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BY MARY K. MUTH

The Price of Food Safety:

The Real Economic Effects of a Major Food Safety Regulation on Meat and Poultry

Meat and poultry plants widely expected to face increased costs under a 1996 USDA food safety regulation. Did costs increase? If so, how much? How have meat and poultry plants of all sizes fared?

The purpose of the U.S. Department of Agriculture's 1996 pathogen reduction/Hazard Analysis and Critical Control Point (PR/HACCP) regulation is to ensure safer meat and poultry products for consumers. HACCP requires plants to conduct a hazard analysis to identify potential food safety hazards, and to develop and implement a plan for monitoring and controlling these hazards to improve food safety. The final regulation also required the USDA to evaluate the effects of the regulation on food safety and on the regulated producers after implementation of the regulation.

The regulation required plants to implement PR/HACCP on a staggered schedule. Large plants with more than 500 employees

Figure 1

Exit Rates for Federally Inspected Meat and Poultry Plants

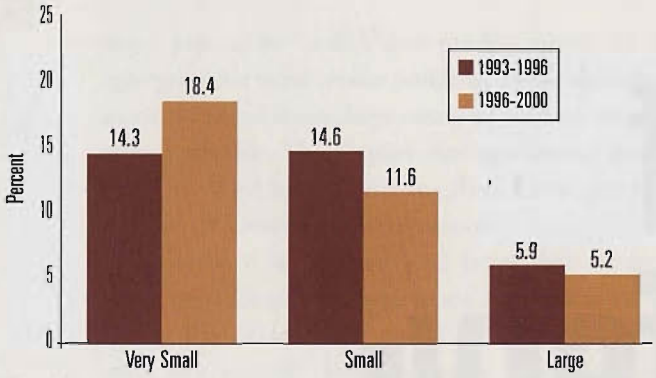


Figure 2

Entry Rates for Federally Inspected Meat and Poultry Plants

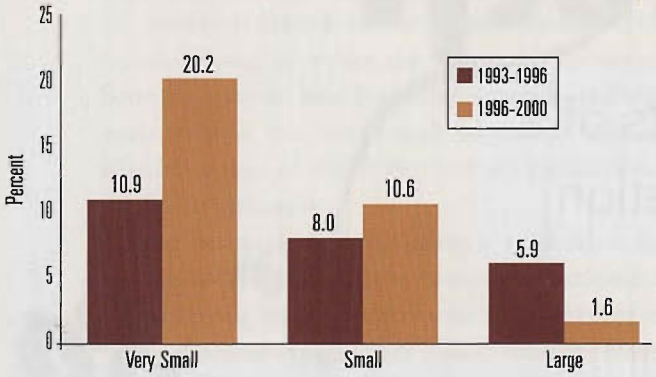
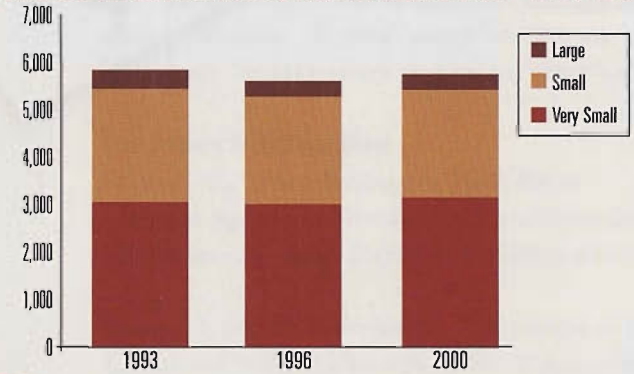
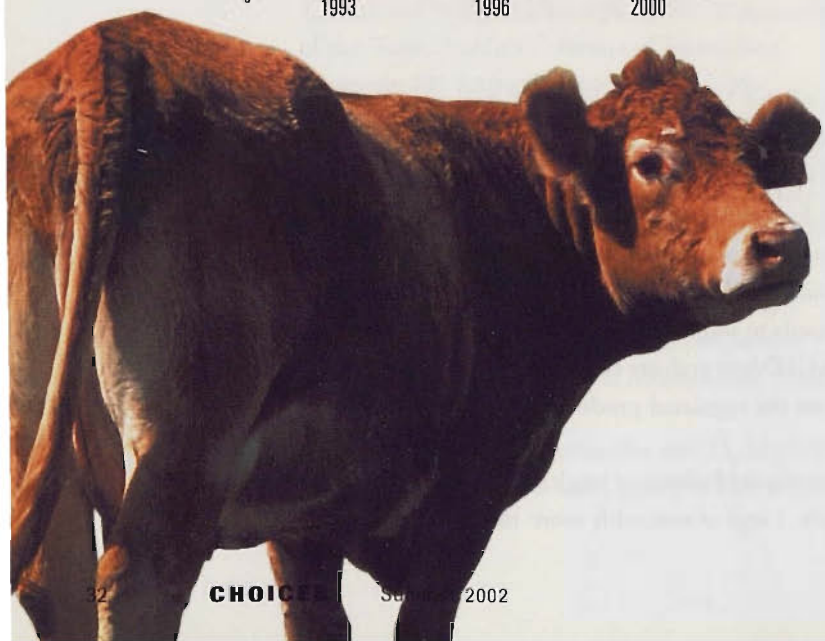
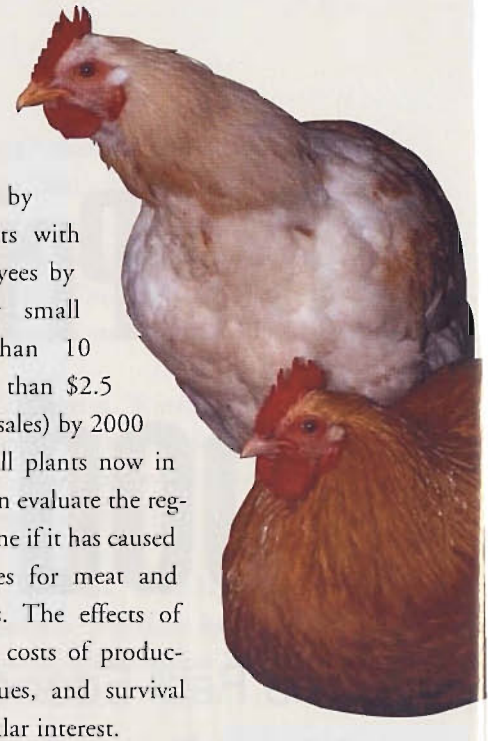


Figure 3

Number of Active Federally Inspected Meat and Poultry Plants







had to comply by 1998, small plants with 10 to 500 employees by 1999, and very small plants (fewer than 10 employees or less than $2.5 million in annual sales) by 2000 (Table 1). With all plants now in compliance, we can evaluate the regulation to determine if it has caused substantial changes for meat and poultry producers. The effects of the regulation on costs of production, plant revenues, and survival rates are of particular interest.

In late 2000 and early 2001, Research Triangle Institute conducted 27 interviews to obtain qualitative information about the changes that the regulation has brought to meat and poultry slaughter and processing plants. The purpose of the interviews was to obtain information on a broad range of cost and revenue effects, including those that cannot be quantified easily.

Individuals interviewed represented different viewpoints, but were generally in agreement regarding the overall effects of the regulation. The individuals included representatives of meat and poultry trade associations, university extension faculty, Food Safety and Inspection Service (FSIS) district managers, FSIS's Technical Service Center staff, and plant managers with knowledge of their own operations. The individuals interviewed were familiar with a range of plant sizes, meat and poultry species, processing and slaughter plants, and different regions of the country.

In general, we found that the required changes in meat and poultry plants have increased costs of production but have not substantially affected plant revenues. However, the regulation was implemented during a time of economic prosperity, so plants may have been able to absorb the additional costs of the regulation.

We Have Seen the Future, and It Is More Expensive

Operating costs have increased because plants installed new capital equipment, modified their layouts, hired additional employees, increased training for employees, increased chemical and water use, and added pathogen testing identified as necessary in their hazard analyses.

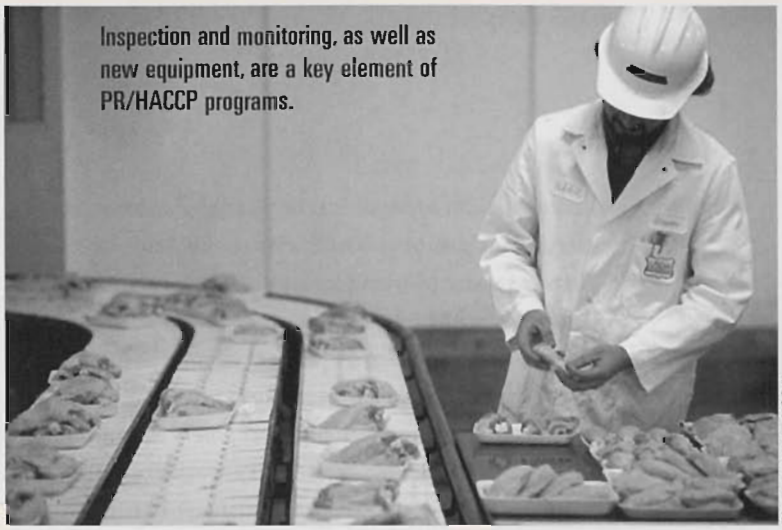

Inspection and monitoring, as well as new equipment, are a key element of PR/HACCP programs.

Photo courtesy USDA.

Costs have also increased because of the steps plants have taken to reduce the possibility of product recalls.

Larger plants in particular have installed additional capital equipment and upgraded existing capital equipment. Some have installed equipment such as steam pasteurization systems and organic acid rinse cabinets to reduce pathogen levels in meat and poultry products. In some cases, the PR/HACCP regulation accelerated capital equipment changes that plants would likely have made over time.

When plants install new capital equipment, they incur the costs of purchasing the equipment. They may also incur additional operating costs into the future. When plants replace older equipment with new equipment, the rate of output and operating efficiency generally increase. This in turn reduces unit operating costs. Thus, if plants install more efficient equipment because of PR/HACCP, they may mitigate some of the cost effects. However, new equipment that supplements existing equipment frequently increases costs for electricity, gas, water, and labor.

Smaller plants have generally made fewer major capital equipment changes. Their modifications in capital equipment are often made because they find they are not properly controlling the hazards identified in their hazard analyses. Large as well as small plants have purchased minor pieces of equipment such as digital thermometers, electronic temperature recording devices, and data storage devices. The manager of one very small plant estimated the costs of minor capital equipment purchases at $1,500.

In addition, some plants have incurred costs to modify the plant layout. Changing the layout helps reduce the possibility of cross contamination between raw and cooked products by altering foot traffic and airflow patterns. In addition, plants made alterations to facilitate record-keeping and production-line applications of antimicrobial chemicals and products.

Labor costs have increased, because plants have found it necessary to hire additional employees and to conduct additional training to help workers understand their responsibilities under PR/HACCP. Larger plants have hired additional workers for monitoring activities, maintaining records for verification, and operating additional equipment. Some also operate their own testing facilities. The managers of large processing plants estimated additional labor requirements at approximately 35,000 hours per year (or two percent of total labor hours). Smaller plants typically responded to the regulations by adding one to two hours per day to the activities of an existing employee.

Employee training costs for PR/HACCP have increased across all plant sizes. One respondent estimated that some large plants have 10 to 12 workers who have taken a standard three-day course on PR/HACCP offered by trade associations or university extension specialists. In larger plants, as many as

Table 1
PR/HACCP Implementation Schedule for Meat and Poultry Plants

Implementation Date	Affected Plant Sizes	Implementation Requirements
January 1997	All plants	Sanitation standard operating procedures (SSOPs) Generic E. coli carcass testing
January 1998	Plants with more than 500 employees (large)	HACCP Salmonella testing on selected raw products
January 1999	Plants with 10—500 employees (small)	HACCP Salmonella testing on selected raw products
January 2000	Plants with fewer than 10 employees or less than $2.5 million in annual sales (very small)	HACCP Salmonella testing on selected raw products

three different types of training may be conducted.

In contrast, very small plants generally have only one or two employees formally trained in PR/HACCP (such as the owner or the owner's spouse), and rely on on-the-job training or direct observation to train other workers. For all plant sizes, training needs are continuous because of high employee turnover and frequent changes in regulatory requirements. The number of training hours are estimated at four to 12 hours per year for HACCP monitors and two to eight hours per year for production-line employees.

For all plant sizes, training needs are continuous because of high employee turnover and frequent changes in regulatory requirements.

Costs for chemicals — mostly antimicrobials and sanitizers — have increased, because more of these products are used. Plants have increased the number of different products as well as the volume of products used. Some plants rotate products to help prevent bacteria from becoming resistant to the products. One respondent said that processing plants are using "anything and everything" to combat *Listeria monocytogenes,* particularly on direct food contact surfaces.

More sanitizers and sanitizing equipment requires more water, particularly in slaughter plants. Increased water use increases plant costs because of the direct costs of the water and the associated costs of waste treatment. One respondent said that poultry plants have increased water consumption from approximately six gallons to 9.5 gallons per bird. For a large plant handling 250,000 birds per day, increased water use may cost $900,000 more per year (approximately one cent per bird).

Slaughter plants have increased pathogen testing because of the requirements for generic *E. coli* carcass testing. Many plants have also increased testing because they identified other pathogens of concern in their hazard analyses. In particular, many plants now test for *Listeria monocytogenes* in ready-to-eat (RTE) products. Many plants also conduct companion sampling of their products when FSIS takes samples for *Salmonella* and *E. coli* O157:H7. Plants are also taking swabs for testing processing equipment and testing incoming meat and poultry ingredients. Respondents said that increased testing has been the most costly of all changes made because of the PR/HACCP regulation. However, many smaller plants do no product or environmental testing beyond USDA's own testing and thus incur little or no cost.

The PR/HACCP regulation has also increased costs because of increased product waste and increased product recalls. In theory, product recalls should decline with PR/HACCP because plants have more control over their processes. In actual practice, recalls have increased because FSIS has increased pathogen testing and because the methods of testing for pathogens have become more sensitive. Recalls result in reduced revenues because of unsalable products and increased costs associated with disposal. Some respondents said that PR/HACCP has made it easier for plants to deal with recalls, because they now have recall plans. Some plants have also decreased lot sizes and coded products to minimize the amount of affected product and made changes in how they reuse partially processed products.

You Have to Spend Money to Make Money...Sometimes, You Just Have to Spend Money

Most evidence indicates that the PR/HACCP regulation has had little effect on plant revenues. Consumers expect meat and poultry products to be safe but cannot directly observe the level of safety. Product labels do not indicate the product was produced under a HACCP system. Thus, firms are generally not able to charge more for safer foods. Interview respondents reported that product prices and potential buyers of their products have not changed because of PR/HACCP. However, revenues may have declined for some smaller plants because they have decreased the number of products they produce.

Improved product quality and safety under PR/HACCP appear not to be reflected in the prices received for meat and poultry products because, according to several respondents, the market is "too competitive" to pass along any increased costs associated with the regulation. Any increase in prices aimed at recovering the costs of PR/HACCP would cause customers to buy from companies that did not increase their prices. If the incremental costs of PR/HACCP are lower for the largest companies, then the price increase required to

cover their costs is lower for them than for smaller companies. Several respondents thought the strong economy of the late 1990s had helped "hide" some of the economic effects of the PR/HACCP regulation.

Even prior to PR/HACCP, some buyers, particularly fast food restaurant chains, required some form of HACCP in their suppliers' plants. Thus, whether a plant had HACCP in place affected its access to these buyers. Now that all plants are required to have PR/HACCP, all plants may have access to these buyers.

Although large plants have made few, if any, changes in the types of products produced, very small and small plants have made some. Smaller plants have experienced greater effects because they produce a greater number of different products, each requiring a separate HACCP plan, and because they may lack the expertise to validate the critical limits (such as required heating temperatures and duration) for each product.

Some plants have stopped producing ground meat products in an effort to avoid *E. coli* O157:H7 hazards. Others have stopped producing RTE products because of concerns regarding *Listeria*, and to avoid the expense associated with *Listeria* testing. Still others have stopped producing low volume, specialty, seasonal, and ethnic products that were already minor products in their revenue streams. Finally, some processors have stopped slaughtering and now purchase boxed beef or pork inputs for use in processing.

How Much More Expensive? Evidence of the Real Economic Effects

Interviews with industry representatives and experts make it appear that the PR/HACCP regulation has increased the cost of producing meat and poultry products, but has had minimal effects on revenues obtained for meat and poultry products. Interestingly, plant representatives told us that even with all of the evidence cited above, they believe the PR/HACCP regulation has had positive effects on their operations. In particular, they said that the PR/HACCP regulation has raised food safety awareness, and the processes they have implemented give staff better direction and organization. They believe their plants produce better products.

The ultimate evidence of the real economic effects of the PR/HACCP regulation on meat and poultry plants is whether they have become unprofitable to the point of closing because of the regulation. Overall, plant closures did not increase substantially during the implementation period. The rate of plant closures for small and large plants actually decreased, as indicated in Figure 1. The rate of closures increased for very small plants, but the rate of very small plant openings increased even more (Figure 2). Overall, as shown in Figure 3, the number of federally inspected plants has been relatively stable. This suggests that the real economic effects of the PR/HACCP regulation on meat and poultry producers have not been large.

For More Information

Research Triangle Institute. "PR/HACCP Rule Evaluation Report: Economic Productivity Changes in Meat and Poultry Slaughter and Processing Plants Since the 1996 PR/HACCP Final Rule." Briefing paper prepared by for USDA/FSIS. September 28, 2001. (Available from the author.)

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Mary Muth is with the Research Triangle Institute.

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