Risk Assessment for Food Safety: Application and Evaluation of HACCP in Hog Slaughter and Processing

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Summary and Implications

Under new regulations issued in July 1996, the federal government requires meat processors to put hazard analysis and critical control point (HACCP) systems in place, to conduct periodic tests for microbial pathogens, and to reduce the incidence of pathogens. The new regulations shift greater responsibility for deciding how to improve food safety in the processing sector to processors themselves. The intent of the new regulation is to promote more efficient resource allocation in food safety improvement by reducing inputs in control and improving food safety outcomes. This study evaluates the marginal costs and effectiveness of HACCP and technologies designed to reduce pathogen contamination of product. An economic optimization model and preliminary data show costs of pathogen control rise with increased levels of control, although the costs of intervention per carcass are small in comparison to total costs of processing. By looking at the plant process with technology-specific data, this study obtains improved estimates of the cost-effectiveness of improvements in the food safety of meat processing.

The research addresses the need for information about the marginal costs and benefits of controlling pathogens in pork slaughter and processing, the costs and efficiency of HACCP, and the need to improve risk assessment methods related to improved pork food safety at the processing level in the food chain.

Introduction

New food safety regulation mandates the use of HACCP and collection of data during slaughter and processing on *Salmonella* and generic *escherichia coli* O157:H7. To understand how mandating the use of HACCP will influence food safety in pork and the meat industry, this research investigates the impact of HACCP on the costs of producing meat products with particular safety levels. In the initial work reported herein, we specifically address: (a) the structure of costs incurred by the firm in applying interventions to control food safety in meat processing; (b) new data on the cost and effectiveness of selected food safety interventions in pork processing; and (c) an economic framework for choosing optical sets of interventions. The intent is to provide basic information on the marginal costs associated with improved pathogen control at the plant level. We describe results on pork processing (also see 3); Jensen, et al. (4) present a related study on beef.

Results and Discussion

Data regarding pathogen reduction in pork processing are drawn from published studies. Dickson (1) reported reductions in total aerobic bacteria and total enterics for water rinses at different temperatures and with or without sanitizing sprays; data regarding the carcass pasteurizer are available from Gill, et al. (2). In the Dickson study (1), carcasses were inoculated with relatively high levels of pathogens, whereas they were not in the Gill, et al. (2). Dickson (1) showed that higher reductions occur as water temperature increases and as rinses were combined with sanitizing sprays, and that reductions were generally up to one-half of the initial levels. Gill, et al. (2) showed that the carcass pasteurizer virtually eliminates the lower levels observed during processing.

An economic optimization model was constructed that minimizes costs of achieving a particular pathogen standard, subject to the costs and effectiveness of various technologies (see 3). The model chooses the least cost set of possible interventions to achieve the level of control. For example, the model was implemented for the set of rinse and spray interventions at different temperatures, and chooses 10 different optimal combinations of activities as pathogen standards were tightened, with corresponding costs increasing from 3 to 47 cents per carcass.

An additional cost of 20 cents for hot water rinses and sanitizing sprays represents an increase of less than 1% (0.7–0.9%) of processing costs. The highest cost optimal combination estimated for pathogen reduction would be 47 cents, a cost representing 1 to 2% of total processing costs. Although total costs of HACCP would include monitoring and testing costs not covered in these estimates, the new food safety control technologies for large plants represent a relatively small potential increase relative to other determinants of cost variation in the industry, such as scale or number of shifts. In a competitive industry, however, achieving efficiency in meeting the new regulation represents a significant challenge to firms.

References

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