SECTION THREE

PREVIOUS SURVEYS OF MANUFACTURING PRACTICES
IN THE FOOD INDUSTRY

In the last few years, a number of surveys have evaluated the state of current manufacturing practices in the food industry. Although most of these surveys are limited in scope, the combined data may assist FDA in identifying various areas of concern and in supporting its own findings regarding food safety practices of the industry. For example, results from several of the surveys indicate that small manufacturers are less likely to have certain food safety practices in place than larger manufacturers. The importance of employee training also appears to be a common theme in some of the survey results.

Table 3-1 summarizes the characteristics of eight industry surveys identified, including survey mode, sample size, and response rate. The following sections discuss the findings of each survey in more detail.

3.1   Meat and Poultry *Listeria* Reassessment Survey

The Meat and Poultry *Listeria* Reassessment Survey was designed to determine the industry response to a 1999 Federal Register (FR) Notice requesting that meat and poultry plants reassess their Hazard Analysis and Critical Control Point (HACCP) plans for *Listeria monocytogenes* (*Lm*) contamination control (Federal Register 64, 1999). The survey was sponsored by the American Association of Meat Processors (AMI), National Chicken Council (NCI), National Meat Association (NMA), North American Meat Processors (NAMP), American Meat Institute (AMI), National Food Processors Association (NFPA), and National Turkey Federation (NTF), whose members answered a three-page questionnaire on their response to the 1999 FR Notice. Survey respondents included mostly small or very small establishments. Only one-third of the survey respondents were large establishments.

Survey results showed that almost all establishments (98 percent) responded to the 1999 FR notice with a reassessment of their HACCP plans for *Lm* contamination control. More than a third of the responding plants indicated adding critical control points. In addition, roughly two-thirds of plants reported having end-product testing programs for *Lm* and almost all plants (90 percent) reported using environmental testing. Among all responding plants, very small plants conducted the least testing. Survey

Table 3-1: Industry Surveys of Manufacturing Practices

Year	Mode	Sample Frame	Response Rate
Meat and Poultry *Listeria* Reassessment Survey (NFPA et al., 2000)			
2000	Mail	Trade group member companies	91% (277/303)
Evaluation Report *Listeria* Reassessment (USDA/FSIS, 2000)			
2000	Email	30 Randomly selected large and small food plants	NA
Food Processing 2002 Manufacturing Trends Survey (Ennen, 2002)			
2002l	Email	Readers	NA
Food Processing 2003 Manufacturing Trends Survey (Ennen, 2003)			
2003	Email	Readers	NA
Food Processing 2004 Manufacturing Trends Survey (Fusaro, 2004)			
2004	Email	149 Readers from circulation list	NA
3rd Annual Best Manufacturing Practices Survey (Gregerson, 2002)			
2002	Mail	Readers	13% (130/1,000)
2nd Annual Best Manufacturing Practices Survey (Morris, 2001b)			
2001	Mail	Readers	13% (132/1,000)
1st Annual Best Manufacturing Practices Survey (Morris, 2000a)			
2000	Mail	Readers	11% (112/1,000)
A Survey of Automation Practices in the Food Industry (Ilyukhin et al., 2001a)			
2001	Mail	U.S. food manufacturers (as well as system integrators and equipment suppliers)	54% (27/50)
A Survey of Control System Validation Practices in the Food Industry (Ilyukhin et al., 2001b)			
2001	Mail	U.S. food manufacturers (as well as system integrators and equipment suppliers)	54% (27/50)
A Survey on the Use of Computer-Integrated Manufacturing in Food Processing Companies (Aly, 1989)			
1989	Mail	Food processing companies in central California	32% (31/98)
FDA HACCP Survey (Muth et al., 2001)			
2001	Mail/phone	U.S. food manufacturers and repackagers	32% (595/1,142)
Survey of Practices of Maryland Cider Producers (Senkel et al., 1999)			
1999	Mail	U.S. cider producers	100% (11/11)

results also showed that the majority of plants respond in some way when environmental testing limits are exceeded, most commonly by intensifying sanitation. Overall, while most manufacturers had appropriate programs in place prior to the reassessment, many refined their programs as part of reassessment.

3.2   *Listeria* Reassessment—Evaluation Report

The Food Safety and Inspection Service (FSIS) of the United States Department of Agriculture (USDA) also conducted a short study of 30 randomly selected large and small plants to investigate activities undertaken in response to the 1999 FR Notice. For the study, FSIS supervisory inspection personnel were questioned by email regarding the actions of plants they inspected.

All 30 of the large and small establishments sampled reviewed their HACCP plans in response to the notice, discussed the notice with plant personnel, and documented their reassessment in their hazard analyses. Approximately three-fourths of the establishments modified their HACCP plans. Of these, half of the plants added or modified critical control points in their HACCP plans, a third added or modified verification activities, and one-fourth added or modified corrective actions. Establishments also viewed *Lm* as a sanitation issue, with about two-thirds of the establishments reviewing their sanitation standard operating procedures (SSOP) programs.

Outside of HACCP and SSOP plans, almost half of plants had taken actions in response to the 1999 FR Notice, such as training, product or environmental testing, adding sanitizers, developing abatement programs, adding floor foamers and citric acid, modifying packaging rooms, adding footbaths, increasing handwashing, providing special clothes, conducting repairs to improve sanitation, doing new construction, and increasing anti-microbial additives. According to the survey, approximately two-thirds of the establishments conduct some form of environmental testing at a minimum on a weekly basis. Fewer than two-thirds typically conduct product testing once per quarter.

3.3   *Food Processing* Magazine's Annual Manufacturing Trends Survey

Each year, *Food Processing* magazine surveys food manufacturing professionals regarding their beliefs about important upcoming issues in the industry and plans for the following year. We reviewed the last three surveys available.

In the 2002 and 2003 surveys, food safety was the top and growing concern, with the events of September 11 having accelerated these concerns. The 2002 survey did not cover many food safety practices, but reported that many of the respondents were increasing security at their plants by securing physical facilities and improving employee identification and surveillance. In 2003, improving security was also a top concern, with 78 percent intent on improving facility security. Roughly half of those

surveyed have added surveillance initiatives and increased background checks during that year. In addition, while the majority of respondents reported responding to the current food safety concern with employee training, roughly three-quarters indicated an intent to either institute a HACCP plan or modify their existing HACCP plan. More than half of the respondents indicated that their companies planned to improve pest control and that they have augmented or will be augmenting, sanitation equipment.

In the 2004 survey, food safety continued to be the top concern for manufacturers. Almost all respondents reported that they would take additional steps to improve food safety, with the majority of respondents mentioning training as the most important factor in improving sanitation. Many respondents also mentioned HACCP programs and improved pest control. Sanitary equipment and rapid microbial detection systems were mentioned less frequently, but many manufacturers use them. Other steps undertaken by food processors to improve food safety included reevaluation of HACCP programs (6.8 percent), improved traceback to suppliers (3.5 percent), bioterrorism training (3.4 percent), and more metal detection (2.7 percent).

3.4   *Food Engineering* Magazine's Annual Best Manufacturing Practices Surveys

Each year, *Food Engineering* magazine surveys its readership to determine current best manufacturing practices. We reviewed the last three surveys available.

Overall, survey results were very similar from year to year. An analysis of survey responses showed that supervised on-the-job training is the most widely used training method in the industry. Other popular methods included onsite classroom training, vendor training programs, and cross-training in various skills. The number of plants practicing reactive maintenance is relatively high across all survey years, oscillating between slightly less than and somewhat more than one-third from year to year. In all years, however, the majority of plants surveyed applied preventive or predictive maintenance programs. In 2000, survey results indicate that HACCP has been voluntarily implemented in more than two-thirds of plants in each industry segment other than meat and poultry, in which HACCP is mandated. However, fewer than 10 percent of plants with HACCP programs had people appointed to manage the HACCP plans; half the plants that did have such managers were meat processors.

The 2002 survey also asked respondents to comment on the efficacy of the practices in use, in addition to providing information on best practices. As might be expected, most respondents (84 percent) characterized their reactive maintenance programs as inefficient. Meanwhile, more than half (56 percent)

of those practicing routine preventive maintenance considered their programs efficient. While anti-microbial treatments and rapid microbial detection systems were not frequently used, plants that used these systems rated them very highly. HACCP programs were rated as very useful, although less so than anti-microbial treatments and rapid microbial detection systems. Few of those employing voluntary HACCP programs expressed disappointment with the programs (2 percent compared to 14 percent of those that implemented mandated HACCP programs). Contrary to other findings, training was only found to be very useful by one-third of plants using it to improve food safety. On the other hand, sanitary equipment was found to be very useful by more than half of plants that recently added such equipment to their locations.

3.5   A Survey of Control System Validation Practices in the Food Industry

Digital control systems, which have increased in use in recent years, require proper validation to prevent serious failures. Ilyukin et al. (2001a) attempted to determine who conducts control system validation at food manufacturing plants and how it is done with an industry survey.

While validation of control systems should be part of a good manufacturing practice program, less than a third of food plants responding to the survey considered themselves responsible for control system validation. The majority of food plants surveyed delegated this responsibility to a third party, such as an equipment supplier, system integrator, or consulting firm. While most food plants that reported not having validation plans would like to establish such plans, up to a quarter indicated that they would never develop them.

Moreover, less than a fifth of food plants reported requesting validation records from the third-party who conducted the validation. Most equipment suppliers and system integrators reported keeping these records and could provide them to their customers. Slightly more than 10 percent of food manufacturers generated and kept validation records themselves. Training on control systems was conducted either by manufacturers (29 percent) or by third-party firms. Roughly one-third of plants surveyed had formal control system maintenance plans in place, and the rest had informal plans.

3.6　Automation Practices in the Food Industry

Ilyukhin et al. (2001b) conducted a survey of food manufacturers, system integrators, and equipment suppliers to determine the state of automation practices in the food industry. The majority (59 percent) of food manufacturers reported that their plants were mostly automated. Ilyukhin (2001b) found that the level of automation was correlated with annual production. Almost all plants with smaller annual production volumes reported a desire to increase automation. The biggest obstacles to automation reported were time and cost.

The level of automation varied by operation. Among the responding plants, processing was automated at 94 percent of food manufacturing operations and packaging was automated at 82 percent. Automation was used in less than half of the plants surveyed for raw material processing, post process handling and inspection, and warehousing and storage. The type of automation used (type of processor, software, sensors, transmission technology, etc.) varied widely. Almost a quarter of food manufacturing plants used computer integrated manufacturing for HACCP.

3.7　Survey on the Use of Computer-Integrated Manufacturing in Food Processing Companies

Aly (1989) conducted a survey of 98 food processing companies located between Sacramento and Fresno in central California. The questions in the survey addressed eight key computer-integrated manufacturing (CIM) functions, namely accounting, production planning, distribution management, computer-aided manufacturing, quality control, materials handling, maintenance scheduling, and design.

Of the CIM functions surveyed, the three most commonly used were accounting (98.6 percent), production planning (77.4 percent), and distribution management (45.2 percent; this category includes such functions as order processing, sales inventory, shipping, and invoicing). Computer-aided manufacturing was used by less than half of companies, with most using it to monitor package weights. A very small number used robots. Further, while the percentage using CIM in quality control was small, more use of this CIM function is expected in this area in the future due to current emphasis on quality. Only a small minority use the other CIM functions surveyed. Aside from the eight functions addressed in the survey, CIM functions used by a small number of survey participants included engineering, scheduling, and process control. Survey results also indicated that 66.7 percent of companies not currently using CIM in their plants are considering use of CIM in the future. Cost has been an obstacle for the majority of companies.

3.8   FDA HACCP Survey

In 1998, FDA conducted an industry survey to determine HACCP practices of food manufacturing facilities in six FDA-regulated industries. For the survey, each of the six industries was further stratified into large and small plants. Plants were contacted by phone and asked questions about their HACCP plans (including training, planning, and implementation), the level of documentation of sanitation practices and procedures, performance of microbiological testing and other monitoring practices, and verification of specific sanitation procedures such as pasteurization.

The survey found significant differences between small and large plants. In general, large plants were more likely to have HACCP practices, sanitation processes, or other food safety procedures in place than small plants. HACCP training was also more likely in large plants. In plants that conduct HACCP training, managers and quality control personnel were the most often trained, but production workers were also trained in over half of plants. Training was most often administered by an industry trade group. Surveys results also indicated that large plants are more likely to be familiar with HACCP than small ones. At the time the survey was conducted (1998), more than half of the plants surveyed had not implemented HACCP and had no intention to do so if not required by FDA. Overall, about 76 percent of plants had written sanitation programs and 78 percent had written records that verified sanitation inspections. Small plants were unlikely to have these systems in place.

3.9   Survey of Maryland Cider Producer Practices

In 1999, Senkel et al. (1999) conducted a survey to evaluate the manufacturing practices of Maryland cider producers. Eleven cider producers were mailed a survey, which included questions about raw material sourcing and sanitation controls. Cider producers were then invited to a training program focused on *E. coli* contamination, HACCP, sanitation procedures, and GMPs.

The survey indicated that the majority of cider producers purchase some or all of their apples from neighboring states. A few make use of windfall apples, using only washers/scrubbers to clean them. While many (7 out of 11 producers) reported washing and brushing apples only prior to milling, a few also reported sanitizing apples after cleaning and before milling. Most producers reported using the traditional hydraulic press with rack and cloths. A few producers use preservatives, but only one reported pasteurizing the cider. None allow fermentation of the cider before distribution or sale and almost all

refrigerate the finished product at temperatures between 0.6 and 7.2 Celsius. While all producers reported washing and sanitizing equipment, a few did not always sanitize equipment between uses.

Evaluation after the training program indicated that producers implemented controls from the HACCP plans, but did not adapt any GMPs, or SSOPs, or keep any monitoring records. While none of the major pathogens were found in in-line samples, generic *E. coli* was found. Given that the generic *E. coli* was not found on the raw materials, in-plant processing contamination likely occurred, indicating a need for GMPs and SSOPs in addition to HACCP controls to ensure product safety.

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