

# **Introduction to HACCP Principles in Meat Plants<sup>1</sup>**

**Jeff W. Savell**

Professor and E.M. Rosenthal Chairholder  
Department of Animal Science  
Institute of Food Science and Engineering  
Texas A&M University  
College Station, TX 77843-2471

## **Introduction**

In the 1990s, no process in the meat industry will be discussed, studied, or feared more than will HACCP — The Hazard Analysis and Critical Control Point System. This decade has brought the attention of many from industry, government, activists, and consumers on the topic of food safety. Pending government regulation will force those in the meat industry to have valid HACCP plans. What was once a voluntary method to identify hazards and install points in a processing plant at which they could be reduced or eliminated will now have the threat of government oversight and intrusion. Regulatory matters aside, HACCP is a system that must be implemented by everyone to better assure a safer meat supply.

The roots of HACCP go back to the early years of the U.S. space program where food safety was an extreme responsibility for those preparing the foods for use high above the earth. HACCP centers on the prevention of problems rather than inspection and the hopeful identification of problems after-the-fact. HACCP was first used in processes such as canning and other cooked foods applications where

---

<sup>1</sup>Presented at “A Practical Approach to Meat Plant HACCP’s,” sponsored by the American Meat Science Association and held at the Airport Marriott, Kansas City, Missouri, June 19 through 21, 1995.

failures in food safety had the greatest consequences. Only until the 1980s did many of the fresh meat processors begin to look at incorporating HACCP in their plants. Even today, though, most meat plants do not practice HACCP. This will change in the next several years if these plants expect to be in business in the next century.

The focus of my presentation will be on outlining the Seven Principles of HACCP to set the stage for more detailed presentations by the others involved in this program. The items that follow are summarized from the outstanding workshop manual edited by Kenneth E. Stevenson and Dane T. Bernard of the National Food Processors Association (National Food Processors Association, 1995). Another good overview of HACCP implementation is found in the Microbiology and Food Safety Committee of the National Food Processors Association (1993) paper.

### **Seven Principles of HACCP**

In the National Food Processors Association (1995) workbook, a series of definitions are given that help people understand the key words used when HACCP is discussed. The list is included in Table 1. The workbook also spells out the initial steps necessary to develop a HACCP plan. These are to: (1) Assemble the HACCP Team, (2) Describe the food and its distribution, (3) Identify the intended use and consumers of the food, (4) Develop flow diagram, (5) Verify flow diagram, and (6) Conduct hazard analysis: (a) identify and list steps in the process where the hazards of potential significance occur, (b) list all identified hazards associated with each step, (c) list preventative measures to control hazards.

The remaining section lists the principles and a brief summary what each entails.

**Principle 1. Conduct a hazard analysis. Prepare a list of steps in the process where significant hazards occur and describe the preventive measures.**

Hazards are categorized into three general areas: biological, chemical, and physical. For the most part, biological, which includes pathogens, is the hazard that most plans are used to prevent.

The challenge that faces the HACCP Team is to determine what are truly significant versus insignificant hazards. The Team must weigh both risk and severity when analyzing hazards.

**Principle 2. Identify the CCPs in the process.**

A Critical Control Point is defined as a point, step or procedure at which control can be applied and a food safety hazard can be prevented, eliminated, or reduced to acceptable levels. This differs from a Control Point, which is a less specific and important step in the process.

The selection of CCPs is aided by the use of a CCP Decision Tree. This Decision Tree is designed to allow the Team to ask specific and logical questions to help determine what is truly a Critical Control Point versus a Control Point or something that could be handled under the GMPs (Good Manufacturing Practices) or SOPs (Standard Operating Practices). Although this Decision Tree is not perfect, it certainly helps to focus the attention of the team on what should be used in a HACCP Plan to control hazards.

**Principle 3. Establish critical limits for preventive measures associated with each identified CCP.**

Critical Limits are important tools that help the HACCP Plan function properly. Critical Limits serve as the boundaries for each CCP. Examples of Critical Limits are preventative measures such as temperature, pH, salt concentration, time, moisture level, etc.

Critical Limits are different from factors that may affect quality. The flavor characteristics of a cooked meat product may be best achieved at a certain endpoint temperature, but the safety of the product may be achieved at another temperature.

**Principle 4. Establish CCP monitoring requirements. Establish procedures for using the results of monitoring to adjust the process and maintain control.**

CCP monitoring is a planned sequence of observations or measurements to assess whether a CCP is under control and to produce an accurate record for future use in verification. Monitoring is focused on keeping the process under control and preventing deviations (those occurrences outside the Critical Limits) from happening. If deviations do occur, monitoring will provide the information as to when problems occurred so that corrective action can be taken.

Monitoring is performed best in real-time, i.e., measuring the process as it occurs rather than taking samples and sending to a laboratory for results that would be produced days later. This is not to say that there is no place for in-depth analyses of processes and products, but that this activity fits best under Principle 7 under verification.

**Principle 5. Establish corrective action to be taken when monitoring indicates that there is a deviation from an established critical limit.**

It must be assumed that deviations will occur, even in the best HACCP Plans. There are three areas that corrective action plans address: (a) to determine the disposition of non-compliance product, (b) to fix or correct the cause of non-compliance to assure that the CCP is under control, and (c) to maintain records of the corrective actions that have been taken where there has been a deviation from Critical Limits.

All HACCP Principles are important, but this Principle answers the question of “what if” before it happens. It is not in the best interest of the company to leave the decision making process to those in the middle of the crisis. Plans must be in place to address what to do with the product under as many scenarios for violations of Critical Limits as possible.

**Principle 6. Establish effective recordkeeping procedures that document the HACCP system.**

The approved HACCP Plan and associated records must be on file at the establishment. For the most part, this may be the only part of the HACCP Plan that will be audited or reviewed by customers or regulators. Adequate records of what is and was measured and what was done with products that were produced outside of Critical Limits are items that people look to see if the HACCP Plan is working.

**Principle 7. Establish procedures for verification that the HACCP system is working correctly.**

Verification is a process to look at the HACCP Plan as it is being carried out and at the long-term trends and implications. The HACCP Team must strive to continue to update and improve the HACCP Plan knowing that the Plan is a dynamic instrument that will grow and change as products and processes evolve and as new forms of hazards enter the food chain.

This Principle deals with reviews of the Plan, both in how it is written and how it is being followed. Outside experts play an important role in giving input to the Team as to ways to improve the Plan. Verification is an on-going process that helps in ensure that the HACCP Plan is doing what it is supposed to do: prevent hazards from becoming a part of the food supply.

### **Summary**

HACCP is program that empowers people to focus their attention on prevention rather than discovering or inspecting out problems after they occur. For those who have not embraced it, it is a change of philosophy of what entity is really responsible for food safety — government versus company. It has been said that for those who do not have a HACCP Plan, most of the activities that are being done in the plant would fit within a Plan. The remaining thrust is to put everything into a document so that a plan that can be followed is made.

HACCP is not a set of seven independent principles; each must build on the other. No great record keeping and monitoring system will overcome inadequate

hazard analysis and critical control point evaluations. As with any other endeavor, all components must be working for the total plan to be effective and successful.

### **References**

Microbiology and Food Safety Committee of the National Food Processors

Association. 1993. Implementation of HACCP in a food processing plant. *J. Food Prot.* 56:548.

National Food Processors Association. 1995. HACCP: Establishing Hazard Analysis Critical Control Point Programs, A Workshop Manual (Stevenson, K.E., and D.T. Bernard, Eds). The Food Processors Institute, Washington, DC.

Table 1. Terms and definitions used in HACCP planning and implementation.<sup>a</sup>

<b>Term</b>	<b>Definition</b>
CCP Decision tree	A sequence of questions to determine whether a control point is a CCP.
Continuous Monitoring	Uninterrupted collection and recording of data such as temperature on a strip chart.
Control	(a) To manage the conditions of an operation to maintain compliance with established criteria. (b) The state wherein correct procedures are being followed and criteria are being met.
Control Point	Any point, step, or procedure at which biological, physical, or chemical factors can be controlled.
Corrective Action	Procedures to be followed when a deviation occurs.
Criterion	A requirement on which a judgment or decision can be based.
Critical Control Point (CCP)	A point, step, or procedure at which control can be applied and a food safety hazard can be prevented, eliminated, or reduced to acceptable levels.
Critical Defect	A deviation at a CCP which may result in a hazard.
Critical Limit	A criterion that must be met for each preventive measure associated with a critical control point.
Deviation	Failure to meet a critical limit.
HACCP Plan	The written document which is based upon the principles of HACCP and which delineates the procedures to be followed to assure the control of a specific process or procedure.
HACCP System	The result of the implementation of the HACCP plan.
HACCP Team	The group of people who are responsible for developing a HACCP plan.
HACCP Plan Reevaluation	One aspect of verification in which a documented periodic review of the HACCP plan is done by the HACCP team with the purpose of modifying the HACCP plan as necessary.



<b>HACCP Plan Validation</b>	The initial review by the HACCP team to ensure that all elements of the HACCP plan are accurate.
<b>Hazard</b>	A biological, chemical, or physical property that may cause a food to be unsafe for consumption.
<b>Monitor</b>	To conduct a planned sequence of observations or measurements to assess whether a CCP is under control and to produce an accurate record for future use in verification.
<b>Preventative Measure</b>	Physical, chemical, or other factors that can be used to control an identified health hazard.
<b>Random Checks</b>	Observations or measurements which are performed to supplement the scheduled evaluations required by the HACCP plan.
<b>Risk</b>	An estimate of the likely occurrence of a hazard.
<b>Sensitive Ingredient</b>	An ingredient known to have been associated with a hazard and for which there is a reason for concern.
<b>Severity</b>	The seriousness of a hazard.
<b>Target Levels</b>	Criteria which are more stringent than critical limits and which are used by an operator to reduce the risk of a deviation.
<b>Verification</b>	The use of methods, procedures, or tests in addition to those used in monitoring to determine if the HACCP system is in compliance with the HACCP plan and/or whether the HACCP plan needs modification and revalidation.

<sup>a</sup> Source: National Food Processors Association (1995).