

develop procedures which reduce or control the spread of pathogens from manure, internal organs, hair, water, etc. to the carcass or the processing environment. Such systems might include improved methods for hide removal; dehairing before removing the hide; washing and/or sanitizing saws, knives or other equipment during slaughtering operations; or other new techniques.

The trim rail, for example, should be moved to an area as far forward in the slaughter process as possible, preferably before the pre-evisceration wash. Such a move would facilitate preventing carcass contamination. This trim area should also be used to trim bruises, lesions, and grubs before spraying the carcass with water or other approved solutions.

The method of cutting around and handling the bung (e.g. tying off, covering, etc.) is another example. The preferred method has been debated for a number of years. There is general agreement, although there is little or no published data, that this step can be a significant source of contamination to the carcass. It is recommended that this step be reviewed and one or more methods be specified which will minimize carcass contamination.

B. Decontamination

There are two basic approaches to decontamination. The first approach usually consists of spraying carcasses during slaughtering and/or chilling. These procedures can reduce but will not destroy all the enteric pathogens. The second approach consists of irradiating packaged meat. Irradiation doses currently approved for use with poultry (Cross, 1992) would be sufficient to destroy the levels of enteric pathogens that would normally be present on freshly packaged meat.

Both approaches require that the slaughtering process be controlled to minimize contamination. The number of enteric pathogens on the carcasses should be as low as possible before either method of decontamination is applied. In addition, the method of decontamination and the organoleptic quality of the decontaminated meat must still be acceptable to consumers.

1. Organic Acid Sprays, etc.

Research and commercial experience has demonstrated that microbial contaminants on the surface of carcasses can be reduced through the use of organic acid sprays, hot water, steam and various combinations of these and other approved bactericidal materials. There may be more than one combination of treatments at one or

more steps during slaughtering and/or chilling. The Committee encourages the development and implementation of such bactericidal systems to reduce the number and incidence of enteric pathogens on carcasses and fresh meat. As systems are developed and approved, FSIS should consider requiring the use of systems that have been proven to actively reduce enteric pathogens. The minimum efficacy required for such systems should be a specified reduction of Enterobacteriaceae (e.g. a 10-fold reduction) using standardized protocols recognized by the regulatory agency with input from other interested parties (e.g., academia, industry, USDA-ARS, NACMCF, and professional organizations). The conditions (e.g., time, temperature, pH, acid concentration, etc.) for effective operation of the decontamination system should be specified in the HACCP plan of the slaughter establishment.

In addition to its use as an in-line system for decontamination, this technology can be applied to unique situations. For example, under current inspection procedures for cattle, the following occurs in the event that during evisceration a break in viscera contaminates the body cavity:

Carcass siderailed;

Carcass trimmed by peeling out fascia in body cavity;

Exposed bone is trimmed; and

Visual reinspection.

An alternate approach to the above may be the following:

Carcass siderailed.

Decontamination of the body cavity by:

Extensive body cavity and carcass wash with potable water.

Decontamination of the body cavity by an approved procedure (e.g., organic acid, alkaline solution, hot water, steam, etc.)

2. Irradiation

Irradiation is an effective technology for destroying enteric pathogens in fresh meats. The irradiation of poultry for pathogen control has been approved in the United States and ten other countries (e.g., France, United Kingdom, and The Netherlands) (ICGFI, 1992). Irradiation of raw beef should, likewise, be approved. Used appropriately, irradiation can be an effective method for assuring the safety of raw meats, particularly raw ground beef.

C. Carcass Identification, Product Coding

Procedures should be developed so that carcasses can be identified as to source and can be traced back to the farm. In addition, minimum requirements for the coding of raw beef products should be developed so that information can be obtained relative to processing establishment(s), sources of raw materials and time of production.

References

1. Cross, H.R. 1992. Irradiation of poultry products. 9 CFR Part 381. Federal Register 57:43588-43600.
2. ICGFI. 1992. Ninth Meeting of the International Consultative Group on Food Irradiation. Inventory of product clearances. International Consultative Group on Food Irradiation, Joint FAO/IAEA Division, International Atomic Energy Agency, Vienna.

VIII. Research Needs

1. Recent research has indicated that the attachment of enteric pathogens involves a specific, genetically-controlled interaction between the bacterial cell surface and connective tissue. Further research is needed to confirm these observations and elucidate the underlying biochemistry of attachment. Potentially, this information could be used to develop enhanced methods for preventing contamination and/or enhancing the removal of enteric pathogens from raw beef.

2. One of the long standing questions with raw meat and poultry products has been the epidemiological significance of low numbers of infectious bacteria such as *Salmonella*, *Listeria*, and *E. coli* O157:H7. Recent biotechnological advances allow for the first time the active tracing of such foodborne pathogens from the farm, through the processing operations, and to ultimate isolation in a clinical setting. An active surveillance study should be undertaken to establish unequivocally the role of raw meat and poultry in transmission of human enteric diseases.

This research should be designed and conducted to identify the major points of introduction and/or dissemination of *Salmonella* and *E. coli* O157:H7. This information is needed to perform accurate hazard analyses and risk assessments to develop preventive measures on the basis of sound information.

The study should be conducted in a manner that permits acquisition of quantitative information of the levels of pathogens related to overt disease. While the establishment of an absolute Minimum Infectious Dose for individuals is not a reasonable