HACCP Elsewhere in the Postharvest Food System (storage, distribution, retailing, food service) and in Processing Water and Wastewater

As has been explained earlier in the course, HACCP was originally devised for application in food processing. Successful application of the HACCP approach in other segments of the food system requires that critical control points be identifiable. Application of HACCP in preharvest situations has been discussed; here, we will consider postharvest situations other than processing. Additionally, water and wastewater processing are applications that would lend themselves well to HACCP; but the US Environmental Protection Agency has not yet made the move.

Storage seldom improves a food (exceptions: hardening ice cream, aging cheese and wine); the best that can usually be hoped for is keeping the food in as good condition as when it entered storage.

1. The principal concerns in storage are temperature control, prevention of physical damage, and vermin (rodents, birds, insects) control.

2. None of these is *really* a critical control point; all are covered by Good Manufacturing Practices. Temperature can be monitored continuously; range limits are established product by product (colder is not always better for the *product*).

Distribution presents the same challenges as storage, except it's happening (typically) on wheels.

1. Again, temperature control, prevention of physical damage, and vermin control are principal concerns for packaged goods.

2. For bulk commodities that contact the inner surface of the conveyance (milk, ice cream mix, liquid eggs, etc.), cross-contamination from other batches or other foods is a significant threat. Example: Schwann's ice cream outbreak of salmonellosis.

3. Evidently, up to $40,000 worth of single-ingredient product is exempt from federal "inspection" on its way to retailers or restaurants. A result is that large quantities of meat have sometimes been transported without proper refrigeration or sanitation.

Retailing is generally selling food for consumption off the premises. Flow diagrams for food that is not prepared on the premises tend to show only temperature control as a critical control point. Training of personnel in sensitive positions is very important.

1. Shelf-stable foods need to be displayed so as to avoid temperature extremes, physical damage, and vermin incursions.

2. Perishable foods need to be held as cold as the food will permit (usually) and discarded after shelf life has been exceeded. Modified atmosphere and vacuum packaging deserve special attention. Frozen foods should be held continuously below 0°F (-18°C); this is a quality, rather than safety, precaution.

3. Ready-to-eat prepared foods, especially if prepared at the retail establishment, put the retailer in a food service role.

4. In addition to toilet facilities in separate washrooms, hand wash stations are advisable in areas where workers prepare or directly handle food.

5. Foods served or sold from bulk (not pre-packaged) should be handled by the worker so as to avoid direct skin contact with the product. Hands that have contacted raw product should be washed before touching other foods.

6. All food should be offered for sale in clean, well lighted displays. Customer handling of food should be minimized.

Food service involves final preparation of food for consumption on or off the premises. Training of personnel is a constant challenge, especially because some food service establishments experience high turnover rates. Also, paid leave for illness is seldom offered, so ill employees often choose to work, rather than stay off the job. Specific safety training of managers and supervisors is being mandated in many places, including California.

1. Adequate facilities and proper sources of raw materials are prerequisites to safe operation in food service.

2. Handling of raw materials from receiving to cooking (if any) may afford multiple opportunities for contamination. Such contamination needs to be prevented; it may be difficult to designate these control points as critical control points.

3. Temperatures of storage of raw materials (room temperature, refrigeration, freezing) need to be appropriate to the food and monitored regularly; refrigeration or freezing may constitute a critical control point in need of regular, documented monitoring.

4. Cooking may be the most important (or only) critical control point in preparing some foods. According to the FDA Food Code, documentation of time and temperature should be done; this may not always be practical.

5. Separating cooked food from raw materials is an important part of good restaurant practice, though not likely to serve as a critical control point. Leftovers present special problems, both as to where to store them and how to bring them through the “danger zone” of temperatures (40–140°F; 5–60°C) as rapidly as possible.

6. Serving hot food hot and cold food cold may constitute a critical control point in some instances.

7. Takeouts, and especially carry-out containers of the "doggy bag" variety, present special problems because the vendor has no control over how the consumer handles the food once it leaves the premises. Now that safe handling instructions are being printed on meat packages, they might be appropriate on takeout containers as well.

FDA Food Code on the Internet: http://www.cfsan.fda.gov/~dms/fc05-toc.html

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Annex 4 MANAGEMENT OF FOOD SAFETY PRACTICES-ACHIEVING ACTIVE MANAGERIAL CONTROL OF FOODBORNE ILLNESS RISK FACTORS

1. ACTIVE MANAGERIAL CONTROL

2. INTRODUCTION TO HACCP

3. THE HACCP PRINCIPLES

4. THE PROCESS APPROACH – A PRACTICAL APPLICATION OF HACCP AT RETAIL TO ACHIEVE ACTIVE MANAGERIAL CONTROL

(C) What are the three food preparation processes most often used in retail and food service establishments and how are they determined?

• Process 1: Food Preparation with No Cook Step

Example flow: Receive – Store – Prepare – Hold – Serve

(other food flows are included in this process, but there is no cook step to destroy pathogens)

• Process 2: Preparation for Same Day Service

Example flow: Receive – Store – Prepare – Cook – Hold – Serve

(other food flows are included in this process, but there is only one trip through the temperature danger zone)

• Process 3: Complex Food Preparation

Example flow: Receive – Store – Prepare – Cook – Cool – Reheat – Hot Hold – Serve

(other food flows are included in this process, but there are always two or more complete trips through the temperature danger zone)

5. FDA RETAIL HACCP MANUALS

6. ADVANTAGES OF THE HACCP PRINCIPLES

(B) What advantages does using HACCP principles offer regulators food service establishments?

Traditional inspections are relatively resource-intensive, inefficient, and reactive than preventive in nature. Using traditional inspection techniques allows for satisfactory “snapshot” assessment of the requirements of the code at the inspection. Unfortunately, unless an inspector asks questions and inquires activities and procedures being utilized by the establishment even at times inspector is not there, there is no way to know if an operator is achieving *active* managerial control.

With the limited time often available for conducting inspections, regulators their attention on those areas that clearly have the greatest impact on food foodborne illness risk factors. By knowing that there are only a few control that are essential to food safety and focusing on these during the inspection, inspector can assess the operator’s active managerial control of the foodborne risk factors.

Regulators can provide invaluable feedback to an operator through their routine inspections. This is especially useful when utilizing a risk-based approach. incorporating HACCP principles into routine inspections, an inspector can operator with the constructive input needed to establish the control system bring the foodborne illness risk factors back under continuous control.

7. SUMMARY
8. ACKNOWLEDGEMENTS
9. RESOURCES AND REFERENCES

Homes are known to be the sites of many abuses of food that can result in foodborne disease. Can you imagine designing a HACCP plan for **your** kitchen?

Water treatment means processing water to make it fit to drink — although much "potable water" is used for industrial or hygienic purposes, rather than as a beverage. **The World Health Organization is moving in the direction of promoting HACCP for drinking water treatment.** The "worst case" situation, which calls for "complete treatment," occurs when the source is *surface* water (from a lake or river). Because surface water is subject to prior use by an upstream community and from contamination by run-off from land, it is assumed to contain all manner of microbial pathogens. If the water actually contains chemical contaminants such as PCBs or heavy metals, extremely high-technology treatment may be required to make it potable, or other sources may need to be sought. We will only consider treatment to deal with microbial contamination.

1. Water receives rough filtration at the intakes, to prevent mechanical damage to the treatment apparatus.

2. A coagulant, such as alum, is added, often with a polymer "coagulant aid," to encourage suspended matter in the water to agglutinate. After the coagulant is mixed with the water, the water is held fairly still, to encourage settling of any suspended matter. This removes clay and other minerals, as well as microbes that are adsorbed to the suspended matter. Parasite eggs and protozoan cysts and oocysts are removed to some extent at this stage, so it is important that the "sludge" that settles to the bottom of the tanks be carefully discarded as *sewage*.

3. Filtration through sand or some other fine medium follows, to remove suspended matter that did not settle in the previous treatment. In the U.S., most sand filtration is done by rapid, gravity flow. When the sand surface becomes clogged by the suspended material that it has captured, this surface accumulation is removed by back-washing and also discarded as sewage.

4. Water that has been clarified in these ways may receive further treatment (pH adjustment, softening, fluoride addition, etc.).

5. Finally, disinfection is performed. The standard method in the U.S. entails

addition of gaseous chlorine, which forms hypochlorous acid (etc.) in solution. If the water has been properly clarified before the chlorine is added, bacteria and viruses will be killed. It is usual to maintain a "free chlorine residual" all the way through the water mains to the homes of those who are served by the water utility.

6. The water utility is responsible for safe distribution of the water all the way to the "service connection," where the water becomes the property of the buyer. Buyers are supposed to handle the water in such a way as not to contaminate the mains and threaten the health of other subscribers. Safe distribution can be the most difficult part of providing safe water to a community, because the underground pipes are harder to maintain than the central treatment plant. In an effort to include distribution in the safety system, the EPA requires that utilities sample water at points representative of the water in distribution, rather than just finished water at the treatment plant. Water anywhere in the distribution network is required to meet EPA drinking water standards.

Wastewater treatment means processing of used water before it is discharged, possibly for other use. Although water may be used in a number of ways that would require treatment before discharge, we will consider only household, "sanitary sewage" here.

1. Unlike drinking water, which is usually distributed under pressure in closed "mains," sewage is usually conducted to the treatment plant in gravity-flow sewers that have a good deal of open space and can be entered via "manholes." Because the path from homes to the treatment plant is not always downhill, "lift stations" collect wastewater at the end of a downhill run and pump it to a higher level, to flow downward again toward the treatment plant. In uneven terrain, several lift stations may be required to conduct the wastewater all the way to the plant. Conduction is supposed to be rapid, so that the wastewater is still relatively "fresh" when it arrives for treatment.

2. Arriving wastewater typically passes through a "bar screen" to remove large objects and through a "grit chamber" to remove pebbles and other small objects by sedimentation.

3. "*Primary* treatment" usually consists of passing the wastewater slowly through a fairly deep chamber. Small suspended particles settle to the bottom, and floating material rises to the top. Both the sludge and scum are continuously collected as "primary sludge."

4. "*Secondary* treatment," applied to the primary effluent, encourages aerobic, microbial growth. The bacteria that grow in this aerated environment convert dissolved and fine suspended pollutants into bacterial cells. This "biomass" is collected as "secondary sludge." Primary and secondary sludges are often de-watered as much as possible and then mixed and "digested" to produce "biogas"

that can be used as fuel and to stabilize the sludge so that it can be disposed of without great offense.

5. "*Tertiary* treatment," such as coagulation and settling and filtration similar to the processes described for drinking water, may be applied if the wastewater is to be discharged to a "sensitive" receiving site.

6. Disinfection may entail chlorination, UV exposure, or any of several other processes that are intended to kill pathogens in the wastewater before discharge. If chlorine is used, it may have to be neutralized before the wastewater reaches a receiving waterway. UV-disinfected wastewater must be held in the dark for periods of several minutes to a few hours, to prevent "photoreactivation" of pathogens.

Both water and wastewater treatment include specific processing steps that could be designated "Critical Control Points." In both instances, final disinfection is a CCP; but not the only one. Only if the water or wastewater has been properly prepared will disinfection be successful, so coagulation and settling and filtration are likely to be CCPs for surface water treatment, and primary and secondary treatment are likely to be CCPs for wastewater treatment. In each case, critical limits can be applied to specific process parameters for continuous monitoring. If a critical limit is violated, remedial action must be prompt — in most instances, ceasing operation is not an option. Up-to-date installations typically are continuously monitored with the aid of computers, but manual-mechanical backup systems are required for emergencies. Even well conceived and operated systems are vulnerable to fires, floods, hurricanes, earthquakes, power interruptions, and deliberate mischief. Security and disaster response are necessary parts of these, because out-of-control situations with water and wastewater cannot be addressed by "recall," as they can with food.

Summary

- Post-harvest food operations, other than processing, offer limited opportunities to apply real HACCP (GMPs & SSOPs more suitable): storage and distribution do best to prevent damage, added risk.
- HACCP plans for retailing and food service are unlikely to be individual-by-food as those in processing should be — a full HACCP plan (with documentation at "CCPs") is unlikely to be developed for each recipe in a food service establishment, let alone for each item offered for sale in a grocery store. Certain very high-risk foods may merit the full treatment.
- Application of HACCP to treatment of water and wastewater has not really been attempted yet, but the possibilities are good.