

## HACCP Principles 2 & 3: Identification of Critical Control Points and Establishment of Critical Limits

### Principle 2: Identify the critical control points (CCP's)

CCP's are located wherever **hazards** can be eliminated, prevented or reduced to an acceptable level. **A CCP must affect the safety of the product.**

There are many stages (operations) in a food processing system that may impact on bacterial load but there are only few where loss of control results in **unsafe food**.

**All** operations in a processing system should be considered potential CCP's and **each** should be analyzed using a CCP decision tree.

CCP's are sometimes divided into different categories:

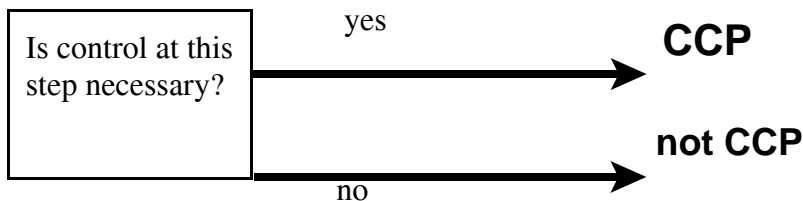
- CCPe = *elimination* of hazard (often called a “kill step”)
- CCPp = *prevention* of hazard (ideal, if feasible)
- CCPr = *reduction* of hazard (These tend to be tenuous.)

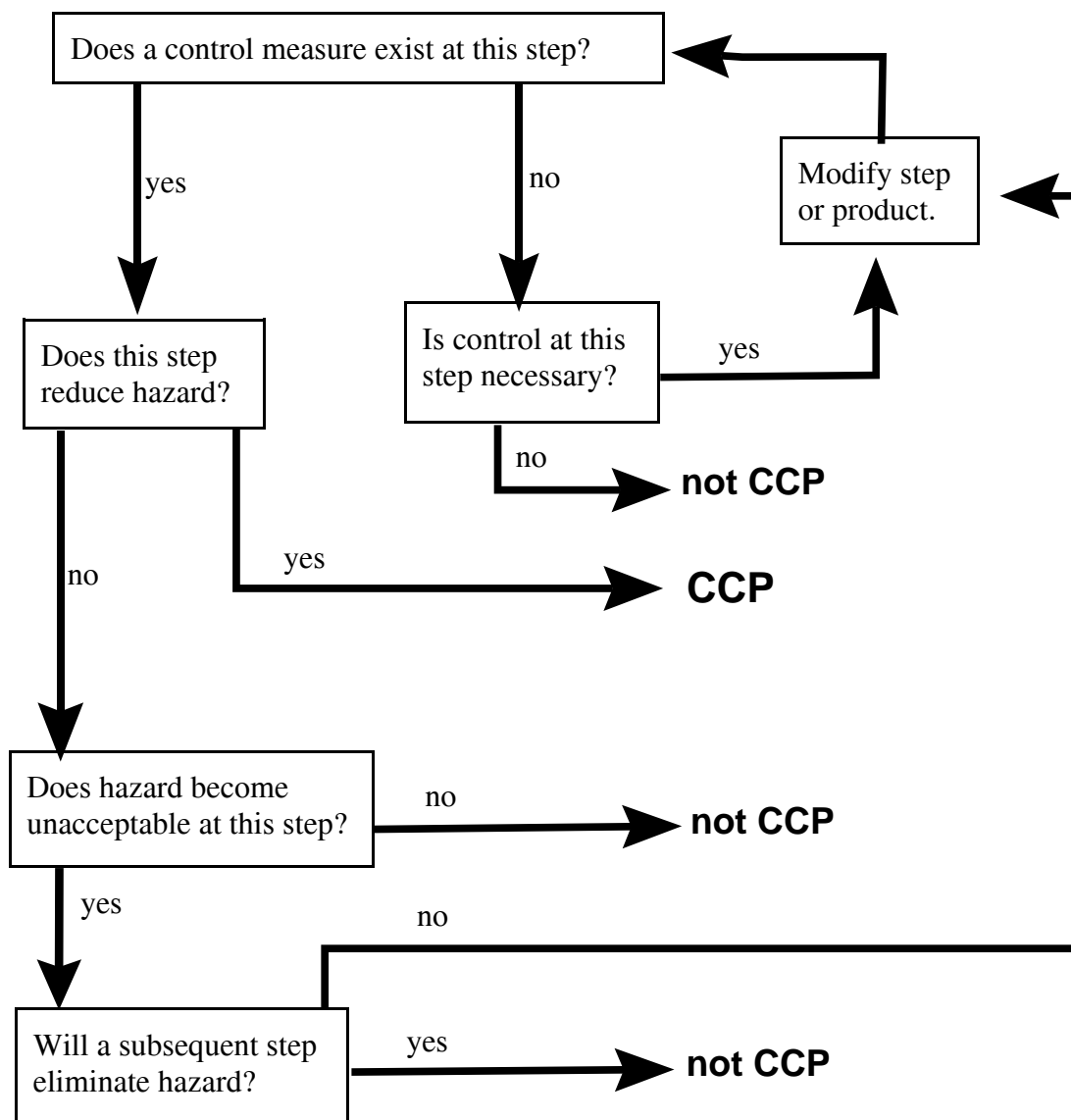
**For each CCP there must be a means of monitoring and a corrective action.**

One CCP may be nullified by another CCP further down the processing line.

**Quality control programs are sometimes called HACCP, HACCP-based, or HACCP-like. If they have no validated CCPs, they are not HACCP plans.**

**“Simplified” CCP decision tree:**



**CCP decision tree:**

### Principle 3: Establish critical limits at each CCP

Critical limits must be based on professional knowledge and experience

One definition of a Critical Limit is “a criterion which separates acceptability from unacceptability.” (Compare absolute vs. relative acceptability.)

These may be chemical, physical, or (maybe) biological in nature. Examples include temperature, time, pH, water activity (moisture level, salt concentration), weight, physical dimensions, etc. What is important is that they be measurable, in some specific unit, and ideally in “real time” (i.e., as the process continues), without waiting for samples to be sent to a laboratory for analysis. An acceptable **range** of values for the parameter in question is usual. A common example for many foods is absence of detectable metal in the product, with specifications as to the instrument used and the means of calibration.

Information can be obtained from the literature, for example the books listed earlier, as well as from scientific journals, extension bulletins, and government publications.

Some may come from earlier regulations that were not originally devised as part of a HACCP system:

- Food that is to be packaged in hermetically sealed container for storage and distribution at ambient temperature must have a pH <4.6 or be thermally processed to an extent that would kill 12 logs of *Clostridium botulinum* spores.
- Fluid milk pasteurization in the U.S. involves holding the milk at 71.7°C (161°F) for at least 15 seconds or at 62.7°C (145°F) for at least 30 minutes.

The USDA Pathogen Modeling Program provides detailed and specific information about critical limits to bacterial growth.

- Nevertheless, it is often necessary to validate the CCP and critical limits in the food in question, using exactly the process that is proposed.
- Unless a proper surrogate — a harmless bacterial species whose growth or death characteristics are exactly like those of the pathogen of concern — exists, it is necessary to work with the pathogen itself, which is seldom an option in a food establishment.
- In such instances, specialized laboratories may have to be enlisted to inoculate the food with the pathogen and carry out a model of the process, to ensure its effectiveness.
- Even when this is done, there is some concern about whether the scaled-up process and the equipment in use in the “real” establishment will produce an identical result.
- Because of the expense of carrying out validations with pathogens in foods, it is important that as much preliminary information be obtained as possible, from such sources as the Pathogen Modeling Program. The Pathogen Modeling Program is now being expanded, to include the fates of bacterial pathogens in real food environments.