, mushroom toxins; added chemicals - pesticides, antibiotics, heavy metals; etc.), biological (food borne pathogens, parasites, rodents, insects, etc.) and allergens (peanuts, milk, eggs, wheat, etc.).
- Management of ruminant production systems can utilize the HACCP approach. True HACCP implementation requires specific measurable control points to be identified throughout the production process.
- Hazard Analysis and Critical Control Point (HACCP) is a system that enables the production of safe meat products through the thorough analysis of production processes, identification of all hazards that are likely to occur in the production establishment, the identification of critical points in the process at which these hazards may be introduced into product and therefore should be controlled, the establishment of critical limits for control at those points, the verification of these prescribed steps, and the methods by which the processing establishment can monitor how well process control through the HACCP plan is working.

### Hazard Analysis Critical Control Point Programs

Currently, HACCP is mandated in the United States for meat and poultry processing facilities inspected by the USDA. This includes harvest, fabrication, and processing of animal derived muscle food products. There is impetus, however, to apply HACCP principles to both plant and animal agricultural production systems, thus decreasing the pathogen load entering processing facilities.

The HACCP system is defined by five prerequisite programs and seven principles:

#### Prerequisite Programs:

1. Assemble the team
  - a. Team should be comprised of members from all aspects of the production process

2. Describe the food and its' distribution
  - a. Description should be thorough, distribution well laid out
3. Identify the intended use of the food product and its' consumers
  - a. Is the product to be used fresh, frozen, etc. and who are the intended consumers of the product
4. Create a flow diagram that describes the food production process
  - a. The production process begins with the acquisition of the animal and includes all components between acquisition and sale/harvest.
5. Verify the flow diagram
  - a. A walk through of the process should be conducted to verify that all steps in the production of the food product have been accounted for in the process flow diagram.

### Principles of HACCP

1. **Perform a Hazard Analysis.** This first principle is about understanding the specific animal operation and determining what hazards are likely to occur. This usually involves defining the operational steps that are taken as ruminants enter and move through the grow-out process. Understand how the people, equipment, methods, and animals all affect each other.
2. **Decide on the Critical Control Points (CCPs).** Operational steps identified as critical to a safe pathogen reduced outcomes. Where can a hazard be prevented, eliminated, or reduced to an acceptable level? Is there a later step that will prevent, reduce, or eliminate the hazard? It is important to know that not all steps are CCPs.
3. **Determine the Critical Limits.** Each CCP must have boundaries that define safety. How will you know when the CCPs are under control? What are the regulatory standards? What will you measure against? Critical limits are the measurements that define pre-harvest food safety.
4. **Establish Procedures to Monitor CCPs.** Monitoring CCPs in the flow of animal management through the operation. Monitoring involves ensuring that the CCPs are kept under control and within the critical limits.
5. **Establish Corrective Actions.** Development of a corrective plan of action should variations occur. Operational step can be outside of the set critical limits. This preventive approach is at the heart of HACCP.
6. **Establish Verification Procedures.** Periodically make observations, calibrate equipment, review records / actions, and discuss procedures with employees. Ensuring that the system is effective and checking to see if it needs to be modified or improved. Regulatory authority or a third party audit should be conducted for verification from an outside source if possible.
7. **Establish a Record Keeping System.** There are certain written records or kinds of documentation that will be needed in order to verify that the system is working. These records will normally involve the HACCP plan and your monitoring activities and serve to document that you really do have an on-going system in place. Record keeping should be as simple as possible in order to make it employee friendly.

### Overview of the Process Approach

- When conducting the hazard analysis, producers and veterinarians should use management as an organizational tool and follow the flow through the production calendar. Conducting the hazard analysis by using the methods or processes common to a specific operation seems to work quite well. This is called the "Process Approach".

- By assembling and analyzing the data systematically, safety assurance levels can be evaluated at every step of the food production chain. This method allows the detection of strengths and weaknesses of the safety system.
- The process approach to the use of HACCP principles can best be described as dividing the many flows in an establishment into broad categories, analyzing the risks, and placing managerial controls on each grouping.
- HACCP is most effective when a team approach is used for designing and implementing a plan based on the HACCP principles. A team could be comprised of the owner and production manager. Although managers are responsible for designing the system, implementation involves the efforts and commitment of every employee.
- Education and training of both management and employees are important in their respective roles of producing safe foods.
- Standard operating procedures can be developed to control some hazards and assist in implementing a pre-harvest food safety system that minimizes the potential for bacterial growth and contamination.

### **VETERINARY HACCP**

- HACCP goals related to food animal production include avoiding contamination of the animal food supply with antibiotic residues, insecticides, growth hormones, specific zoonotic bacteria (e.g., *E. coli* and *Salmonella* spp.) and veterinary injectables (see Injection Site Lesions).
- Accurate, auditable record keeping systems and individual animal identification schemes are essential to allow proper withdrawal times. Extralabel drug use should be minimized.

### **FOODBORNE PATHOGENS**

- Food (meat and milk products) producing animals may harbor pathogenic bacteria that could ultimately contaminate the food supply, in spite of multiple post-harvest control measures.
- Examples of pathogenic bacteria include:
  - *Salmonella* sp.: associated with meats and poultry with contaminated feed as possible source.
  - *Campylobacter jejuni*: associated predominately with poultry and with animal exposure from fecal contamination as the major suspected cause.
  - *Staphylococcus aureus*: associated with humans and animals, the latter seems to be related to lactating dairy cattle in a form of mastitis that can easily be transmitted to humans in contact with animals and equipment. Microbial toxin is heat stable. In most food borne cases, human vectors introduce the organism.
  - *Listeria monocytogenes*: associated with milk products and processed meats. Can be isolated from soil, silage, water, vegetation, many foods, and feces. Primarily implicated as a post-heat process contaminant.
  - Pathogenic *Escherichia coli*: predominant in intestines of animals and humans with many strains pathogenic to humans, the most notable being *E. coli* O157:H7.
- Other diseases include mycotoxicosis, caused by mycotoxins produced by fungi in growing food.



### **MISCELLANEOUS**

## **ZOONOTIC POTENTIAL**

- *Salmonella* sp., *Campylobacter jejuni*, *Staphylococcus aureus*, *Listeria monocytogenes* and pathogenic *Escherichia coli* O157:H7 are all zoonotic agents.

## **BIOSECURITY**

- HACCP is an excellent tool in the assessment of pre-harvest biosecurity.

## **PRODUCTION MANAGEMENT**

- See above

## **SEE ALSO**

- Food Animal Residue Avoidance Databank (FARAD)
- Campylobacter
- Dairy Heifer Management Program ([www.fiveminutevet.com/ruminant](http://www.fiveminutevet.com/ruminant))
- *Escherichia coli*
- Listeriosis
- Mastitis: Staphylococcal
- Salmonellosis

## **ABBREVIATIONS**

- CCPs = Critical Control Points
- FARAD = Food Animal Residue Avoidance Databank
- HACCP = Hazard Analysis Critical Control Point
- USDA = United States Department of Agriculture

## **INTERNET RESOURCES**

HACCP Principles & Application Guidelines. US FDA1997.  
[www.fda.gov/Food/GuidanceRegulation/HACCP/ucm2006801.htm](http://www.fda.gov/Food/GuidanceRegulation/HACCP/ucm2006801.htm)

### ***Suggested Reading***

Duffy G, McCabe E. Veterinary Public Health Approach to Managing Pathogenic Verocytotoxigenic *Escherichia coli* in the Agri-Food Chain.

Microbiol Spectr. 2014 Oct ;2(5). doi: 10.1128/microbiolspec.EHEC-0023-2013.

Cusato S, Gameiro AH, Corassin CH, Sant'ana AS, Cruz AG, Faria Jde A, de Oliveira CA. Food safety systems in a small dairy factory: implementation, major challenges, and assessment of systems' performances.

Foodborne Pathog Dis. 2013 Jan ;10(1):6-12. doi: 10.1089/fpd.2012.1286. Epub 2012 Nov 15.

Beekhuis-Gibbon L, Whyte P, O'Grady L, More SJ, Doherty ML. A HACCP-based approach to mastitis control in dairy herds. Part 1: Development. Ir Vet J. 2011 Mar 31; 64(1):2. Epub 2011 Mar 31.

Beekhuis-Gibbon L, Devitt C, Whyte P, O'Grady L, More SJ, Redmond B, Quin S, Doherty ML. A HACCP-based approach to mastitis control in dairy herds. Part 2: Implementation and evaluation. Ir Vet J. 2011 Mar 31 ;64(1):7. doi: 10.1186/2046-0481-64-7.

**Author** Bonnie Loghry

**Consulting Editor** Kaitlyn Lutz

**Acknowledgment** The author and editors acknowledge the prior contribution of Daniel C. Rule and Warrie J. Means.