Spin-off from space travel

Food associated diarrhoeal diseases are preventable and need not occur. The concept of the hazard analysis critical control point (HACCP) is the most viable means to this end yet devised

by Silvia Michanie and Frank L. Bryan

It was in order to provide absolutely safe foods for astronauts while travelling in space in the 1960s that the hazard analysis critical control point (HACCP) concept evolved in the United States. During the following decade, the HACCP approach was adopted by the US Food and Drug Administration in cooperation with the food-processing industry as a means of providing safe low-acid canned foods.

Since then, many food processors and some food-service operators have found that the HACCP approach does not only provide a high degree of assurance of food safety and quality; it is also economically advantageous. It is rational since it is based on historical data about causes of illness and spoilage; it is comprehensive in that it relates to ingredients and subsequent use of products as well as to the process; it is continuous in that problems are detected when they occur and action is taken then to correct them; and it is systematic in that it is a comprehensive plan covering step-by-step procedures. And it offers greater assurance than either testing final products or making periodic inspections.

By hazard we mean the unacceptable contamination, growth or survival of micro-organisms that might cause illness or spoilage, and/or the unacceptable production (or persistence in foods) of toxins of microbial metabolism. Severity is the magnitude of the hazard or the degree of consequences that can result when a hazard exists. Risk is an estimate of the probability that a hazard will occur.

A critical control point is an operation (practice, procedure, process or location) or a step of an operation at which a preventive or control measure can be exercised. This measure will eliminate, prevent or minimise any hazard that has occurred prior to this operation.

The criteria that ensure control at critical control points are specified limits or characteristics. They may be physical (time, perhaps, or temperature), chemical (concentration of salt or acetic acid), or biological (sensorial or microbiological).

Dr Silvia MICHANIE is Food Protection Supervisor at the Pan American Health Organization/Pan American Zoonoses Center (CEPANZO), Buenos Aires, Argentina, and Dr Frank L. BRYAN is a Food Safety and Training Consultant based in Tucker, Georgia, USA and works periodically as a Consultant to the WHO/PAHO Food Safety Programme.

Monitoring means checking that a processing or handling procedure at each critical control point meets the established criteria. It involves systematic observation, measurement and recording of the significant factors needed to prevent or control hazards. The monitoring procedures chosen must enable action to be taken to rectify an out-of-control situation or to bring the product back within acceptable limits either before start-up or during processing or preparation. So one great advantage of the HACCP system is immediate response to hazardous situations.

During hazard analyses, sources and modes of contamination are sought. Measurements establish whether disease-causing microbes survive cooking or other processes, and whether they multiply during intervals between preparation and ingestion. Certain foods may or may not lend themselves to supporting the growth of microbes. Samples may be collected and analysed for the presence and quantity of disease-causing and/or spoilage microbes. Each step of the food flow is considered and illustrated on a diagram, with the hazards and critical control points highlighted.

Answers have to be found to a number of questions. For instance, what are the raw ingredients? What is the pH (degree of acidity) of the final product? What is the time-temperature exposure of the product during processing of preparation? Will the product be eaten immediately after preparation, or will it be stored hot, cold or at ambient temperature?

This looks rather sophisticated for use in homes, yet these analyses have been conducted in homes in a capital city, an island city, a suburban shanty town, a mountain pueblo and a rice-farming village. The variety of these settings provides a stringent test of the validity of the approach, and it has passed the test.

In addition to contamination that may be specific to certain kinds of raw food, such factors as traditions, education, economic resources, sanitary facilities, personal hygiene and environmental sanitation may further contribute to hazards during preparation, when food is kept after being cooked, or while leftovers are handled. The

Hazard analysis involves finding out whether disease-causing microbes survive cooking or other processes. A hospital kitchen in Santiago, Chile.

Photo WHO/P. Almasy

greatest hazard, however, is holding cooked foods at ambient temperature for six hours or longer between preparation and eating. This allows time for microbial contaminants to multiply to quantities large enough to cause enteric illness or to generate toxins. Reheating of the leftover foods is often not enough to inactivate microbes that have grown during long holding periods.

All these observations reveal the hazards and indicate the critical control points of culture-associated food preparation procedures. The next step of the HACCP approach is for persons who are knowledgeable of food microbiology and hygiene to select or devise preventive and control measures and criteria. These have to be both economically feasible and culturally acceptable, and must also be communicated to the public either through organized community action or national educational campaigns.

Determine hazards and their severity and risks

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Identify critical control points

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Institute control measures and establish criteria to assure control

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Monitor critical control points

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Take action whenever monitoring results indicate criteria are not met

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(Verify that the system is functioning as planned)

The HACCP System

As the diarrhoeal diseases are studied in all their aspects more intently than in the past, it is becoming clear that contaminated and mishandled foods are the major vehicles of transmission. So the educational follow-up of HACCP evaluations may be the most valuable function of the HACCP concept. This is particularly so in countries that lack foodborne disease surveillance activities. The information gathered can be used to inform the health and social authorities, train public health personnel and educate the adult public and schoolchildren.

Food associated diarrhoeal diseases are preventable and need not occur. The HACCP concept is the most viable means to this end yet devised. ■