



RESEARCH AND EXTENSION

PROGRAM UPDATES AND HIGHLIGHTS

* STEAM PASTEURIZATION TO GREATLY REDUCE THE INCIDENCE OF PATHOGENS ON BEEF CARCASSES *

SITUATION:

Foodborne illness remains a serious problem. A report by the Council for Agricultural Science and Technology has estimated that foodborne diseases in the United States caused by pathogenic bacterial may cause as many as 9,000 deaths each year and 6.5 million to 33 million cases of diarrheal disease. The annual economic losses associated with foodborne disease may be as large as \$5 billion to \$6 billion.

Meat and poultry products are primary sources of foodborne illness worldwide. Several highly publicized foodborne illness outbreaks associated with meat-based products have prompted the USDA to totally change its meat inspection system, relying for the first time on scientific information, especially microbiology. This new system imposes microbiological guidelines for meat processors, including steps to be taken for antimicrobial intervention that will meet government standards for processing. Many types of interventions have been researched and even utilized, with varying and inconsistent degrees of success in reducing associated pathogens. Industry and consumers are demanding better methods of reducing pathogens on meat carcasses and in finished meat products.



THE RESEARCH:

Bacterial contamination of beef carcass surfaces is an unavoidable consequence of processing cattle into meat for human consumption. This contamination can come from processing equipment, workers, and the environment, but the primary source is the animal. The hide, hooves, intestinal contents, and milk can harbor large numbers of bacteria, some of which are likely to be pathogenic. Therefore, all such visible contamination must be removed from the surfaces of beef carcasses. Several methods have been used with varying success. New technology includes high temperature vacuum and steam pasteurization.

Hot water/steam vacuum systems are designed to remove visible spots of contamination from small areas on the carcass and are used to augment the traditional knife trimming. Steam pasteurization is a process whereby beef carcasses are placed in a slightly pressurized, closed chamber at room temperature and sprayed with steam that blankets and condenses over the entire carcass. This raises the surface temperature to 195°F or 200°F and kills nearly all pathogens. Carcasses then are sprayed with cold water.

THE IMPACT:

The commercial Steam Pasteurization System (SPS) provides beef processors with the most effective bacterial reduction technology available and will help them to meet newly established governmental microbiological standards. It also will provide an accurate, effective, and true critical control point to reduce microbiological risks in the beef slaughter process. Consumer groups are currently advocating SPS technology to improve meat safety.

The process effectively killed nearly 100 percent of pathogens deliberately introduced on the surface of meat, including *Escherichia coli*. Commercial testing at a meat-packing plant was equally successful. Other tests indicated an advantage to combining several methods. For example, knife trimming and/or steam spot vacuuming can be used to remove visible contamination before steam pasteurization.

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Four of the largest domestic meat-packing companies are using, have ordered, or are thinking about using SPS units. Projections are that 70 percent to 80 percent of all processed meat will be pasteurized within a few years.

Significant market pressures are influencing domestic and international wholesale buyers to develop meat products from steam-pasteurized carcasses, and all indications are that these market pressures will intensify. To date, nine units have been installed in some of the nation's largest beef-slaughter facilities, with over 50 additional large SPS units on order. Several other countries are evaluating or seeking approval for SPS incorporation into beef-slaughter operations.

ADDITIONAL INFORMATION:

Working with engineers from the Frigoscandia company, K-State Research and Extension is developing and verifying the small-scale SPS units for low-volume slaughter operations. A prototype unit has been installed, and microbiological testing carried out. The system has demonstrated good antimicrobial capabilities and industrial applicability. Smaller slaughter operations must meet microbiological standards, but they tend to have fewer intervention technologies at their disposal. As larger processors invest in sophisticated technologies, and as markets request products produced with those technologies to assure higher levels of food safety, smaller processors face stiff competition. A less costly semi-manual version of SPS can be obtained by smaller processors to allow them to effectively compete. Additionally, the international market is comprised of predominantly smaller processors who would utilize the smaller SPS version.

Another steam delivery system is being designed to decontaminate raw meat trimmings destined for grinding operations. A significant percentage of meat-borne bacterial illness can be traced to comminuted products, which makes this research critical to further reducing consumer risks. Preliminary studies have shown the efficacy of the process, with more studies planned.

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Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, Kansas

MF-2314

January 1998

Issued in furtherance of Cooperative Extension Work, acts of May 8 and June 30, 1914, as amended. Kansas State University, County Extension Councils, Extension Districts, and United States Department of Agriculture Cooperating, Richard D. Wootton, Associate Director.

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File Code: Foods and Nutrition-5

SM 1-98-2000