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Food Protection Trends

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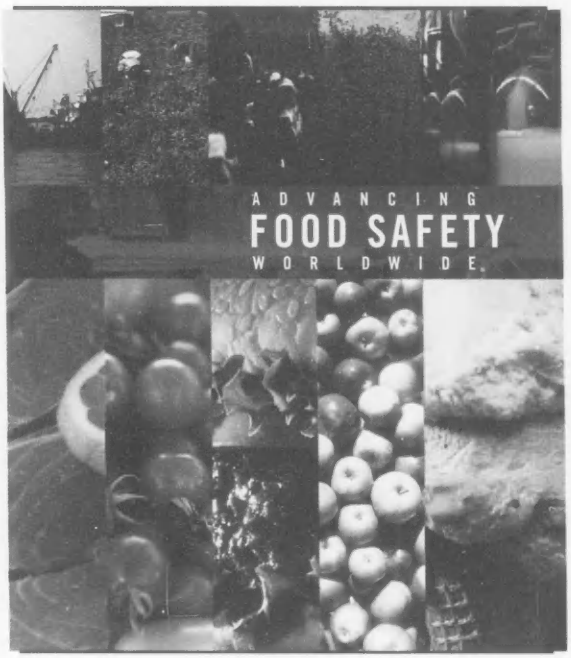

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International Association for Food Protection

FOOD PROTECTION TRENDS

VOLUME 28, NO. 1

ARTICLES

ASSOCIATION NEWS

DEPARTMENTS

EXTRAS

A NOTE FROM THE *FPT* PRODUCTION EDITOR...

It is with great pleasure that I announce the new scientific editor for *Food Protection Trends*, Dr. David Golden.

Dr. Golden is an Associate Professor in the Department of Food Science and Technology at the University of Tennessee in Knoxville. If you have concerns or recommendations regarding *Food Protection Trends*, please contact Dr. Golden.

Manuscript submission activity has remained steady since 2006. Thirty-three manuscripts were submitted in 2007, with six papers rejected.

The vision of several committee members and readers has inspired a new cover design for the 2008 volume of *Food Protection Trends;* one that will better reflect the scientific nature and content of the journal.

We welcome at all times your comments and suggestions on how to serve you better.

Donna A. Bahun, Production Editor

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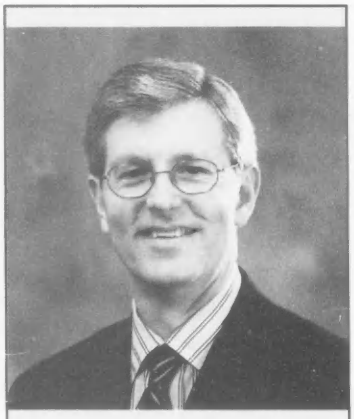


By GARY ACUFF
PRESIDENT

"One of the best qualities of IAFP membership is that the Association is focused on food protection"

Levelland, Texas. That's where I grew up. Likely, you have already gathered from the name that it is not a mountainous place. In fact, if you are reading this on a table top, you are viewing a fairly accurate model of the typical Levelland terrain. It is very flat and obviously not one of the garden spots of the world, but it does have its positive aspects. For example, some of the best sunsets you'll ever see are in that part of the country—that's because there are very few of those pesky trees to get in the way of the view. And the people there are nice—there is really not much to do there but be nice. Well, I am just a few lines into this article and already side-tracked. What I intended to write about was one of my friends in Levelland. Actually, I want to talk about his mother. In junior high he mentioned to me once that his mother was a very cautious driver and would not turn left. Seriously, she would not turn left. And we are talking about Levelland—there is not a lot of traffic to deal with in Levelland. Anyway, I didn't really believe him and didn't think much about it again until I rode home from school with him one day. Sure enough, his mother drove right past the intersection where I expected her to turn left and proceeded one more block. Then after three right turns, she was heading the right direction. How ridiculous, I thought. I couldn't imagine anyone being that paranoid. Of course, that line of thinking apparently comes naturally for teenagers, as I have discovered in my attempt to raise two. Later in life, I have remembered this story and thought I was wrong to be so hasty in my conclusion that my friend's mom was being too cautious. She got where she wanted to go, and she did it her way—and felt very confident and comfortable in the way she did it.

What does this story have to do with IAFP? Several things. I think one of the aspects I like most about being a member of IAFP and attending the Annual Meeting is getting to meet people who are working in the same area of research that interests me. There are opportunities to read about their research in the *Journal of Food Protection*, talk to them at poster sessions at Annual Meetings, and hear them speak in symposia. But what I really enjoy is getting a chance to talk with them one-on-one in a casual setting (maybe at one of the many evening receptions) to discuss their findings and their methodology. Here's the best part: many times I find someone who works in a research area almost identical to mine but who has utilized a completely different methodology and experimental design. A confirmation of results obtained in my laboratory from a different lab using different methods always initiates a great discussion. In other words, it may look to me like they made three right turns to get where they were going, but we ended up with similar results.

One of the best qualities of IAFP membership is that the Association is focused on food protection. Members are interested in food safety research from all parts of the globe, different points of view, multiple methodologies—whether you use a left turn or a "three-right-turn" process to get your research results, you can find someone in IAFP who is interested and someone who wants to discuss your views and philosophy. The IAFP mission statement is *to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply*. That means there are people in IAFP who are interested in what you do—regardless of whether you work in an academic, industry or regulatory position. The exchange

of scientific knowledge, ideas and philosophy are at the heart of IAFP membership, and I can't imagine how one progresses in this field without the intellectual assistance and discussion of colleagues with similar goals and objectives.

The Annual Meeting is a great place to exchange ideas, meet new colleagues, hear about cutting-edge research, and find out what is of concern and interest to others in the field of food protection. If you are like me, your summer schedule fills up quickly, and it is important to lock in dates on your calendar before it is too late. Let me encourage you now to make plans to attend the Annual Meeting this year in Columbus, Ohio. The IAFP staff and local Ohio affiliate have been working for quite a while now preparing for the 2008 meeting. Did you know that Columbus is the 15th largest city in the US? It is centrally located, which will make transportation easy, and I think you will find that the hotel rooms are going to be very reasonably priced this year. The city has outstanding convention facilities with a wide variety of restaurants close by for evening gatherings with colleagues. Basically, Columbus is going to provide a great setting for our meeting, and if you bring your family along there will be plenty of activities for them as well—from first class shopping to outstanding golf courses and the world famous Columbus Zoo. You won't want to miss this opportunity.

So if you catch yourself thinking that nobody is interested in your research or your point-of-view, that's where you would be wrong. Come to the meeting and see for yourself. I guarantee you will not want to miss another meeting and it will become part of your annual summer schedule.

Let me know if you have any comments or suggestions for IAFP or the Annual Meeting. I value your feedback—even if you don't like to turn left.

Is Your Program Crumbine Material? Put it to the Test!

The Samuel J. Crumbine Consumer Protection Award for Excellence in Food Protection at the Local Level is seeking submissions for its 2008 program. Achievement is measured by:

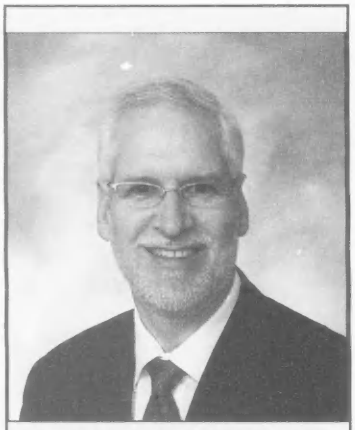
- Sustained improvements and excellence, as documented by specific outcomes and achievements, over the preceding four to six years, as evidenced by continual improvements in the basic components of a comprehensive program;
- Innovative and effective use of program methods and problem solving to identify and reduce risk factors that are known to cause foodborne illness;
- Demonstrated improvements in planning, managing, and evaluating a comprehensive program; and
- Providing targeted outreach; forming partnerships; and participating in forums that foster communication and information exchange among the regulators, industry and consumer representatives.

All local environmental health jurisdictions in the U.S. and Canada are encouraged to apply, regardless of size, whether "small," "medium" or "large."

The Award is sponsored by the Conference for Food Protection, in cooperation with the American Academy of Sanitarians, American Public Health Association, Association of Food and Drug Officials, Foodservice Packaging Institute, International Association for Food Protection, International Food Safety Council, National Association of County & City Health Officials, National Environmental Health Association, NSF International and Underwriters Laboratories, Inc.

For more information on the Crumbine Award program, and to download the 2008 guidelines and previous winning entries, please go to www.fpi.org or call the Foodservice Packaging Institute at (703) 538-2800. **Deadline for entries is March 14, 2008.**

"COMMENTARY"
FROM THE EXECUTIVE DIRECTOR



By DAVID W. THARP, CAE
EXECUTIVE DIRECTOR

"Our ability to meet your needs for reliable information regarding food safety is one of the reasons you choose to remain an IAFP Member!"

This month, we are pleased to announce the newest symposium planned by IAFP under the title of "Timely Topics on Food Safety." This is somewhat similar to our "Rapid Response" symposium held in September of 2006 on the subject of leafy greens. But in this case, rather than falling under a truly fast response to an issue in food safety, what we are now terming a "timely topic" as one that is of interest to a large number of food safety professionals at a given time.

The topic and title for our "Timely Topics on Food Safety" is "Prepared, But Not Ready-to-Eat Foods – What You Need to Know." This symposium will address outbreaks and regulatory issues related to prepared, but not ready-to-eat foods along with covering consumer practices and expectations. In addition, a number of presentations will dive deeper into microwave cooking, proper labeling, validation of cooking instructions, and microwave power factors that can affect cooking by this method. Experts will cover each topic in depth and the symposium will conclude with a question and answer round table.

This symposium is scheduled for Thursday, January 24 at the Doubletree Hotel Crystal City in Alexandria, Virginia. Registration information and additional details, including speaker names and biographical information, is available at the IAFP Web site. We encourage your review of the subject and attendance if this is a topic of interest to you and your position.

In addition to the Timely Topics Symposium, the American Meat Institute Foundation (AMIF) and the National Meat Association (NMA) will hold an all day briefing at the same hotel on Wednesday, January 23 on recent issues revolving around *E. coli* O157 outbreaks. There is a link on our Timely Topics Symposium Web page that will direct you to AMI's page of information on their briefing.

The Timely Topics Symposium has been planned over a very short period of time, which is a key attribute of IAFP. The Association has the capability to identify an area of concern (prepared, but not ready-to-eat foods), then react quickly by planning an event to bring experts together to discuss this topic in great detail.

You may have noted an increase in IAFP's participation in planning opportunities for food safety professionals to come together on various topics on food safety. This is a new direction for your Association and one that is planned. The IAFP Executive Board sees this as a very valuable service that we can offer to IAFP Members and those involved in food safety. After all, our mission is "To provide food safety professionals worldwide with a forum to exchange information on protecting the food supply." Our ability to meet your needs for reliable information regarding food safety is one of the reasons you choose to remain an IAFP Member!

Along these same lines, we are continuing our planning process for three events at the present time (four if you include the Timely Topics Symposium!). In order of occurrence, we have the Latin America Symposium on Food Safety (May 26–28 in Brazil), then IAFP 2008 in Columbus, Ohio (August 3–6) and finally, the European Symposium on Food Safety (late October or early November). This is a lot to manage, but we have a number of great IAFP Members helping us out on each of these events! Along with our IAFP staff oversight, the planning of each of these events comes together smoothly.

For January, I'll leave you with a number of reminders. First, be on the lookout for your Secretary ballot

which will arrive in your E-mail at the end of January. Don't forget that this year's election will be held electronically (review my December column for details). You may vote through March 17, but why not vote when your notification arrives? Next, the abstract submission deadline for IAFP 2008 is January 29, so do not delay in submitting your abstract for consideration! And lastly, we want to remind you to visit the IAFP Web site to find detailed information on the Timely Topics Symposium (Prepared, But Not Ready-to-Eat Foods – What You Need to Know) and the Latin America Symposium on Food Safety.

That concludes this month's column. We hope that you are proud of IAFP and the information YOUR Association provides to food safety professionals worldwide!

ARTICLES
Food Protection Trends, Vol. 28, No. 1, Pages 16–25

6200 Aurora Ave., Suite 200W, Des Moines, IA 50322-2864
International Association for Food Protection

A Review of the Developments in the Regulation of Poultry Processing to Incorporate HACCP in New South Wales, Australia

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SUMMARY

This paper reviews changes in the regulatory processes for ensuring food safety in the New South Wales poultry industry with the adoption of a HACCP-based food safety system through a single food safety authority and relates this system to the changes occurring in Australia. The NSW poultry processing industry contributes 35% of the poultry consumed in Australia. Per capita consumption is on the order of 33 kg per year, and 80% of the population reported having consumed poultry in any seven-day period. It is considered a high-risk food by public health regulators. Over the past 100 years, the way in which the industry has been regulated in NSW has changed substantially, moving from general regulation under the Pure Food Act of 1908, through the industry-specific regulation of the Poultry Processing Act of 1969 and finally to the "paddock to plate" HACCP-based regulatory scheme of the NSW Food Act of 2003. Over that time, the industry has become uniform in the way in which it processes poultry, and good operators in NSW can achieve relatively low microbial counts of indicator organisms. Surveys of the industry carried out at the start of the introduction of HACCP-based food safety systems in 1998–99 and then two years later demonstrated a reduction in the prevalence of *Salmonella* positive carcasses, from 48.6% on all classes of poultry product in 1998–99 to 34.3% in 2001. No further industry-wide data are yet available to confirm a continuation of this trend under the present regulatory system.

A peer-reviewed article

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TABLE 1. A timeline of changes in regulatory schemes for NSW poultry processing

Year	Regulation	Regulatory authority
1908	Pure Food Act 1908	NSW Health Department
1971	Poultry Processing Act 1969	NSW Agriculture Department
1984	Amended Regulations	NSW Agriculture Department
1997	Amended Regulation (1996)	AQIS
1997	Draft Meat Orders	AQIS
1998	Food Production (Safety) Act	SafeFood NSW
2000	Food Production (Meat Food Safety Scheme) Regulation 2000	SafeFood NSW
2004	Food Act 2003	NSW Food Safety Authority

INTRODUCTION

Australia has a federation of State and Territory governments, with an overarching national government, but with each State or Territory government having responsibility for food regulation within its own boundaries. These governments have recently adopted a national standard for food regulation to minimize the conflicts between individual State, Territory and national requirements *(11, 22)*. The State of New South Wales (NSW) has a highly urbanized population of around 6.7 million, largely congregated on the eastern seaboard. Because it is in the temperate zone, its climate is generally free from extremes of hot and cold temperatures, except for extremes that can be experienced in the alpine areas or western arid areas. NSW is the most populous and heavily industrialized state in Australia, with the most prominent industrial sectors being business and financial services, along with information and communication technology. Mineral production, agriculture and manufacturing are also prominent economy drivers *(20)*.

The NSW poultry industry produces approximately 35% of the chicken meat eaten in Australia *(21)*. The Australian production of poultry meat for 2002–2003 was 650,000 tons, with 98% going to the domestic market *(34)*. Consumption has risen, from 8.3 kg per capita per year in 1968–69, up to 32.8 kg per capita per year in 2004. Therefore, the poultry industry makes a significant contribution to the Australian diet *(16, 34)*. OzFoodNet, an Australian network of health professionals monitoring foodborne illness, found during its investigations that 80% of the population reportedly having eaten poultry in the previous seven days *(42)*. In NSW over the past 50 years, the poultry industry has grown from small backyard operations to a mixture of large scale operations, capable of processing up to 140,000 birds per day, and small-scale niche processors, usually producing fewer than 1,000 birds per day of operation. Production estimates for NSW derived from registration data indicated that about 180 million birds of all types were processed by 46 registered processors in 2001 *(15)*. Along with the industry's processing changes, there has been an evolutionary change in the means by which it has been regulated.

Because poultry are not grown in a sterile environment, they enter the processing plant carrying pathogens and a range of other organisms. OzFoodNet has stated that poultry meat is a high risk food product *(41)*. This is because it has been demonstrated to carry both *Salmonella* and *Campylobacter*, with these organisms responsible for 8,376 cases of salmonellosis (41.2 per 100,000 population) and 15,640 cases of campylobacteriosis (117 per 100,000 population) in 2004, although these are not all of attributable to poultry products *(43)*. Therefore, the objective of good poultry processing practice is to minimize the numbers of organisms on the final product *(36)*. This paper describes the regulations driving that objective and shows the microbial outcomes capable of being achieved by an industry operating under food safety plans based on Hazard Analysis Critical Control Point (HACCP). An initial response to the change in the regulatory regime is demonstrated by the significant reduction of *Salmonella* prevalence over all classes of poultry product, from 43.6% in 1998–99 to 32.6% in 2001, the last year that an industry-wide survey was conducted in NSW.

THE DEVELOPMENT OF THE REGULATORY REGIME

Initially managed under the Pure Food Act of 1908 by the NSW Health Department, the industry was brought under specific poultry processing legislation through the NSW Department of Agriculture in 1969. Most recently, this regulation has been carried out through the NSW Food Safety Authority, which is charged with the task of regulating all food processes in NSW on a risk assessment basis. This authority was the first "paddock to plate" food safety authority to be formed in Australia *(18)*.

The changes to the regulation of processing are summarized in Table 1.

Prior to 1969, the industry had been supervised by the Department of Health and by Local Government under the Pure Food Act of 1908. This provided for general hygiene standards and gave inspectors the right to intervene if they were concerned about compliance with these standards or a risk to public health.

With the introduction of mechanized poultry processing starting in 1958 *(14)*, the scale of production expanded, and the State government decided that processing should be regulated through specialized regulation, the Poultry Processing Act of 1969 *(1)*, under the supervision of the Minister for Agriculture, who was responsible for cattle, sheep and pig abattoirs in NSW. The Act introduced a requirement that processors of poultry, defined initially as chicken, ducks, geese and turkeys, be licensed and through its regulations mandated construction and operating requirements. Licensing fees were charged based on the number of

TABLE 2. Changes in the structure of the NSW Poultry Industry 1971 to 2001, showing number of processors by category

Birds processed per year	1971	1981	Birds processed per year	1985	1991	1992	1993	1995	1999	2001
	Number of processors			Number of processors in each category						
<10,000	N/A*	19	<10,000	18	10	8	12	7	6	6
10,000–200,000	N/A	42	10,000–25,000	10	8	5	2	2	4	1
200,000–500,000	N/A	8	25,000–100,000	25	13	14	15	17	13	13
500,000–1,000,000	N/A	8	100,000–1,000,000	25	26	21	24	10	8	10
>1,000,000	N/A	12	>1,000,000	11	13	15	5	16	17	14
Total	120	89	Total	62	70	63	58	59	49	46

Source: *(15, 47)*
*N/A: not available

birds processed annually from May to April. Inspectors were employed by the agriculture department to visit plants and oversee compliance.

From its start, on 7 May 1971, this regime was associated with a reduction in the number of licensed processors from 120 processors, to 89 by 1981 (Table 2), because of the requirement that operators invest in upgrades to their plants *(47)*. On April 2, 1982, a major amendment to the Act and Regulations took place, with the definition of poultry being broadened to include all birds being processed for human consumption, thereby including game birds, quail, pheasants, pigeons and guinea fowl in addition to chicken, ducks, geese and turkeys. Also, the pressure on operators to upgrade their plants increased. To be licensed, plants had to comply substantially with the regulations and the processing guidelines incorporated within them *(47)*. As regulatory change continued, the number of processors further decreased (Table 2) and now seems to have remained steady at about 40–plus operators *(28)*. Over the years, the pressure to conform to set construction and operational standards has resulted in a generally uniform approach to the processing of poultry throughout NSW.

To enforce the amended regulations, additional inspectors were employed by the agriculture department to visit the plants regularly throughout the year, to ensure compliance with construction requirements and also to inspect product for compliance with packaging specifications, ensure fitness for human consumption, ensure the proper disposal of condemned birds, monitor processed birds coming into a plant from other plants, seize or retain unsatisfactory poultry meat and inspect records for throughput *(47)*. The regulations under which the plants were operating were designed to be compatible with the Codex Alimentarius 1976 requirements for poultry processing *(3)*. In 1985, all Australian governments adopted a set of guidelines, the Australian Code of Practice for Poultry Processing, which allowed for the staged implementation of improved processing standards throughout Australia over a number of years *(2)*. The NSW regulations were compatible with these guidelines.

CONSTRUCTION, OPERATIONAL AND HYGIENIC REQUIREMENTS FOR A POULTRY PROCESSING PLANT IN NSW

The requirements, which were first introduced in 1969 and developed from then onward, set the foundation for the industry in NSW. They were imposed on all operators, and any person found to be operating without a license was prosecuted.

Basic construction requirements (Schedule 2)

The plans for construction or renovation had to have prior approval of the regulatory authority. The placement of the plant had to avoid impact on nearby residences and any impact on safety of the product from nearby industries. The immediate surrounds had to be free of dust, with shelter, paving and drainage provided for areas where poultry or poultry meat was delivered. Entry points to the plant had to exclude flying insects, vermin and pet animals. All plants, irrespective of size, had to have the basic utilities of reliable water (including a supply of potable water sufficient for all operating needs), power and drainage. The internal materials used had to be impervious to moisture, resistant to corrosion and capable of being easily cleaned. Cadmium, copper or copper alloys, lead, paint, enamel, wood, porcelain or aluminum were prohibited from coming into contact with poultry meat. All equipment installed in the plant had to be designed and located so that all parts were readily accessible for cleaning and inspection. Refrigeration capacity had to be adequate to meet the needs of the processing operation as determined by the regulatory authority. The internal plan had to have killing and plucking areas effectively separated from evisceration, washing and chilling areas, and adequate lighting was to be provided for the opera-

tions being carried out. Storerooms and amenity areas had to be separated from the operational areas. Good internal drainage was mandated. Hands-free taps had to be provided throughout the plant to enable personnel to maintain cleanliness.

Basic operational requirements (Schedule 3)

Basic health requirements were required to be met by the bird from the time that it arrived at the plant. No dead or sick bird was allowed to be processed or to enter the processing area. The coops, crates or cages in which they arrived had to be in good repair and free from rust. Only materials such as plastic or galvanized steel were acceptable for the construction of these containers to meet the requirement that they be easily cleaned. Only humane slaughtering processes were approved. A set of criteria specified action in the case of localized and general post mortem findings, either by trimming or condemnation, dependent upon the condition found. Major fecal spillage contaminating a carcass required condemnation of that carcass. Minor contamination such as dropped birds, unhygienic contact or minor spillage required that the bird be washed or trimmed to remove any contamination.

Any water-filled immersion tank, such as scald, wash, spin, chill or thawing tank, had to have a constant overflow unless it was of a single-use type. Except for the scald tank, which was held at 56–65°C, dependent upon the type of scald required, a water tank could not exceed 20°C, and if the carcass was to remain in the tank longer than 15 minutes, the temperature of the water in the tank was not to exceed 4°C. A pre-evisceration wash by spray or running water immediately after plucking and an inside-outside wash after evisceration by either hand or machine were mandated. Giblets retained for human consumption had to be washed and, if to be replaced in the carcass, had to be chilled and bagged in an approved material.

Effective temperature control throughout the whole process was required. The temperature of poultry meat had to be reduced to below 4°C within 90 minutes of killing; carcasses over 5 kg were allowed 150 minutes. Boning of carcasses, if performed on the premises, was to be done in a room maintained at a temperature of not more than 10°C. Thawing was to be undertaken only under temperature-controlled conditions of 15°C in air or 20°C in water. Frozen poultry that had thawed was not to be refrozen.

General hygiene

Packaging materials were to be clean, odorless, unused and of sufficient strength and durability to protect the product. Ice had to be made from potable water. Non-potable water could not be used within the plant without approval. Chlorinated water, where used, had to have a residual chlorine level of 0.25 ppm. The temperature of water in any tank where a carcass remained longer than 15 minutes during processing was not to exceed 4°C. Otherwise, except for in scald tanks, water was not to exceed 20°C.

Overalls or a protective coat, head covering and waterproof footwear had to be worn by any person in the processing area while processing was occurring. General cleanliness, including hand washing and utensil cleanliness, was required. An approved plant cleaning program covering daily cleaning, in-process cleaning and waste disposal had to be in place. Waste had to be controlled and placed into waste bins that were clearly distinguishable from bins or containers being used for edible product. The waste had to be removed from the plant daily.

THE INTRODUCTION OF QUALITY ASSURANCE

As part of a move toward a national meat inspection service, the NSW Minister of Agriculture, in 1993, passed the responsibility for inspection of plants, by way of an intergovernmental agreement, to the national meat inspection service, the Australian Quarantine and Inspection Service (AQIS). This body, set up by the Australian government to carry out export inspection and control for Australia, had responsibility for all export meat abattoirs, including those registered with it for the export of poultry meat. Prior to this, it had no responsibility for the regulation of product for the domestic market in NSW.

From July 1, 1993 to June 30, 1997, AQIS inspected all NSW plants utilizing the State legislation (NSW Poultry Processing Act 1969) as the basis of its authority. While AQIS prepared for the full handover of inspection from the State to itself as the national authority, a set of draft Meat Orders (1993) *(4)* was developed by consultation with the industry through the NSW Poultry Processing Consultative Committee (PPCC), which consisted of representatives of poultry processors, AQIS veterinarians and a NSW Agriculture veterinarian. These orders built upon the existing regulation to provide a regulatory instrument for AQIS. However, they were never enacted. In 1997, because of a change in Australian government policy, AQIS withdrew from this service and handed back responsibility for domestic poultry inspection to the State. During its period of responsibility, AQIS, through the Meat Orders, introduced the concept of Operational Monitoring Arrangements, a precursor to Quality Assurance (QA) Programs *(4)*. Additionally, they introduced water testing for *E. coli*, defined humane killing, modified the chilling regime to more suitable conditions for large carcasses and specified that poultry meat was not to be dispatched from the premises until its temperature had reached 4°C measured in deep muscle, such as the breast.

The poultry processing regulation 1996

By March 1995, the Australian Resource Management Council of Australia and New Zealand (ARMCANZ) had responded to both Australian and international concerns about food safety by setting up the Meat Standards Committee (MSC). This committee, consisting of State, Territory, Australian government veterinary and food safety representatives, and meat industry representatives, was charged with reviewing the existing Codes of Practice for the meat industries of Australia, including the code for poultry. The codes were redrafted as mandatory standards expressed in outcome terms. They introduced QA schemes consistent with AS/NZ ISO 9000 – 1994 and specified that process control was to be achieved through the application of HACCP as defined by the Codex Alimentarius Commission (Codex) *(13)*. A new Australian Standard for the Hygienic Production of Poultry for Human Consumption (ASPP) was

written by the MSC. Using an outcome format, it incorporated QA and HACCP as the means of process control *(6)*.

At the same time, the NSW poultry processing regulations were being reviewed because of State government policy regarding its regulations. Therefore, a new regulation *(5)* was drafted to incorporate the requirements of the ASPP, which was still being finalized. This new regulation retained some aspects of the 1982 regulation (as amended), such as prior approval, by the regulatory authority, of the plan of a plant before it was constructed. However, it reduced the prescriptive nature of the 1982 regulation by focusing on the outcomes required. It required the operator to have a HACCP-based food safety plan and gave opportunity for process control to be achieved through an approved QA program incorporating HACCP *(5)*. By February 1997, with AQIS still in charge, 32 HACCP-based food safety plans had been approved, 13 were progressing and 7 operators had shown no progress *(10)*.

After 30 June 1997, the NSW Meat Industry Authority (MIA), a state government authority within the portfolio of the Minister for Agriculture, responsible for red meat regulation, took over the regulation of poultry processing from AQIS. MIA continued the training for and development of HACCP in the industry to prepare it for the transition to an audit system based upon the ASPP *(7)*.

The introduction of the Food Production (Safety) Act of 1998 and the formation of the NSW Food Authority

In 1998, the Food Production (Safety) Act of 1998 was passed in NSW. The MIA was merged with the NSW Dairy Corporation to form SafeFood NSW, and this new body became responsible for meat and dairy regulation. As part of its regulatory activity, it produced the Food Production (Meat Food Safety Scheme) Regulation 2000, which adopted the ASPP in total, superseding the Poultry Processing Act 1969 and its 1996 Regulation. The new Act removed the poultry licensing fee that had been based on throughput, replacing it with one based on plant size, and introduced an audit program to monitor compliance. This new Act also included a provision for a review of the effectiveness of this new regulatory system. This review, when completed, recommended the formation of a NSW Food Authority by merging SafeFood NSW with the food regulatory activities of the NSW Health Department. On February 23, 2004, the Food Act 2003 took effect, and the New South Wales Food Authority was constituted by the NSW Food Legislation Amendment Act 2004 on April 5, 2004 *(18)*. This created Australia's first completely integrated or "through-food-chain" regulatory agency. The NSW Food Authority has responsibility for regulating food safety across the entire food industry, from primary production to point-of-sale, using food safety schemes as the regulatory mechanism. These schemes are being introduced gradually, being focused initially on industries considered high risk, such as raw meat, including poultry, fish and shellfish, and eventually extending to cover horticulture and other primary products *(18)*.

The aim of the establishment of the Authority was to create a more streamlined, consistent and efficient approach to food regulation in NSW and to act as a single point of contact for both the industry and the public. Food safety training and food safety plans required under national food laws are also being managed by it. The mission of the NSW Food Safety Authority is to ensure that food in NSW is safe and correctly labeled and that NSW consumers are able to make informed choices about the food they eat. The new authority was placed in the portfolio of the Minister of Primary Industry (previously Agriculture) *(18)*.

In November 2003, a paper entitled "Toward a Strong Food Regulation Partnership" addressed the definition of roles for various NSW agencies, recovery of costs and the provision of support and coordination across the NSW State and local government agencies involved in food regulation *(18)*. This amalgamation of responsibility was in line with moves that had been happening concurrently at the Commonwealth level with the recommendation for a single "food authority" to manage food safety from "paddock to plate" *(11)*.

The Australian government rationale for the use of the HACCP approach

In 1997, the Prime Minister of Australia announced the Food Regulation Review *(11)*, which was undertaken by an independent chair to report to all Australian governments on ways to reduce and clarify the regulatory burden on the food industry while ensuring a safer food supply. This report gave guidance to the Australian, State and Territory governments by issuing a series of recommendations which included ways of achieving an integrated and coordinated food regulatory system, improved compliance and enforcement, better legislation and national decision making, integrated monitoring and surveillance and more effective communications *(11)*.

It was with this background that in 2000 the Regulatory Impact Statement for the Australian Standards and the Meat Industry *(13)*, which revealed the concept of mandatory HACCP-based food safety plans, was issued. The Agriculture Resource Management Committee of Australia and New Zealand (ARMCANZ), a national committee consisting of representatives of Australian, State and Territory government primary industries departments, listed several reasons for revising Australia's existing meat industry Codes of Practice. These were to:

- eliminate as far as possible the risk of serious (life-threatening, permanently incapacitating or debilitating) human food poisoning;
- improve control over the microbiological status of meat products and meat industry by-products and to ensure consistency in Standards across the Commonwealth; and
- ensure that the Australian public has confidence in meat safety and production in Australia and, as appropriate, provide Australia's trading partners with similar assurances.

The aim was for adoption of Australian Standards through the ARMCANZ process to have broad benefits both for the consumer and for industry. The consumer would have confidence in the production systems used throughout Australia; for industry, the process should result in a consistent set of standards to work toward and a uniform approach to food safety throughout the country. It was also intended that writing the Standards with an outcome focus would allow processors

to be innovative and flexible in their production processes while at the same time protecting consumers *(13)*.

The principles of the HACCP approach have been widely recognized as a sound foundation for the development of food safety programs *(9, 40, 44)*. The Regulatory Impact Statement for the Australian meat production standards states that the successful application of HACCP requires the full commitment and involvement of management and the workforce *(13)*. To assist with this, the Standing Committee on Agriculture and Resource Management (SCARM) published "A guide to the implementation and auditing of HACCP" *(8)*, which has become the basis for the development of food safety plans in NSW *(18)*. By 2001, all poultry processors in NSW were utilizing approved plans they had designed using this framework. And, as already described, NSW had fully implemented the Australian model through its formation of the NSW Food Authority. While the NSW poultry processing industry has had a long association with the QA approach to production through its introduction in 1993 in the Draft Meat Orders, a key change was a move away from reliance upon the inspection services for direction and advice and a move toward having industry control their own processes. Importantly, it allowed for a processor to demonstrate the application of "due diligence" in the production of food, a defense against litigation when there is a foodborne illness associated with that producer *(12)*.

The use of microbiological testing in the Australian Standard

In the development of the ASPP by public health veterinarians, other food safety professionals and industry representatives, the role of microbiological testing was considered. It was recognized that a significant part of the application of HACCP programs is the use of microbiological testing in validating the processing system. End product testing to control a process is particularly inefficient and ineffective because the size of the sample may have to be large and the frequency of sampling great if the organism being sought occurs sporadically or in low frequency in the finished product *(27, 35, 45)*. Therefore, the ASPP describes the role of microbiological monitoring of work and product surfaces in verification of the HACCP program, not as a means of providing a measure of the product. Although a total viable count is recommended as useful for identifying trends, it identifies the verification of *E. coli* or *Salmonella* levels that may be linked to formal industry baseline testing and assessment programs *(19)*. The NSW Food Safety Authority has opted to use *E. coli* as its major monitoring tool for the assessment of product hygiene *(17)*. This followed the industry surveys commissioned by the PPCC to establish industry baselines for both TVC and *E. coli (32, 33)* and the recommendations of an expert panel on the role of microbial testing in verifying food safety *(37)*. The expert panel, which included microbiologists, food scientists and veterinarians, set these guidelines as a means of judging the performance of industry in meeting its obligations for food safety. Samples were required to be taken on a specified basis according to the scale of operation, and the results were to be used by the operator and the regulator to assess the effectiveness of their HACCP program.

NSW processing outcomes as determined by industry surveys

The processing outcome data were required to guide regulators in their understanding of the industry and of the level of achievement they could reasonably expect under HACCP-based food safety programs. Little public information was available on carcass contamination. A small number of larger processors had been collecting data privately; however, they considered this information to be "commercial in confidence" and not available to the wider community *(30)*. Therefore, the PPCC sponsored two surveys of all NSW poultry processing plants *(32, 33)*. The results of the two surveys were made available to the regulatory authority as consolidated de-identified data. All processors received their individual results as well as the consolidated data so that they could compare their results to those of other processors. For many small operations, it was their first encounter with microbiological sampling. The first survey, conducted in 1998–1999, involved 42 of the 55 registered processors (1998 registrations) and the second, in 2001, involved 43 of the 46 registered processors. The second sampling for individual plants was matched for seasonality as much as possible.

A random sample of ten birds was taken at the end of processing, at the point where the carcasses were weighed just prior to packaging or were directed to another area for further processing. The first survey determined Total Viable Count (TVC) per cm^2 and *Salmonella* and *Campylobacter* positive carcass counts. The second survey, carried out 2 years later, determined TVC and *E. coli* counts per cm^2 and *Salmonella*- positive carcass counts *(32, 33)*. TVC was used in both surveys because this was the industry preferred indicator organism *(29, 32, 33)*.

Table 3 gives the summary results for the two surveys for the whole range of products being produced in NSW. These were broiler chickens, Chinese chicken (a style with head and feet retained on the carcass), spatchcock, Chinese Silky (a breed of bird processed with only the feathers removed), quail, duck, turkey and squab. *Campylobacter* was found on 93% of samples in 1998–9. *Salmonella* prevalence was found to be 48.6% in 1998–9 and 34.3% in 2001. This reduction in *Salmonella* was significant ($P < 0.05$). Because in Australia *S.* Sofia appears to have a low virulence to humans, it is noteworthy that in both surveys it was found to make up about 70% of all *Salmonella* isolated.

A matched-pairs analysis of the ranked TVC results found that the results for the top ten processors did not differ between their first and second survey, while the bottom 13 processors showed an increase in their TVC results ($P < .01$). For the total 432 samples for all products, 60 had no detectable *E. coli*.

Although no industry-wide survey results are yet available following these initial surveys, microbiological testing had been carried out as part of ongoing investigations on behalf of the PPCC. The results from three plants are shown in Table 4. The result from plant 2C04, one of the original top ten, demonstrates the similarity in the TVC between the two surveys. For plant 2C19, one of the lower ranked plants, the results show the initial increase found between the two surveys. However, for a third plant, 2C23, initially in the lower ranked group, there is the demonstration of an initial increase

TABLE 3. Enumeration of organisms on all poultry classes in the surveys of NSW poultry processors

Bacteria	Number of samples	Number of samples positive (> limit of detection)	Level of positives log mean per cm^2 Mean	SE
Indicator organisms				
TVC 1999 survey	430	430	3.3	0.034
TVC 2001 survey	432	432	3.4	0.039
E. coli	432	372	1.60[1]	1.01
Pathogenic organisms expressed as a percentage of samples positive				
C. jejuni/coli *1999*[c] Survey only	430	400	93%	
Salmonella spp. *1999* Survey	430	209	48.6%	*Salmonella* Sofia 148 69.8%
Salmonella spp. *2001* Survey	432	148	34.3%	*Salmonella* Sofia 104 68.9%

Source: *(32, 33)*

[1]60 samples below the limit of detection; a log value for negative samples was given by adjusting the sample result to the mid-point between zero and limit of detection.

based plan took effect within the plant. The difference in log TVC is significant ($P < 0.001$), but the difference in log *E. coli* counts is not significant.

DISCUSSION

The design and operation of poultry processing premises

The purpose of the initial Poultry Processing Act in 1969 was to provide for the registration of plants processing poultry. Implicit in this was the regulation and control of the processes carried out within those plants *(1)*. These regulations were utilized to ensure that public safety was protected. The value of many of the requirements placed in the legislation has been confirmed by studies into the activities which form the various parts of poultry processing. The eventual development of the ASPP built upon these early regulations until they have now reached a stage where they incorporate the principles of good practice with HACCP and quality assurance approaches *(19)*.

The application of these regulations within the NSW poultry processing industry over the years has resulted in a uniform approach to poultry processing, with the main variation relating to the scale of the operation and the appropriate level of technology for that scale. In large operations, continuous chain conveyor systems are used to carry the birds through the various stages of processing, and large counter-flow chill tanks or air chillers are used to cool the carcasses. The small operation is more likely to use batch processing, often by hand, with only a few of the operators having devices such as an evisceration machine to ease the manual labor involved in processing. Chilling is usually by static ice-water chill tanks.

If the transport cages in which birds arrive at the plant are not kept in good repair, they can be a source of injury to the birds. Also, it has been shown that transport cages can be a major source of contamination with *Salmonella* species if they are not cleaned thoroughly between farms *(26)*. Therefore, this requirement has helped alleviate issues of animal welfare and disease transmission, with birds now carried in purpose built plastic or galvanized steel cages.

G.C. Mead has highlighted the importance of the effective separation of areas with a high level of aerosol contamination, such as the shackling, killing and plucking areas, from the evisceration, chilling and other processing areas within the plant to prevent contamination of the final product *(39)*. By this requirement, the early regulations had set a high standard for these initial stages of the process. The standards for the materials used in construction and for equipment ensured that the surfaces in the plant could be easily cleaned. Specifying that certain kinds of materials were prohibited was an attempt to prevent contamination of product with potentially toxic materials, such as cadmium or lead, or materials that could cause discoloration, such as copper or aluminum. Having good drainage ensured that there was less risk of product being contaminated by splash and made for a safer working environment. Similarly, effective lighting for the plant

TABLE 4. Results of sampling at selected plants over four years

Plant	2C04 (high performance operator)				2C19 (low performance operator)				2C23 (low performance operator)			
Year	Mean Log TVC	Range	Mean Log *E. coli* count	Range	Mean Log_{10} TVC	Range	Mean Log_{10} *E. coli* count	Range	Mean Log_{10} TVC	Range	Mean Log_{10} *E. coli* count	Range
1999	3.00	2.27-3.8			3.32	2.89-3.94			3.3	2.75-4.04		
2001	2.99	2.3–3.8	0.92	-0.03 -2.31	3.72	3.08-4.20	1.58	1.07-2.70	4.04	3.11-5.36	1.42	0.93-2.06
2001			1.86	1.60-2.17			2.82	2.64-3.02			2.30	1.66-3.00
2003									2.93	2.22-4.01	1.44	0.48-3.05

Source: data from various trials undertaken by S. King, including NSW poultry processing surveys *(32, 33)*.

improved worker safety and allowed for effective product inspection. Cleaning programs are an important part of any food producing operation and the regulations and the new standard entrenched this requirement *(19)*.

Within the plant, the scalding step has some important implications. Although the external surface of a slaughtered bird to be scalded is heavily contaminated, the continuous overflow of contaminated scald water, plus the destruction of some bacteria by heat, can prevent the excessive accumulation of bacteria in commercial tank scalders *(24)*. A study of a three-tank, two-pass counter flow scalder found there was a marked reduction in the level of solids and aerobic bacteria in the final water of the three-tank system *(25)*. The requirement for the operation of the scalding tanks within both the regulation and the current standard support this outcome. Small operations use a basic system with the constant addition of hot water being required to replace that removed on the wet bird. This has the effect of keeping the scald water relatively clean. Larger operations have installed counter-current scalders with constant overflow.

The attachment of organisms to the skin of poultry is a complex mechanism *(38)*. Therefore, throughout the processing stream there are a number of washing steps designed to remove organisms that have not attached to the poultry skin, thus reducing the overall load of organisms carried by the bird. The attachment of bacteria to surfaces is considered to be a two-stage process; the bacteria first become loosely associated with the surface through reversible sorption involving London-van-der Waals forces, after which there is a time-dependent phase of attachment through the formation of viscous polymers. The frequent washes were expected to have their effect upon this first stage of attachment *(31)*. The rapid removal of contamination specified within the regulations was designed to remove as many bacteria as possible before they became firmly attached to the skin. An effective pre-evisceration wash, i.e., with sufficient flow and pressure, should reduce surface organisms prior to evisceration, a key step to remove as many organisms as possible and any blood, feces or other material spilled onto the carcass or on the processing machinery. Mead notes that spray-washing after evisceration is carried out primarily to ensure that the carcass is visibly clean. "However, efficient spray washers, with high pressure jets can also remove significant numbers of microbial contaminants from both the inner and outer surfaces of each bird, thus avoiding excessive contamination of chill water" *(39)*. This was a required step immediately after evisceration to wash away any fecal contamination that may have occurred.

Of the steps in poultry processing, the role of chilling, both by immersion and by air, has been closely studied. In a review of this process it was demonstrated that continuous immersion chilling systems can be operated to bring about a reduction in the total microbial count on poultry. This involves having clean birds entering the plant, an adequate overflow of water from the chiller and a reasonable ratio of birds to water in the chiller so that the birds are effectively chilled. Although this step can be linked to cross contamination of carcasses, it is only one step in the process, and with appropriate management its role as a cross-contamination point can be minimized. Air chilling systems, found to be comparable in effectiveness to immersion chilling, similarly had potential for cross contamination if not properly managed *(46)*. A recent study confirmed that immersion chilling in a controlled system reduces the microbial load of carcasses, but air chilling was not

shown to be as effective in this regard *(23)*. Thus, chilling and refrigeration have been shown to have a positive impact on the microbiological status of the product. Because the early regulation required the operator to declare the number of birds to be processed within the plant, the regulatory authority was in a position to judge the adequacy of the chilling equipment and refrigeration. The pressure to have adequate chilling capacity has continued with industry understanding its refrigeration needs to meet performance standards that set the temperatures that have to be achieved within certain times.

No flow rates were specified for the overflow from tanks in the regulation, but the Code of Practice previously referred to *(2)* was available to the inspectors and operators and suggested an overflow rate of about 0.25 liter per carcass for scald tanks, 1 liter per carcass for wash tanks and 0.75 liters per carcass for immersion chillers. These were adopted by many of the operators in their processes.

At the end of processing, the raw meat produced had to be protected from contamination and temperature abuse that could undo the efforts put into its production. This was achieved through packaging and handling requirements. The NSW Food Safety Authority, being a "paddock to plate" agency, also has regulatory powers over transport vehicles carrying product from the processor to the wholesaler, further processor or retailer. By regulating these levels of the industry it is able to maintain the integrity of the product through to point of sale *(18)*. It is still early in the development of this system; therefore, the analysis of its effectiveness depends upon the accumulation of sufficient data and its release to the public.

The effectiveness of the introduction of HACCP-based food safety systems

It appears that the introduction of HACCP has not had a large immediate effect on the outcomes being achieved by processors. It is postulated that the top ten operators, because of their good performance, did not have much room to improve; therefore, no change was initially detected by TVC, the only comparative measure available at the time. The poorer performers, however, initially slipped in performance as measured by TVC. This slippage could be because of the lessening of direct control by inspectors when they moved the responsibility of processing to the operators. Using a special case, it is noticeable from the results of 2C23 (Table 4) that in cases in which an operator is applying HACCP effectively, as was observed on visits to this plant over a period of time, the log TVC counts improved significantly. No significant change in log *E. coli* counts was observed, but this might reflect the fact that evisceration at this plant was functioning properly. It is suggested that an improvement in overall plant cleanliness and operational hygiene is being indicated by the decreasing TVC.

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Food Safety Practices of Meat Slaughter Plants: Findings from a National Survey

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SUMMARY

Meat slaughter plants may implement technologies and practices to control *E. coli* O157:H7, *Salmonella*, and other pathogens during slaughter, fabrication, and further processing operations (e.g., grinding or cooking). To characterize the use of food safety practices and technologies in the US meat slaughter industry, we conducted a nationally representative survey of plants that slaughter cattle, swine, goats, lambs and other meat species, including plants that slaughter and also conduct further processing activities (598 completed surveys, 65% response rate). Many plants have adopted the food safety technologies and practices asked about in the survey. In particular, 75% of plants use some type of carcass decontamination intervention, and 41% use some type of decontamination intervention for processed product such as ground beef or luncheon meats. Seventy percent of plants conduct voluntary microbiological testing, and 52% conduct environmental sampling. Less than 30% of plants have their operations audited, have written food security policies and procedures, and have documented requirements that animal growers use stipulated practices for pathogen control. Large and small plants are more likely than very small plants to use many of the food safety practices and technologies ($P < 0.01$). The survey findings, coupled with other data, can be used to characterize meat slaughter plants' food safety risk management practices.

INTRODUCTION

Food safety is a focus area of *Healthy People 2010*, a set of health objectives developed by leading federal agencies for the United States to achieve by the year 2010. One objective is a 50% reduction in foodborne illness caused by key pathogens such as *Salmonella*, *Escherichia coli* O157:H7, and *Listeria monocytogenes (32)*. *Salmonella* foodborne infections result in an estimated 1.3 million human illnesses and 553 deaths annually in the United States, and *E. coli* O157:H7 foodborne infections result in an estimated 62,500 illnesses and 52 deaths annually *(16)*. Listeriosis is less common, with an estimated 2,500 illnesses per year, but the hospitalization rate of 90% and the mortality rate of 20% are much higher than for the other two pathogens *(16)*. Human foodborne illnesses from these three pathogens have been linked to meat and meat products, among other foods *(15)*. *Salmonella* may be present in the intestines of healthy animals and may contaminate meat during slaughter *(12)*. In cattle, *E. coli* O157:H7 is a particular concern *(23)*. *Listeria monocytogenes* poses a concern in ready-to-eat (RTE) meats because of postprocessing contamination, as it can survive for long periods of time on equipment surfaces and in refrigerated conditions *(26)*.

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Bovine Spongiform Encephalopathy (BSE) is an additional concern for establishments that slaughter cattle. A disease affecting the central nervous system of adult cattle, BSE has been linked to the fatal human variant Creutzfeldt-Jakob Disease (vCJD) *(29)*. Three cases of BSE-infected cattle were discovered in the United States between 2003 and 2006 *(5)*.

Under the Federal Meat Inspection Act, the US Department of Agriculture's Food Safety and Inspection Service (USDA, FSIS) is charged with the responsibility of protecting and regulating the nation's meat supply. In 1996, FSIS mandated the Pathogen Reduction: Hazard Analysis and Critical Control Points (PR: HACCP) Final Rule (9 CFR 417), aiming to reduce the microbiological hazards that can occur during meat and poultry slaughter and processing. To verify that plants' PR: HACCP systems are effective, FSIS set performance standards for *Salmonella* that all slaughter establishments must meet. Additionally, all plants producing raw ground beef are subject to *E. coli* O157:H7 testing by inspection personnel *(27)*. Further, in 2003, FSIS published an interim final rule that requires plants that produce RTE meat and poultry products to consider *L. monocytogenes* a hazard that is reasonably likely to occur (9 CFR 430). Therefore, plants must have written programs to control *L. monocytogenes* and some plants must conduct testing of food contact surfaces to verify the effectiveness of their sanitation program. In 2006, FSIS implemented a more intensified testing program for high- and medium-risk RTE products (FSIS directives 10,240.4 and 10,240.5).

Establishments that slaughter cattle must also comply with the BSE interim final rules (9 CFR 301, 309, 310, 313, 318, and 320). Published on January 12, 2004, these rules mandate that (1) nonambulatory disabled cattle cannot be slaughtered, (2) specified risk materials (SRMs) are prohibited from human food, (3) skulls and vertebral column bones from cattle 30 months of age and older cannot be used in advanced meat recovery systems, and (4) certain stunning devices are prohibited. Specified risk materials include the brain, skull, eyes, trigeminal ganglia, spinal cord, vertebral column, and dorsal root ganglia of cattle 30 months of age and older, and the tonsils and distal ileum of the small intestine of all cattle.

To comply with these regulations and to meet the relevant pathogen performance standards, plants may use a variety of technologies and practices that can be tailored to each plant's specifications and product mix. For example, some plants may use steam pasteurization methods, while other plants may use an organic acid rinse as a decontamination intervention *(25)*.

FSIS contracted with RTI International to conduct a national survey of meat slaughter plants to collect uniform information on practices and technologies currently used to control biological, chemical, and physical hazards and to promote food safety *(19)*. We used the survey data to estimate the prevalence of various food safety technologies and practices used in the United States meat slaughter industry, to characterize the use and types of microbiological testing, and to assess the prevalence of different types of employee food safety training. We surveyed plants that slaughter cattle, swine, goats, lambs, and other meat species, including plants that conduct both slaughter and processing activities (e.g., grinding or cooking). The survey results provide FSIS with measures of the current use of food safety technologies and practices among regulated establishments to guide regulatory policy making and for required economic analyses. The survey findings, along with other data, can also be used to characterize meat slaughter plants' food safety risk management practices.

MATERIALS AND METHODS

We conducted a national survey of federally and state-inspected meat slaughter plants, using a multimodal survey approach. The sampling methods, questionnaire development, survey administration, and analysis procedures are described below.

Sampling methods

We used an FSIS database of federally and state-inspected establishments to construct the sampling frame for the survey. The database contains establishment-level information on production volume, annual revenue, number of employees, inspection activities, and contact information from various USDA sources and a commercial data source for company information.

Plants that currently slaughter meat species (cattle, swine, lamb, goat, and other meat species) were included in the sampling frame for the survey. The sampling frame also included plants that slaughter and conduct further processing activities (e.g., grinding or cooking). The sampling frame excluded plants that conduct only further processing activities. To make the sampling frame representative of the vast majority of federally and state-inspected plants, we excluded plants that operate for objectives that are not strictly commercial (e.g., nonprofit, prison, education, and government facilities), plants that slaughter only equine or other meat species (e.g., bison, elk, ratites), plants used as cold storage or locker facilities only, and state-inspected plants that conduct only custom-exempt slaughter. Also, because of the potential for language barriers, plants located in a United States territory were excluded from the sampling frame.

The sample was stratified by inspection status (federal versus state) and HACCP size (very small, small, and large). Large plants have 500 or more employees, small plants have at least 10 employees but fewer than 500, and very small plants have fewer than 10 employees or less than $2.5 million in annual sales. The sample design specified a sample size that was expected to yield precision of +/– 5 percent or better for estimates of all proportions. For federally inspected plants, we selected a systematic sample of very small plants and took a census of small and large plants because of the relatively small number of plants. For state-inspected plants, we selected a sample of very small plants and took a census of small plants (there were no large state-inspected plants). Systematic sampling ensures that the selected sample represents the population by forcing the sample to include plants with varying characteristics, such as geographic location and type of species. The starting sample size was 1,080 meat slaughter plants (590 federally inspected and 490 state-inspected plants).

Questionnaire development

The questionnaire was designed to collect information on the use and frequency of sanitation practices, use of specific food safety technologies and practices, use and types of microbiological testing, food safety training procedures, beef packing plants, response to the BSE interim final rules and plant characteris-

tics (e.g., age, size, and number of shifts). Plants were asked to provide information on their activities during the past year; the survey was administered in fall 2004.

To test the survey instrument, we used a structured, standardized instrument review methodology. This approach evaluated the survey questions in terms of the tasks required of the respondents to understand and respond to the questions, as well as evaluating the structure and effectiveness of the questionnaire form. We also conducted interviews with eight meat slaughter plants to pretest the survey instrument. In addition, the survey instrument was reviewed by several industry trade associations. The pretest participants and trade associations provided suggestions for improving the survey instrument, which we subsequently revised. The survey instrument and study design were approved by the Office of Management and Budget's (OMB's) information collection clearance process.

Survey administration

We implemented a variety of procedures aimed at maximizing the survey response rate, including many of the procedures recommended by Dillman *(6)*. Before beginning data collection, we worked with several industry trade organizations to secure their support of the survey. These organizations sent an e-mail message to their membership or posted information in their newsletter and on their Web site that described the survey and encouraged members' participation. We contacted sampled establishments by telephone to identify the plant manager and then mailed a letter on FSIS letterhead that described the upcoming survey. We subsequently contacted plant managers by telephone to screen for eligibility (e.g., plants were not eligible for the survey if they conduct only custom-exempt slaughter and are exempt from inspection) and to identify the target respondent for the survey (if other than the plant manager). We mailed target respondents the self-administered questionnaire via Federal Express and later sent a thank you/reminder postcard. We made a series of telephone calls and remailed the questionnaire to nonrespondents to encourage response.

We received completed surveys from 598 plants. Of the remaining plants in the sample, 235 were eligible but did not complete the survey and 173 were ineligible (e.g., plants that were out of business and custom-only plants). We were unable to determine eligibility for 74 plants. We calculated weighted response rates (respondents/[nonrespondents + respondents]) by stratum, using the initial sampling weights adjusted for unknown eligibility so that cases with unknown eligibility were distributed between eligibles (nonrespondents) and ineligibles in the same proportions that existed among cases with known eligibility. Ineligible plants were excluded from the response rate calculation. The overall weighted response rate for the survey was 65%.

Analysis procedures

Before tabulating the survey data, we cleaned the raw survey data, including conducting data editing and data coding of the survey responses. The edited and coded questionnaires were double-keyed for quality control purposes. The survey data were weighted to reflect the selection probabilities of sampled units and to compensate for differential nonresponse *(13)*. Nonresponse adjustments help reduce nonresponse bias to the extent that respondents within weighting classes are homogeneous. Nonresponse adjustments were implemented by computing and applying adjustment factors for each weighting class (in this case, HACCP size and inspection status).

We computed weighted proportions for questions in which respondents could select one or more responses from a list of responses and computed weighted means for questions that required a numeric response. We computed weighted proportions and means by HACCP size (very small, small, and large). We performed a chi-square test for statistical significance between the variable of interest and plant size (large versus very small and small versus very small). We conducted all analyses using Stata®, a statistical analysis software tool that takes the stratified sample design into consideration when computing variances *(21)*.

RESULTS AND DISCUSSION

Plant characteristics

Although the meat slaughter industry mostly comprises very small and small plants, large plants account for the vast majority of revenue. Eighty-two percent of meat slaughter plants are very small and account for approximately 3% of total industry revenue, 14% are small and account for 24% of total industry revenue, and 4% are large and account for 73% of total industry revenue. The mean plant age (or years since most recent renovation) was 24 years (standard error = 0.97), the mean plant size was 28,901 square feet (standard error = 3,301), and the mean number of employees was 107 (standard error = 13.8). Table 1 provides additional information on plant characteristics by HACCP size.

Use of food safety technologies for meat slaughter and fabrication

Meat slaughter plants have implemented technologies and practices to control *E. coli*, *Salmonella*, and other pathogens during slaughter and fabrication operations. These technologies and practices may have been adopted as a critical control point (CCP) in the plant's HACCP plan. For example, antimicrobial decontamination methods such as steam vacuuming, acid or hot water spray washing systems, and steam pasteurization can help improve the microbial safety of beef carcasses immediately postslaughter *(25)*. Use of multiple interventions is often more effective than use of only one intervention. For example, hot water washing followed by organic acid rinsing can significantly improve the microbiological quality of pork carcasses *(7)*. For beef carcasses, steam vacuuming combined with hot water and lactic acid sprays is more effective in reducing microbiological contamination than steam vacuuming alone *(4)*.

Table 2 presents the percentage of plants using the food safety technologies asked about in the survey by HACCP size. The most frequently used technology is some type of carcass decontamination intervention (75% of all plants). All large plants use some type of carcass decontamination intervention. The most common interventions are organic acid rinse (53% of all plants) and tempered carcass rinse/wash (46% of all plants). Fewer plants use steam pasteurization systems and steam vacuum units, although the majority of large plants use each of these technologies. Most interventions were more likely to be used by large and small plants than by very small plants ($P < 0.01$).

TABLE 1. Meat slaughter plant characteristics (weighted % of plants)

	Very Small	Small	Large	Total
Number of slaughter and fabrication shifts operated daily				
Plant does not operate daily	17.1	1.3	0.0	13.9
One	81.4	94.8	39.6	81.5
Two or three	0.9	3.2	60.4	4.1
No response	0.5	0.6	0.0	0.5
Number of further processing shifts operated daily				
None	38.5	42.9	35.8	39.0
Further processing shift is not operated daily	13.9	7.1	5.7	12.5
One	45.6	42.9	11.3	43.6
Two or three	1.5	6.5	47.2	4.4
No response	0.5	0.6	0.0	0.5
Number of clean-up shifts operated daily				
None	5.2	0.6	0.0	4.3
Clean-up shift is not operated daily	5.4	1.3	0.0	4.5
One	73.9	80.5	81.1	75.2
Two or three	15.0	17.5	18.9	15.5
No response	0.5	0.0	0.0	0.4
Number of USDA- or state-inspected plants owned by the company that owns this plant				
1	95.7	70.8	9.4	87.8
2 to 5	2.5	19.5	17.0	5.8
6 to 20	0.0	7.1	32.1	2.6
21 or more	0.0	1.3	41.5	2.2
No response	1.8	1.3	0.0	1.6
Total plant sales revenue				
Under $2.5 million	90.4	16.9	0.0	75.1
$2.5 million to $49.9 million	6.0	51.3	5.7	12.8
$50 million to $249.9 million	0.0	19.5	7.5	3.3
$250 million or more	0.0	4.5	71.7	4.1
No response	3.6	7.8	15.1	4.8

TABLE 2. Use of food safety technologies for meat slaughter and fabrication operations (weighted % of plants)

	Very Small	Small	Large	All Plants
Use of some type of carcass decontamination intervention	72.0	80.5++	100.0***	74.6
Organic acid rinse	48.4	66.2+++	83.0**	52.7
Tempered carcass rinse/wash	43.0	49.4	75.5***	45.5
Steam vacuum units	1.9	34.4+++	81.1***	10.6
Steam pasteurization system	2.3	16.2+++	49.1***	6.6
Positive air pressure from clean side to dirty side	5.8	33.8+++	79.2***	13.5
Metal detection equipment	2.2	37.0+++	98.1***	12.0
Conveyor belts made from materials designed to prevent bacterial growth	3.5	29.2+++	41.5***	9.1
Bioluminescent testing system	2.6	21.4+++	58.5***	8.1

Notes:

+++ = Difference between small and very small plants is statistically significant at the 0.01 level.

++ = Difference between small and very small plants is statistically significant at the 0.05 level.

+ = Difference between small and very small plants is statistically significant at the 0.10 level.

*** = Difference between large and very small plants is statistically significant at the 0.01 level.

** = Difference between large and very small plants is statistically significant at the 0.05 level.

* = Difference between large and very small plants is statistically significant at the 0.10 level.

Plants can use metal detection equipment to control physical hazards in incoming animals. Ninety-eight percent of large plants, 37% of small plants, and 2% of very small plants use metal detection equipment. Few plants (8% to 14%) employ positive air pressure to prevent contamination from the dirty to the clean side of the plant, use conveyor belts made from materials designed to prevent bacterial growth, or use a bioluminescent testing system for preoperative sanitation checks. Large and small plants are more likely than very small plants to use these technologies in their slaughter and fabrication operations ($P < 0.01$).

Use of food safety practices for meat slaughter and fabrication

Current PR:HACCP regulations require that plants have a sanitation plan, follow the plan, and keep records of sanitation practices; however, plants have some flexibility in choosing what practices to follow. Many plants reported using the sanitation practices listed in Table 3. Nearly all plants use sterilizer pots for heat sterilization of hand tools during operations. The majority of plants sanitize hands or gloves at a specified frequency, rotate sanitizing chemicals on an annual or more frequent basis, and use chemical sanitizers for food contact hand tools during operations.

The survey also collected information on other types of practices that plants may adopt to promote food safety (see Table 3). Although there is no regulatory requirement to test live animals for biological or chemical hazards, the PR:HACCP regulation requires plants to evaluate hazards in incoming animals. As a result, plants may require producers to use specific production practices for controlling pathogens and chemical hazards (pesticides and drug residues) as part of their HACCP plan or as a prerequisite program. For example, plants could require proper animal drug or pesticide use in the 90 days before slaughter and written assurances or letters of guarantees *(22)*. Ten percent of plants require and document that their animal growers use stipulated production practices for controlling pathogens, and 27% have such requirements for controlling chemical residues in incoming animals. Large and small plants are more likely than very small plants to stipulate these requirements for controlling pathogens ($P < 0.10$) and for controlling chemical residues ($P < 0.01$).

Although there is no regulatory requirement that establishments include a recall plan in their HACCP plans or as a prerequisite program, FSIS recommends that establishments have these plans *(28)*. A recall plan should provide detailed information on the actions the company will take in deciding whether to recall a product and, in cases of a recall, the specific procedures for conducting it *(28)*. All large plants, 76% of small plants, and 72% of very small plants have written policies and procedures for product recalls. About one-half of plants identify and track products backward and forward, a practice that can facilitate recalls. Large and small plants are more likely than very small plants to track products forward ($P < 0.01$). Differences were not observed by size of plant for tracking product backward.

TABLE 3. Use of food safety practices for meat slaughter and fabrication operations (weighted % of plants)[a]

	Very Small	Small	Large	All Plants
Sanitation Practices				
Uses sterilizer pots for heat sterilization of hand tools during operations	95.1	97.4	100.0	95.7
Sanitizes hands or gloves that contact raw product in slaughter area on a specified frequency	66.2	76.0++	86.8***	68.6
Sanitizes hands or gloves that contact raw product in fabrication area on a specified frequency	63.5	70.3	71.7	64.9
Rotates sanitizing chemicals on annual or more frequent basis	47.9	65.6+++	94.3***	52.8
Uses chemical sanitizers for food contact hand tools during operations	50.6	53.2	58.5	51.4
Other Practices				
Has written polices and procedures for product recalls	72.0	76.0	100.0***	73.9
Identifies and tracks products—forward	49.0	67.5+++	86.8***	53.5
Identifies and tracks products—backward	52.1	51.3	62.3	52.5
Has food safety manager on staff	41.8	74.0+++	96.2***	49.3
Has written polices and procedures to protect against bioterrorism	24.6	38.3+++	90.6***	29.8
Requires and documents that animal growers use stipulated practices for controlling chemical residues	20.9	42.2+++	84.9***	27.2
Conducts audits of slaughter and fabrication operations	11.8	55.2+++	96.2***	22.3
Requires and documents that animal growers use stipulated practices for pathogen control	9.2	14.3+	17.0*	10.3

[a]See Table 2 for description of notation used to indicate statistical significance.

FSIS issued a set of security guidelines in 2002 to help meat, poultry, and egg products establishments identify ways to protect against and respond to intentional contamination of food products *(24)*. Ninety-one percent of large plants, 38% of small plants, and 25% of very small plants have written policies and procedures in place to protect against bioterrorism.

As part of doing business, plants' customers may require audits that are conducted by the customer's own audit team or by a third-party auditor. Likewise, plants may hire a third party to audit their own operations to ensure that food safety, good manufacturing practices (GMPs), quality, sanitation, and other programs are meeting internal and external standards *(10)*. Ninety-six percent of large plants, 55% of small plants, and 12% of very small plants have their slaughter and fabrication operations audited.

Use of food safety technologies for processing operations in meat slaughter plants

Eighty-two percent of meat slaughter plants grind meat or conduct further processing (e.g., grinding or cooking) in addition to conducting slaughter activities. Of these, 47% produce RTE products, 80% produce not-ready-to-eat (NRTE) products, and 18% produce inputs to further processing by another plant.

The interim final rule on the control of *Listeria monocytogenes* in RTE meat and poultry products (9 CFR 430) provides incentives for producers of RTE products to use postlethality treatments, antimicrobial ingredients at formulation, and other intervention technologies to significantly reduce the risk of the presence or growth of *L. monocytogenes* on these products *(3)*. Additionally, plants may implement technologies and practices to control *Salmonella*, *E. coli*, and other pathogens during processing operations.

Table 4 presents the percentage of plants by HACCP size with processing operations using the food safety technologies asked about in the survey. The most frequently used technology during processing operations is some type of decontamination intervention (68% of large plants, 55% of small plants, and 38% of very small plants). A variety of effective decontamination interventions are available to plants. Several studies have found that the application of antimicrobial chemicals such as sodium lactate and sodium diacetate can be used to control *L. monocytogenes* on frankfurters *(1, 2, 9)*. Another study found that adding lactic acid bacteria to raw ground beef reduces *E. coli* O157:H7 and *Salmonella (20)*. Several studies have found that high-pressure processing can reduce

TABLE 4. Use of food safety technologies for further processing operations in meat slaughter plants (weighted % of plants)[a]

	Very Small	Small	Large	All Plants
Use of some type of decontamination intervention during processing operations	37.7	54.6+++	67.5***	41.0
Application of antimicrobial chemicals	35.5	52.6+++	65.0***	38.8
Other types of pasteurization	6.0	11.3+	20.0***	7.3
Infrared technology	1.2	1.0	17.5***	1.9
High-pressure processing	2.2	0.0	0.0	1.8
Irradiation	0.7	0.0	0.0	0.5
Metal detection equipment	3.2	40.2+++	100.0***	11.8
Conveyor belts made from materials designed to prevent bacterial growth	6.3	33.0+++	40.0***	10.9

[a]See Table 2 for description of notation used to indicate statistical significance.

TABLE 5. Use of food safety practices for further processing operations in meat slaughter plant (weighted % of plants)[a]

	Very Small	Small	Large	All Plants
Sanitation Practices				
Sanitizes hands or gloves that contact RTE product in further processing area on a specified frequency	80.6	79.5	100.0	80.9
Treats drains with sanitizers for pathogen control	77.6	84.5	95.0**	79.2
Sanitizes hands or gloves that contact raw product in further processing area on a specified frequency	67.9	70.1	77.5	68.6
Uses chemical sanitizers for hand tools during operations	63.1	70.1	70.0	64.2
Rotates sanitizing chemicals on an annual or more frequent basis	54.2	72.2+++	90.0***	57.9
Other Practices				
Requires and documents that raw meat suppliers use stipulated practices for pathogen control[b]	81.7	78.9	87.1	81.6
Requires and documents that raw meat suppliers use stipulated practices for controlling chemical residues[b]	54.4	51.5	53.3	54.0
Treats food contact equipment to remove biomatter during operations	42.7	48.5	47.5	43.5
Uses antimicrobial treatment for food contact equipment during operations	33.2	49.5+++	57.5***	36.1
Conducts audits of further processing operations	14.3	58.8+++	97.5***	23.1

[a]See Table 2 for description of notation used to indicate statistical significance.

[b]Results are for plants that purchase raw meat.

TABLE 6. Microbiological testing practices in meat slaughter plants (weighted % of plants)[a]

	Very Small	Small	Large	All Plants
Conducts voluntary microbiological testing	65.5	82.5+++	98.1***	69.6
Has company-owned lab for microbiological testing	9.0	35.1+++	88.7***	16.7
Tests hides before slaughter[b]	13.6	26.0+++	44.2***	17.8
Tests carcasses before fabrication[b]	64.4	81.1+++	98.1***	69.6
Tests raw meat after fabrication (before processing)[b]	48.5	64.6+++	92.3***	54.3
Tests RTE finished products (for plants producing RTE product)[b]	63.7	87.0+++	100.0**	67.2
Tests NRTE finished product (for plants producing NRTE product)[b]	41.3	77.4+++	93.5***	51.2
Conducts environmental sampling	46.7	68.8+++	94.3***	52.3

[a]See Table 2 for description of notation used to indicate statistical significance.

[b]Results are for plants that conduct microbiological testing.

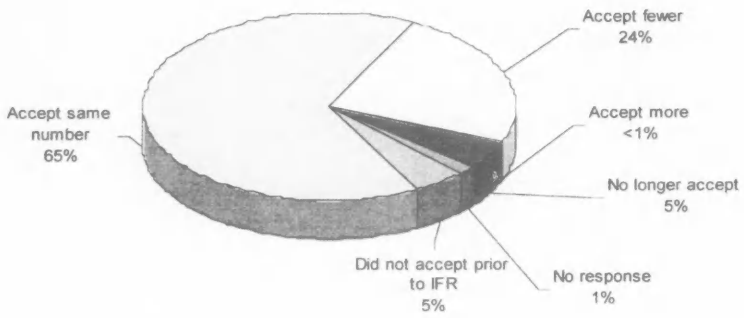
TABLE 7. Food safety training for meat slaughter plant employees (weighted % of plants)[a]

	Very Small	Small	Large	All Plants
Newly hired employees[b]				
On the job	83.5	84.4	83.0	83.6
Written materials	15.8	44.8+++	79.2***	23.2
Formal coursework	7.6	20.8+++	56.6***	11.9
No training	7.5	2.6++	0.0	6.4
Continuing training[b]				
On the job	78.8	82.5	88.7*	79.8
Formal coursework	9.7	27.3+++	62.3***	14.8
Written materials	5.6	18.8+++	43.4***	9.4
No training	14.5	6.5++	0.0**	12.6
HACCP training				
One or more production employees has completed formal HACCP training	84.0	97.4+++	98.1***	86.7

[a]See Table 2 for description of notation used to indicate statistical significance.

[b]Respondents could select multiple responses.

FIGURE 1. Acceptance of cattle 30 months of age and older since interim final rule (IFR) on prohibition of the use of specified risk materials (weighted % of cattle slaughter plants)



L. monocytogenes on RTE meats and also extend the refrigerated shelf life of these products *(11, 14)*. Finally, irradiation can be used as a method of decontaminating finished product *(8)*. For plants using a decontamination intervention during processing, most plants use antimicrobial chemicals; very few plants use infrared technology, high-pressure processing, irradiation, or other types of pasteurization. Large and small plants are more likely than very small plants to use some type of decontamination intervention ($P < 0.01$). All large plants, 40% of small plants, and 3% of very small plants use metal detection equipment to control physical hazards in processed product.

Use of food safety practices for processing operations in meat slaughter plants

Plants are required to have sanitation plans in the processing area of the plant as well as in the slaughter area. The majority of plants use the sanitation practices listed in Table 5. For most of these practices, differences were not observed by size of plant, with the exception that large and small plants are more likely than very small plants to rotate sanitizing chemicals annually or more frequently ($P < 0.01$).

The survey also collected information on other types of practices that plants may use in the processing area to promote food safety (see Table 5). The PR:HACCP regulation requires that processors address hazards that are reasonably likely to occur, including incoming hazards present in their raw materials. Eighty-two percent of plants require and document that their raw meat suppliers use stipulated production practices for controlling pathogens. Fewer plants have this practice in place for controlling chemical residues (54%). Differences were not observed by size of plant.

Nearly 44% of plants treat food contact equipment to remove biomatter during operations; differences were not observed by size of plant. Thirty-six percent of plants use antimicrobial treatment for food contact equipment during processing operations; large and small plants are more likely than very small plants to have such procedures ($P < 0.01$). Ninety-eight percent of large plants, 59% of small plants, and 14% of very small plants have their further processing operations audited for food safety.

Microbiological testing practices

FSIS requires meat slaughter plants to conduct generic *E. coli* testing of carcasses (9 CFR 381.94[a]). In addition to this mandatory testing, plants conduct voluntary testing of raw product, finished product, equipment, and food contact surfaces for a variety of pathogens.

Table 6 presents the percentage of plants, by HACCP size, with specific microbiological testing practices. Seventy percent of plants conduct voluntary microbiological testing for generic *E. coli*, *E. coli* O157:H7, *Salmonella* species, and other pathogens. The majority of plants use traditional cultural methods. Eighty-nine percent of large plants, 35% of small plants, and 9% of very small plants have a company-owned lab for microbiological testing.

For plants conducting microbiological testing, 18% test hides before slaughter, 70% test carcasses before fabrication; and 54% test raw meat after fabrication. Plants most often test carcasses for generic *E. coli* (74%) and *E. coli* O157:H7 (72%) and test raw meat after fabrication for *E. coli* O157:H7 (66%) and generic *E. coli* (62%). For plants that conduct microbiological testing and produce RTE finished product, 67% test finished product, most often testing for *Listeria* species (71%) and *L. monocytogenes* (65%). For plants that conduct microbiological testing and produce NRTE finished product, 51% test finished product, most often testing for generic *E. coli* (76%), *E. coli* O157:H7 (69%), and *Salmonella* species (64%). Large and small plants are more likely than very small plants to conduct testing of hides, carcasses, raw meat, and finished product ($P < 0.01$).

Fifty-two percent of plants conduct environmental sampling. Large and small plants are more likely than very small plants to conduct environmental sampling ($P < 0.01$). The majority of plants use traditional cultural methods and sample equipment surfaces. For plants conducting environmental sampling, 76% test for *Listeria* species on a routine basis.

Food safety training practices

Table 7 presents the percentage of plants, by HACCP size, with specific food safety training practices. Nearly all plants provide food safety training for new hires and most plants conduct on-the-job training (84%). Less than 23% of plants use written materials or formal coursework; large and small plants are more likely than very small plants to use such training ($P < 0.01$). Most plants also provide continuing food safety training for their employees. Most plants conduct on-the-job training (80%). Less than 15% of plants use written materials or formal coursework; large and small plants are more likely than very small plants to use such training ($P < 0.01$). Many plants have one or more production employees who have completed formal HACCP training (87%). Large and small plants are more likely than very small plants to have production employees trained in HACCP ($P < 0.01$).

Practices Related to BSE

Nearly all plants that slaughtered cattle in 2003 continued to slaughter cattle in 2004, after the BSE interim final rules were published in January 2004. Furthermore, 65% accept approximately the same number of cattle 30 months of age and older as before the rules were published (see Fig. 1). Three-fourths of plants use dentition (i.e., examination of teeth) to determine the age of cattle. For plants using dentition, 80% of plants treat 5% or fewer of the fed steers and heifers slaughtered as being 30 months and older. For cattle 30 months of age and older, 35% of plants remove the vertebral column during the slaughter process and 62% remove the vertebral column during the fabrication process; the remaining plants shipped carcasses containing vertebral column to another plant for removal. Since 2003, some plants have implemented additional procedures to ensure control in the removal of SRMs; 46% of plants had implemented one to two additional procedures and 38% had implemented three or more additional procedures.

During 2003 (before the interim final rule on the prohibition of the use of SRMs), the majority of plants fabricated vertebral bone-in cuts from at least some cattle 30 months of age and older, including T-bone steaks (60%), porterhouse steaks (57%), bone-in or standing rib roasts (53%), and blade or chuck roasts (57%). Some plants also sold by-products of cattle 30 months of age and older for human consumption during 2003, such as market heads (28%) and vertebral columns (12%). These bone-in cuts and by-products from cattle 30 months of age and older are no longer allowed for human consumption. In response to the regulations to prevent the spread of BSE, plants that used to fabricate vertebral bone-in cuts from cattle 30 months of age and older have replaced them with boneless cuts. For example, T-bone steaks are now cut as New York strip steaks. Although boneless cuts may weigh less than bone-in cuts, their higher per-pound value may offset the loss in saleable weight incurred by the plant. By-products from cattle 30 months of age and older that can no longer be sold for human consumption must be sent to inedible rendering or to a landfill *(17)*.

CONCLUSION

This study surveyed meat slaughter plants, including plants that slaughter and process, to collect uniform information on practices and technologies used to control biological, chemical, and physical hazards and promote food safety. The survey was nationally representative with a high response rate (65%). The data are self-reported and the extent of self-reporting bias is unknown; however, the survey results provide a unique and comprehensive review of food safety practices in the meat slaughter industry.

Many plants have adopted the food safety technologies and practices asked about in the survey. Large and small plants are more likely than very small plants to use many of the food safety technologies and practices asked about in the survey, to conduct microbiological testing and environmental sampling, and to offer some of the types of food safety training asked about in the survey. However, there are no data suggesting that large and small plants produce a safer product than very small plants. Furthermore, a 2001 survey conducted by USDA's Economic Research Service (ERS) found that large plants typically relied on sophisticated equipment and testing, while smaller plants tended to focus more on their SSOPs and plant operations in response to compliance with the PR:HACCP rule *(18)*. FSIS began funding cooperative agreements in 2004 to identify feasible technologies and to encourage their adoption among very small and small plants to enhance the positive effects of new technology on food safety and public health *(30)*. Additionally, FSIS recently announced initiatives that will provide technical and other assistance for small and very small plant owners to further improve their establishments' food safety programs, such as a toll-free number and Web page for technical assistance and improved access to technical resources such as scientific validation materials and education and training information *(31)*.

Practices and technologies implemented by meat slaughter plants for controlling foodborne pathogens and other hazards may subsequently help reduce the risk of foodborne illness. The survey findings, coupled with other data, can be used to characterize meat slaughter plants' food safety risk management practices.

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Benefits and Barriers to Following HACCP-based Food Safety Programs in Childcare Centers

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SUMMARY

Before HACCP can be implemented in childcare centers, it is important to identify existing prerequisite programs and implementation barriers. Studying the food safety beliefs and perceptions of directors and foodservice employees in childcare centers is the first step in the process. On the basis of reviewing previous Health Belief Model and food safety research, an instrument was developed that focused on childcare centers, the children at the childcare centers, and HACCP-based food safety behaviors. The population for this study included childcare centers directors and foodservice employees in six Midwestern states.

Overall, respondents agreed that they could follow HACCP-based programs; however, foodservice employees indicated more confidence in their abilities than did directors. The least implemented prerequisite programs were those related to equipment maintenance, food safety training, and kitchen operation procedures. For all nine prerequisite programs, significant differences based on certification status were found. It appears that childcare centers could easily adapt existing programs to follow a HACCP-based food safety program, but additional food safety training is needed. Future research conducted with directors and employees of childcare centers should assess knowledge levels and attitudes about HACCP-based food safety programs.

INTRODUCTION

Regulatory authorities define childcare centers as licensed facilities that provide childcare services to pre-school age children. Children attending childcare centers are at a higher risk for contracting foodborne illnesses because of their less developed immune systems, their lower weight, and the possibility of being exposed to pathogens transmitted by secondary sources *(3, 30)*.

Between 1990 and 2004 in the United States, 43 foodborne illness outbreaks affecting 1,276 children in childcare centers were confirmed *(6)*. Childcare attendance has been associated with a number of infections and outbreaks. Reeves et al. *(20)* found that fecal colonization of a strain of *E. coli* was higher among children in childcare (30%) than among control children (6%) or medical students (8%). Stroup and Thacker *(28)* proposed increased surveillance of childcare centers because children had diarrheal incidents 1.6 to 3.5 times greater than those who were cared for in their homes. Wilde, Van, Pickering, Eiden, and Yolken *(31)* stated that rotaviruses are rampant in day care facilities during diarrheal outbreaks.

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Hedberg and Osterholm *(12)* reported that Norwalk-like viruses (rotaviruses, caliciviruses, and astroviruses) had become the most common cause of viral gastroenteritis outbreaks in young children. Matson *(15)* identified the following factors reated to the spread of viral gastroenteritis in childcare centers: (1) the high infectious rate of viruses, (2) the fact that infections occur most often during outbreaks, and (3) the more common occurrence of asymptomatic infections than of symptomatic infections *(15)*.

Tucker, Haddix, Bresee, Holman, Parashar, and Glass *(29)* reported that nearly 1.5 million doctor visits, 200,000 hospitalizations, and 300 deaths of children per year were caused by acute gastroenteritis and almost one third of all hospitalizations of children less than five years old are for rotavirus diarrhea. Foodborne disease costs in direct medical care for these children are almost $250 million per year, with an additional societal cost estimated at $1 billion per year *(29)*.

In 2004, CDC *(4)* reported confirmed cases of *Shigella sonnei* in six states: Virginia (876), Maryland (250, plus one death), New Jersey (254), South Carolina (95), Delaware (200), and North Carolina (935). High porportions of these outbreaks were associated with daycare attendance *(4)*. These reports illustrate the importance of implementation of a food safety system in childcare centers. Researchers have recognized HACCP as an effective, proactive food safety system that had decreased the occurrence of foodborne illness outbreaks since USDA and FDA mandated its implementation in processing industries *(5, 16)*.

Food safety prerequisite policies and programs are the foundation of the development and implementation of HACCP. Examples of prerequisite programs include personal hygiene, cleaning and sanitation, pest control, and food safety training. Without these prerequisite programs in place, the successful implementation of a HACCP-based food safety program is uncertain *(16)*. However, understanding the barriers to implementation can be just as critical.

Several researchers have investigated barriers to implementing HACCP in different sectors of the foodservice industry. In Iowa retail operations, Roberts and Sneed *(23)* found that of 13 barriers to prerequisite and HACCP implementation, the greatest ones included employee training and employee motivation, managers' time to implement programs, costs associated with food safety and employees' taking time to follow food safety practices. In a follow-up study, Roberts, Barrett, and Sneed *(22)* found that sanitarians in Iowa and Kansas identified the greatest barriers as employee knowledge and time. Riggins, Roberts, and Barrett *(21)* indicated that employee training (77%), employee motivation (70%), and time for managers to monitor activities (63%) were the barriers identified by managers in college and university foodservices.

In school foodservice, Hwang, Almanza, and Nelson *(14)* found that of 162 school foodservice managers surveyed, 22 (14%) had implemented HACCP programs. Of those who did not have a HACCP program, 28% had plans to implement HACCP in the future. The majority (69%) either did not know what a HACCP program was, or had no plans to implement HACCP. Other researchers *(10, 11, 25, 33)* who have examined barriers to HACCP implementation in school foodservice have reported time as the greatest barrier to prerequisite and HACCP program implementation.

The Child Nutrition Program *(7, 8)* mandated HACCP-based food safety programs for schools; however, there are no such requirements for childcare centers. The National Resource Center for Health and Safety in Child Care *(19)* publishes standards for health and safety in childcare centers. Analogous to the Child and Adult Food Program regulations *(7, 8)* the standards require that state and local food safety laws and regulations be followed *(1)*.

Before implementation of HACCP in childcare centers, it is important to identify existing prerequisite programs and the barriers to implementation. Studying the food safety beliefs and perceptions of directors and foodservice employees in childcare centers is the first step in the process.

The Health Belief Model (HBM) developed by Rosenstock *(24)* has been used successfully in previous studies to identify preventative health behaviors and was therefore judged to be appropriate for use in the current study. Additionally, the HBM has been used in food safety research *(10, 11, 25)*.

The primary purposes of this research were to determine beliefs and perceptions of directors and foodservice employees about benefits, barriers, and intentions to follow HACCP-based food safety programs and to examine differences based on employment status, educational level, and food safety certification. Additionally, this study sought to determine the status of prerequisite programs in childcare centers and to identify differences in prerequisite program status based on certification status.

METHODOLOGY

Instrument development

Following a review of previous belief and perception questionnaires used in HBM and food safety research *(10, 11, 25, 32)*, an instrument was developed specifically for childcare centers to determine beliefs and perceptions about HACCP-based food safety programs. Items which focused on either the childcare center, the children at the childcare center, or HACCP-based food safety programs, measured perceived susceptibility, severity, benefits, barriers, self-efficacy and behavioral intentions to follow a HACCP-based food safety program. The instrument had three parts and was available in both paper and electronic formats.

Part I of the questionnaire contained 33 items. Six items measured perceived susceptibility and focused on either the center or on children becoming ill from a foodborne disease. Perceived severity (8 items) focused on the severity of consequences to either the center or the children in the event of a foodborne disease. On the basis of previous research from other segments of the foodservice industry, perceptions of benefits and barriers were measured with 4 and 9 items, respectively *(10, 26, 27)*. Self-efficacy items (n = 3) were worded to assess general agreement about confidence, skills, and knowledge related to following HACCP-based food safety programs. Three items measured behavioral intention and asked about plans to follow HACCP-based food safety programs in the future. Statements were measured on a five-point Likert scale (one being strongly disagree to five being strongly agree).

Part II requested information about prerequisite program implementation.

Because childcare personnel did not know or use the term "standard operating procedures," the term "kitchen operating procedures" was substituted.

Part III obtained demographic information about the respondents and the facilities.

The questionnaire and research protocol were reviewed and approved by the Human Subjects Committee for the Institutional Review Board (Kansas State University, Manhattan).

Population and sample

The population for this study included childcare center directors and foodservice employees who were members of the National Association for the Education of Young Children (NAEYC) *(17, 18)*. To be included in the study, the center had to be located in one of six Midwestern states and provide lunch to children participating in full-day care. The final sample included 528 centers in Colorado (122), Iowa (99), Kansas (64), Missouri (100), Nebraska (58), and Oklahoma (80).

Pilot test

Childcare facilities (n = 20) were randomly selected from the sample database and contacted to review the instrument. Additional questions asked about content and clarity of the subject matter as well as its applicability to childcare centers. Minor wording changes to HACCP definitions were made based on pilot participant (n = 8) recommendations.

A focus group (n = 7) and a committee (n = 5) of food safety, HACCP, and child care experts confirmed content validity.

Data collection

Two cover letters explaining the objectives of the research (one each for the director and foodservice employee), two copies of the instrument, and a postage-paid, coded return envelope were mailed to participants. The cover letters and paper instruments included the website address for those participants who might prefer to complete the survey electronically. Dillman *(9)* suggests that higher response rates may be attained if instruments are available in multiple formats. Reminder postcards were sent two and five weeks after the initial mailing to encourage participation.

Data analysis

All data analysis procedures used the Statistical Package for Social Sciences (SPSS) (version 12.0, 2003, SPSS, Inc., Chicago: IL). Descriptive statistics computed were frequencies, means, and standard deviations. Independent samples *t*-tests were used to determined the statistical significance of differences in item mean scores based on position title, location, level of education, and food safety certification. Chi-square tests were used to determine proportional differences for categorical data. An alpha level of .05 was set as the level of significance.

RESULTS

A total of 28 survey packages were returned as undeliverable, reducing the number of facilities in the sample population to 500. An overall facility response rate of 17.2% (n = 86) was obtained. Based on the assumption that only half the centers would have a designated foodservice employee, the sample population was estimated at 750 (500 facilities multiplied by 1.5 staff members). Because of incomplete and missing data, the final overall response rate was 17.5% (n = 131).

Demographics

Demographics indicated that most of the respondents were employed as directors (n = 78), were female (95.4%), and reported being between 40 and 49 years of age (26.7%, μ = 43). The majority of directors had a bachelor's degree (45.9%) and most of foodservice employees, a high school diploma (35.7%). The largest proporation (43.7%) of facilities were located in areas with populations over 50,000, and 60.9% received reimbursement from the Child and Adult Care Food Program.

Item responses

Overall responses to individual questionnaire items are shown in Table 1. Analyses were conducted to determine differences based on position title, location, level of education, and food safety certification.

Significant differences were found for the statement "if children develop foodborne illness, it could be more serious than other diseases" (t = -1.67, P = 0.05) and "following a HACCP program reduces food safety problems" (t = 1.74, P = .04), with directors rating the items higher. Other significant item differences were the benefit of using food safety checklists (t = 2.46, P = 0.01), the lack of funding for additional food safety training (t = 1.98, P = 0.03), the time that would be required to complete additional paperwork (t = 1.90, P = 0.03), and the development of new skills (t = 2.08, P = 0.02). For these items, foodservice employees had higher mean scores. Foodservice employees also indicated having higher levels of confidence (t = 2.23, P = 0.01) and skills necessary (t = 2.69, P = .004) to follow a HACCP-based food safety program.

For perceived susceptibility of children to foodborne illness, a significant difference was found for the item "Within the next year, the children at my Center will get a foodborne illness" (t = 2.61, P = .01); those with more education had higher mean scores.

Three items measuring perceived severity had significant differences, and related to job endangerment in the event of a foodborne illness (t = -2.29, P = .02) and the severity of consequences to children from foodborne illnesses (t = -2.30, P = .02), respondents with less education had higher mean scores. Conversely, for the item stating that foodborne illnesses were more serious than other diseases for children (t = 2.90, P = .00), those with higher levels of education had higher mean scores.

For items measuring perceived benefits and perceived barriers, respondents with less education had higher mean scores for four items: certification increasing safe food handling practices (t = -2.28, P = .02), HACCP being important to maintain food safety effectively (t = -2.42, P = .02), time for additional paperwork required by HACCP (t = -2.85, P = .01), and the difficulty of developing new habits (t = -2.61, P = .01). For self-efficacy, those with less education had higher mean scores for confidence to follow a HACCP-based program (t = -2.83, P = .01) and needing to learn more to follow the program (t = -2.01, P = .05). There were no differences for behavioral intentions.

Analysis of differences in beliefs and perceptions between those who reported

TABLE 1. Overall responses to items (n = 131)

Construct [a]	Statement [b, c]	M	SD
Perceived Susceptibility	A child has an increased chance of having complications that come from getting a foodborne illness.	3.95	0.79
	When I think about a foodborne illness occurring at my center, I feel concerned.	3.83	1.26
	Children, in general, have a greater chance of getting a foodborne illness than adults.	3.67	1.03
	I worry a lot about some of the children at my center getting a foodborne illness.	1.99	1.02
	Within the next year, the children at my center will get a foodborne illness.	1.66	0.76
	The chances of children at my center getting a foodborne illness are great.	1.62	0.81
Perceived Severity	A foodborne illness could cause severe consequences for young children.	4.32	0.67
	Problems children would experience from a foodborne illness could last a long time.	3.81	1.03
	I am afraid to even think about the possibility of a foodborne illness outbreak at my center.	3.41	1.26
	If children acquire a foodborne illness, their whole life could change.	3.35	0.98
	If the children developed a foodborne illness, it could be more serious than other diseases.	3.22	0.94
	The center's financial security would be in jeopardy if any child got a foodborne illness.	2.92	1.10
	A foodborne illness outbreak would endanger the relationship I have with my fellow employees.	2.82	1.16
	If the children at my center contracted a foodborne illness, my job would be endangered.	2.66	1.12
Perceived Benefits	Employees with food safety certification are more likely to use safe food handling practices.	4.17	0.76
	Food safety checklists may locate a problem before it is discovered by regular health inspections.	4.17	0.60
	A HACCP-based food safety program is important for maintaining food safety effectively.	4.06	0.77
	Following a HACCP-based food safety program at work would greatly reduce future food safety problems for me.	3.82	0.93
Perceived Barriers	We lack the time required to train employees properly in food safety. [d]	4.05	0.97
	We do not have the resources to improve food safety at my center.	4.02	1.00
	Foodservice employees lack training in food safety issues. [d]	3.71	1.06
	I would be less anxious about foodborne illness if I followed a HACCP-based food safety program. [d]	3.65	0.92
	We lack the funding to pay for additional food safety training. [d]	3.61	1.29
	We do not have the time for the additional paperwork a HACCP-based food safety program would require. [d]	3.47	1.13
	Staff and employees of childcare centers do not feel comfortable with change. [d]	3.33	1.11
	Completing HACCP-based food safety program requirements would involve developing new habits, which is difficult. [d]	3.30	1.06
	Other than myself, center employees do not care about food safety issues. [d]	1.91	1.00
Self-efficacy	I am confident that I can follow a HACCP-based food safety program.	4.06	0.71
	I have the skills necessary to follow a HACCP-based food safety program.	3.88	0.89
	I need to learn more to be able to follow a HACCP-based food safety program.	2.57	1.07
Behavioral Intentions	I would not use a food safety self-inspection form unless mandated.	3.77	0.94
	I would follow a voluntary HACCP-based food safety program.	3.77	0.81
	I would use recipes modified for HACCP-based food safety programs.	3.54	0.86

[a] Construct Names.

[b] All statements were preceded by the instructions to "Circle the response that corresponds to the way you feel about each statement. There is no right or wrong answers, please be honest."

[c] All statements were measured on a 5-point Likert scale with 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree.

[d] Item reverse scored.

TABLE 2. Overall prerequisite program implementation status based on facility (n = 86)

Program [a]	Completely [b]		Partially [b]		Not [b]		No Response	
	n	%	n	%	n	%	n	%
Personal Hygiene	82	94.3	3	3.4	0	0.0	2	2.3
Pest Control Program	76	87.4	5	5.7	5	5.7	1	1.1
Chemical Storage	79	90.8	3	3.4	4	4.6	1	1.1
Purchasing Procedures	74	85.1	10	11.5	2	2.3	1	1.1
Food Allergy Procedures	76	87.4	9	10.3	1	1.1	1	1.1
Equip Cleaning Procedures	70	80.5	15	17.2	1	1.1	1	1.1
Kitchen Operation Policies	70	80.5	10	11.5	5	5.7	2	2.3
Food Safety Training Program	65	74.7	17	19.5	3	3.4	2	2.3
Equip Maintenance Program	53	60.9	25	28.7	7	8.0	2	2.3

[a] Percentages may not add to 100% due to rounding.

[b] As reported by one respondent per facility. Director responses were used when possible.

having food safety certification and those reporting no certification indicated that for every significant difference noted, certified respondents had the higher mean score. Significant differences were seen for 52% of the items in the questionnaire.

Prerequisite program implementation status

Participants indicated the implementation status of nine prerequisite programs by specifying "Not Implemented", "Partially Implemented", or "Completely Implemented" (Table 2). Frequency distributions indicated that most prerequisite programs were fully or partially implemented. The programs implemented by the largest number of childcare centers were personal hygiene (94.3%), pest control (87.4%), and chemical storage (90.8%). The least often implemented prerequisite programs were kitchen operations procedures (80.5%), food safety training (74.7%), and equipment maintenance (60.9%).

There were significant differences in those who reported complete implementation of each of the nine prerequisite programs based on reported certification status in food safety. Respondents with food safety certification had higher rates of implementation (Table 3).

DISCUSSION

This research determined beliefs and perceptions of childcare center directors and foodservice employees about benefits, barriers, and intentions to follow HACCP-based food safety programs. The low response rate may be due to several factors, including lack of an internet connection or difficulty accessing the instrument. Other possible reasons are that the sample population did not have time, did not consider the topic important, and/or were not knowledgeable about HACCP-based food safety programs.

Overall, respondents agreed that children were vulnerable to foodborne diseases and that consequences for children could be severe, but they believed that a foodborne disease would not occur at their center and, if it did, there would be no consequences to themselves or the center.

Pertaining to barriers, respondents indicated that they lacked time for proper employee training, resources to improve food safety, and funding to pay for training. These results are consistent with results of other research *(10, 14, 21, 22, 23, 27, 33)*, which also found that time, money, resources, and training were barriers to implementing prerequisite and HACCP-based food safety programs.

Respondents agreed that they could follow a HACCP-based food safety program; however, foodservice employees indicated more confidence in their abilities than did directors. This is an expected finding, because employees should perceive themselves as more confident, since directors may lack the practical foodservice experience necessary for estimating performance requirements accurately.

Other differences in beliefs and perceptions found between directors and foodservice employees included the stronger agreement of directors than of foodservice employees that a foodborne disease would be serious, which may reflect their accountability as directors. Foodservice employees agreed more strongly than did directors that a lack of time and funding for training were barriers. Foodservice employees indicated the need for additional food safety training; however, because of budget constraints, directors may be reluctant to allow additional training except for that required by accrediting agencies or health departments.

Differences based on level of education indicated that those with more education were more likely to agree that foodborne illnesses were more serious than other diseases for children, although respondents with less education agreed that the consequences of foodborne illnesses for children are severe. For eight of the nine barrier items, those respondents with less education had higher mean scores than those with more education; one item had nearly identical mean scores (3.62 and 3.63). The one item with nearly identical scores stated "I would be less anxious about foodborne illness if I followed a HACCP-based food safety program." These results indicate that less educated directors and foodservice employees perceive more barriers to implementation of HACCP-based programs than do those with higher levels of education. Interestingly, those with less education also indicated more confidence in being able to follow a HACCP-program and had less disagreement about needing to learn more about HACCP-programs.

TABLE 3. Implementation of prerequisite programs by certification status of all respondents

Program [a]	Certified [c] n [b]	Certified [c] %	Not Certified [c] n [b]	Not Certified [c] %	—	Sig.
Personal Hygiene	42	0.98	79	0.95	13.45	0.00*
Pest Control Program	38	0.88	78	0.94	15.54	0.00*
Chemical Storage	41	0.95	79	0.95	13.67	0.00*
Purchasing Procedures	38	0.88	73	0.88	12.67	0.00*
Food Allergy Procedures	41	0.95	71	0.86	9.47	0.00*
Equipment Cleaning Procedures	36	0.84	71	0.86	13.13	0.00*
Kitchen Operation Policies	39	0.91	66	0.80	8.33	0.00*
Food Safety Training Programs	34	0.79	64	0.77	10.78	0.00*
Equipment Maintenance Program	31	0.72	52	0.63	6.79	0.01*

[a] Percentages may not add to 100% due to non-response.

[b] Completely implemented program.

[c] As reported by respondents.

* *P*-value < .05.

Significant differences were found in beliefs and perceptions about HACCP-based food safety programs on the basis of food safety certification status. In all cases, those with certification had the higher mean scores, which would indicate that those with food safety certification have a greater understanding of the importance of food safety and of implementing a HACCP-based food safety program. All groups agreed that time for additional HACCP paperwork was a barrier to implementing HACCP-based programs.

Implementation differences

Most centers in this study had implemented personal hygiene policies (94.3%) and policies covering chemical storage (90%), which are among the policies required for accreditation through the NAEYC *(17, 18)*. The least implemented prerequisite programs were kitchen operation procedures and food safety training. These programs are essential for safe food preparation; however, size of operation and numbers fed may influence implementation. Because the largest number of respondents indicated that they fed fewer than 50 children, directors and foodservice employees may not consider these programs important.

However, food safety certification significantly impacted implementation. Those who were certified had implemented all nine programs. This finding is consistent with previous research that has indicated that food safety certification has an impact on program implementation *(23)*.

CONCLUSIONS AND APPLICATIONS

Results of this study are consistent with findings of previous research. It appears that noncommercial foodservices, regardless of segment, report the same barriers to implementing prerequisite and HACCP-based food safety programs: time, money, resources, and training *(2, 13, 14, 15, 21, 23, 27, 33)*. Overall, respondents agreed about the importance of these barriers, regardless of level of education or certification status.

Most respondents had partially or fully implemented the prerequisite programs. It appears that childcare centers could easily adapt existing programs to include requirements for the implementation of HACCP-based food safety programs. Written procedures for kitchen operations and food safety training were implemented least often and should be addressed. The lower implementation rate of these programs reinforces the findings of this study that directors were not as concerned about food safety training as the foodservice employees. However, those with food safety certification had implemented the nine programs, which would indicate that certification does have an impact on childcare center food safety.

Respondents generally disagreed that they needed to learn more to follow a HACCP-based food safety program; however, the number of neutral responses may indicate a lack of knowledge in this population. For HACCP implementation, childcare center directors may need more education on food safety practices. Future research conducted with childcare center directors and employees should include determining knowledge levels of and attitudes toward HACCP-based food safety programs. Focus groups and individual interviews could be used to determine requirements for integrating a HACCP-based food safety program into existing programs. Because of the highly susceptible population served, childcare centers should be concerned about the safety of the food prepared and implement the best possible systems to ensure that no child becomes ill from a foodborne disease.

Results of this research indicate the need to develop food safety and training materials specifically for childcare centers. Additionally, as the majority of respondents indicated that they prepared meals using convenience foods instead of cooking from "scratch," a model HACCP program should be developed considering this and other factors characteristic of childcare.

These findings are useful to regulatory and accrediting agencies. As previously mentioned, The Child Nutrition Program *(7, 8)* mandated HACCP-based food safety programs for school foodservice operations. However, even though childcare also receives this funding, there are no requirements for HACCP-based food safety programs in childcare centers. Childcare facilities serve a higher-risk population than do school foodservices, yet food safety issues do not appear to be a concern. Training in food safety is scanty and HACCP is not a requirement for licensing. Federal agencies should revise current regulations governing childcare centers, and state agencies should emphasize food safety in childcare centers

and perform inspections similar to those at other, non-commercial, operations. Because it was significant that those with food safety certification had implemented prerequisite programs, it would be important for accrediting agencies to require nationally recognized food safety certification for foodservice personnel. Additionally, for accreditation purposes, the inclusion of a criterion requiring implementation of a HACCP-based food safety program should be considered.

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International Association for Food Protection (IAFP) Position Statement

Milk Pasteurization and the Consumption of Raw Milk in the United States

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Milk Pasteurization

Federal regulation of milk pasteurization and sanitation in dairy processing plants has been in existence in the United States for nearly 100 years *(1)*. This comprehensive program involves application of sanitary procedures throughout production, handling, pasteurization, and distribution. As a result of regulations under the US Public Health Service and a variety of state and local regulatory agencies, the incidence of milkborne illness in the US has decreased from approximately 25 per cent of all reported foodborne illness outbreaks in 1938 to less than 1 per cent of reported outbreaks today *(1)*. Similar trends have been observed internationally with mandatory milk pasteurization having a significant positive impact on public health and safety in many countries.

Risks of Raw Milk Consumption

Pathogenic or disease-causing microorganisms may be shed into milk even by healthy cows, goats, and sheep *(2)*. Further, milk handling procedures on the dairy farm may introduce pathogenic microorganisms into the milk. Milk is an excellent growth medium and when stored improperly will allow the rapid proliferation of pathogens. A recent survey by Jayarao et al. *(3)* identified several foodborne pathogenic bacteria, including *Campylobacter jejuni*, *Shigatoxin*-producing *Escherichia coli*, *Listeria monocytogenes*, *Salmonella* serovars, and *Yersinia enterocolitica* associated with raw milk. This is but one of several studies demonstrating that pathogenic bacteria are common in raw milk *(4, 5)*. In addition, unpasteurized milk is a vehicle for transmission of other pathogenic microorganisms (e.g. *Brucella*, *Mycobacterium) (6, 7)*. While these pathogens can affect the health of anyone who drinks raw milk, they are especially dangerous to high risk consumers (e.g., pregnant women, children, the elderly, and people with weakened immune systems).

The consumption of raw milk has been associated with numerous foodborne illness cases and outbreaks and has resulted in product recalls *(8, 9, 10)*. According to the survey report by the National Association of State Departments of Agriculture (NASDA) in 2004 *(11)*, 29 states have recorded illness outbreaks traceable to raw milk consumption. Further, in 2005–2006, more than 10 outbreaks caused by the consumption of raw milk or raw milk cheese were reported by the Food and Drug Administration (FDA) *(12–15)*.

Pasteurization assures the destruction of pathogenic microorganisms that may be present in raw milk. Since 1987, US FDA regulations *(16)* have required mandatory pasteurization of packaged milk and milk products for human consumption in interstate commerce. Milk pasteurization as a public health control measure is endorsed by the Centers for Disease Control and Prevention (CDC) *(8)* and the US Department of Agriculture (USDA) Agricultural Marketing Service *(17)*. In spite of this, the majority of state regulations currently allow raw milk sales with certain limitations and legislative changes have been or are being proposed in many other states to allow raw milk sales.

As a public health control procedure, the milk pasteurization process (or equivalent) has been recognized throughout the world. According to the World Health Organization (WHO) *(18)*: "Pasteurization of milk is almost universally accepted as an essential public health technology that enjoys the confidence and support of the consuming public." In Canada, federal and many provincial regulations prohibit the sale of raw milk *(18)*. However, direct sale of unpasteurized milk to the consumer is allowed in many regions of the world, with certain restrictions and limitations.

A variety of regulatory, educational and public health authorities have issued position statements, fact sheets, and related documents which warn against the risks of raw milk consumption, including:

- American Veterinary Medical Association (AVMA) *(1)*;

- Association of Food & Drug Officials (AFDO) *(20)*;
- Health Canada *(21, 22)*;
- NASDA *(11)*;
- National Association of State Public Health Veterinarians (NASPHV) *(23)*;
- National Conference on Interstate Milk Shipments (NCIMS) program *(24)*;
- State regulatory agencies *(25, 26)*; and
- University cooperative extension programs *(27–30)*.

In recent years, organizations *(31, 32)* have emerged promoting raw milk consumption and making unsubstantiated and false claims regarding the health benefits achieved by drinking raw milk and the "toxic effects of drinking pasteurized milk." Further, they make unsupported statements that raw milk sales will "save the family farm." These organizations have sought to overturn state regulations prohibiting the sale of raw milk. This movement has had some support from some individual state cooperative extension specialists who are promoting direct farm sales under sustainable and value added agriculture programs.

As the premier professional association for microbiological safety of foods, the International Association for Food Protection (IAFP), the IAFP Dairy Quality and Safety Professional Development Group, and the 3-A Committee on Sanitary Procedures commend the success of the time honored and effective regulatory program for milk pasteurization and sanitation through the NCIMS *(24)*, a cooperative federal/state regulatory program. We hereby join the numerous other associations and agencies in warning consumers regarding the risk of raw milk consumption. It is overwhelmingly clear from scientific and epidemiological evidence that the risks of raw milk consumption far outweigh any perceived benefits.

In conclusion, scientific evidence is clear that there is an increased risk of serious milkborne illness and even death associated with the consumption of raw milk.

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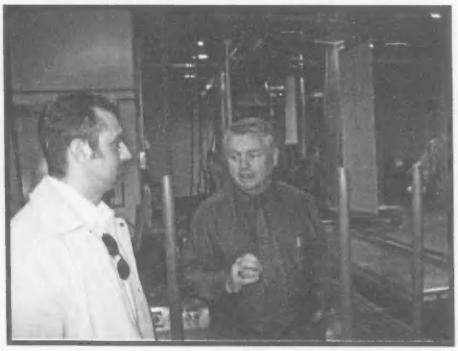
Ivan Nastasijevic Visits IAFP and Iowa State University

IAFP Member Ivan Nastasijevic, recipient of a Student Travel Scholarship at IAFP 2007, traveled again from Belgrade, Serbia, in late October to spend six weeks in the exchange visitor program at the Roman L. Hruska US Meat Animal Research Center (USMARC) in Clay Center, NE.

In a project arranged by USMARC Director Dr. Mohammad Koohmaraie, Mr. Nastasijevic researched and wrote on the topic of "Prevalence and characterization of *E. coli* non-O157 STEC in US swine and pork products." In this advanced research setting, Mr. Nastasijevic sought further development in the field of meat microbiology and safety in applying different lab techniques, and to gain laboratory management experience in the processing of a large number of samples. In Serbia, he seeks to apply new approaches and insight to his work in developing National Risk Assessment projects concerning microbial pathogens along the meat chain, and to improve the laboratory management system at the Institute of Meat Hygiene and Technology.

While working in Nebraska, Mr. Nastasijevic took a day to visit the IAFP staff in Des Moines, IA. From there, he traveled to Ames with executive director David Tharp to discuss meat safety issues and HACCP extension programs with Professors James Dickson and Joseph Cordray at the Meat Laboratory of the Iowa State University Animal Science Department. A brief tour of the pilot plant and meat-processing unit highlighted the site's educational and training capacities, inspiring agreement for the group to work cooperatively on future projects.



FOOD PROTECTION TRENDS

INSTRUCTIONS FOR AUTHORS

NATURE OF THE MAGAZINE

Food Protection Trends (FPT) is a monthly publication of the International Association for Food Protection. It is targeted for persons working in industry, regulatory agencies or teaching in the field of food science or for anyone interested in food safety and food protection.

The major emphases include:

- research as well as practical technical articles on food protection;
- new product information;
- news from activities and individuals in the field;
- news of the Association affiliate groups and their members;
- excerpts of articles and information from other publications of interest to the readership.

SUBMITTING ARTICLES AND OTHER MATERIALS

All manuscripts should be submitted in triplicate (original and two copies), in flat form (*not folded*), to Donna Bahun, Production Editor at the address at the end of these instructions. A fourth copy of the manuscript must be provided on computer disk saved as text format.

Material to be published in *FPT*, including advertising should be forwarded to the address at the end of these instructions.

Correspondence regarding subscriptions or membership in the International Association for Food Protection should be sent to Julie Cattanach, Membership Coordinator, at jcattanach@foodprotection.org or see corresponding information at the end of these instructions.

Manuscripts of a Sensitive Nature. Bioterrorism and food security are of major concern to all involved in food production, processing, evaluation and distribution including members of IAFP. Manuscripts dealing with sensitive issues are expected to approach the subject from a preventative stance and not provide a "how to" guide. A review policy is used in the evaluation of manuscripts submitted for publication in journals printed by IAFP to minimize the possibility that their contents may be used to pose a food security threat.

Suitability of Publication. Prospective authors with questions about the suitability of their material for publication are invited to request an opinion from the Scientific Editors. Opinion based submissions (800–1,000 words) may only be considered for publication in "Thoughts for Food safety" columns. Full-length, opinion based articles are not appropriate for publication in *FPT*.

LETTERS TO THE EDITOR POLICY

Food Protection Trends invites Letters to the Editor. Letters commenting on articles printed in this publication are subject to review from the Scientific Editors before acceptance. The author of the article that is the focus of the letter is provided the opportunity to respond to the comments. This response is sent back to the author of the letter who is then given the option to continue with the publication process or to withdraw the Letter to the Editor. If withdrawn, neither the Letter to the Editor nor the author's response will be published. If not withdrawn, both the Letter to the Editor and the author's response will be published in their entirety.

PUBLICATION OF MANUSCRIPTS

Manuscripts are accepted for publication only after they are reviewed by two members of the Editorial Board. Occasionally, when the subject of the paper is outside of the specialties of members of the Editorial Board, other specialists may be asked to review manuscripts. After review, a manuscript will be returned to the author by the Scientific Editor for revision in accordance with reviewers' suggestions. Three clean copies of the revised paper and a disk copy are to be returned to the Scientific Editor as soon as possible. Authors can hasten publication of their papers by submitting well-written manuscripts conforming to the journal's style and by revising and returning manuscripts promptly. If, after review of a manuscript is completed, an author chooses to withdraw rather than revise the paper, the Scientific Editor should be notified promptly. If an author does not respond in *four months* after a reviewed paper is returned, the paper will be considered as withdrawn. With authors' cooperation, articles are usually published within three to six months after they are received and may appear sooner.

When a manuscript is received, it is numbered, and the author is notified by mail that the manuscript has been received. The manuscript number will be given on the letter and should be used on all future correspondence and revised manuscripts. Authors will be notified when a manuscript has been accepted for publication.

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Page proofs will be sent to authors prior to publication.

Authors are responsible for the accuracy of their papers. Neither *FPT* nor the Association assume responsibility for errors made by the authors. Furthermore, *FPT* and the International Association for Food Protection assume no responsibility for conclusions reached by authors, especially when products are evaluated.

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POLICY ON COMMERCIALISM

Manuscripts submitted for consideration for publication in *FPT* are not to be used as a platform for commercialism or the promotion of branded products or services. References to branded products or services except as may be warranted by scientific merit and research data or as are necessary for the understanding, evaluation and replication of the work described are to be avoided. However, scientific merit should not be diluted by proprietary secrecy. The excessive use of brand names, product names, logos or trade names, failure to substantiate performance claims, and the failure to objectively discuss alternative methods, processes, products and equipment may be considered indicators of commercialism. Disclosure and acknowledgment of both funding sources and any conflicts of interest by the authors is encouraged. In general, the spirit and principles of the International Association for Food Protection Policy on Commercialism also apply to manuscripts submitted for consideration of publication in *FPT*. Restricting commercialism benefits the authors and the audience of *FPT*. The Scientific Editor shall in his or her sole discretion, determine whether a submitted manuscript violates this policy on commercialism.

TYPES OF ARTICLES

Readers of *FPT* are people working in the food industry, regulatory agencies, as well as teachers and researchers. *FPT* publishes a variety of papers for food safety professionals. Technical research and general interest manuscripts are appropriate for publication in *FPT*. All manuscripts will be peer reviewed by experts in the related field.

Technical Research

FPT regularly publishes papers resulting from research related to various aspects of food safety and protection. These papers should be of interest to our membership whether they are in academics, industry, or government.

General Interest

FPT also publishes papers that are of a practical technical general interest to most IAFP members. These papers include topics such as the organization and application of food safety and quality control programs, methods of solving food safety and protection problems, and experiences resulting from such activities. Presentations at affiliate and the annual meetings can be adjusted to make them appropriate for *FPT* publication.

(Contact the *FPT* Scientific Editor if there are questions concerning the suitability of material for publication.)

Book Reviews

Authors and publishers of books relating to food safety are invited to submit their books to the Production Editor. Books will then be reviewed by a specialist in the field covered by the book, and the review will be published in an issue of *FPT*.

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The Scientific Editor assumes that the senior author has received proper clearance from his/her organization and from coauthors for publication of the manuscript.

All manuscripts should be typed double-spaced on 8-1/2 by 11 inch white bond paper. *Lines on each page should be numbered to facilitate review of the manuscripts. Manuscripts submitted on paper without numbered lines will be returned to authors.* Margins on all sides should be at least one-inch wide and pages of the original manuscript should not be stapled together. A manuscript should be read critically by someone other than the author before it is submitted. If English is not the author's first language, the manuscript should be reviewed by a colleague of the author who is fluent in written English to ensure that correct English is used throughout the paper. *The Scientific Editor and editorial staff will not rewrite papers when the English is inadequate.*

Authors are encouraged to consult previously published issues of *FPT* to obtain a clear understanding of the style of papers published.

Manuscripts should not be commercial in nature nor contain excessive use of brand names.

Revised manuscripts that do not require a second review should be printed on plain white bond paper *without* numbered lines or box outlines, etc. A copy of the revised manuscript should be included on a disk saved as text formats.

ORGANIZATION OF ARTICLES

The title of the manuscript should appear at the top of the first page. It should be as brief as possible and contain no abbreviations. The title should be indicative of the subject of the manuscript. Avoid expressions such as "Effects of," "Influence of," "Studies on," etc.

Full names and addresses of each author should appear on the title page. An *asterisk* should be placed after the name of the author to whom correspondence about the paper and proofs should be sent. The E-mail, telephone and facsimile numbers of this author should be given at the bottom of the page. No text of the manuscript should appear on the title page.

The Abstract should appear on a separate piece of paper directly following the title page, and should not exceed 200 words. It should summarize the contents of the manuscript, and be meaningful without having to read remaining pages. The Abstract should *not* contain references, diagrams, tables or unusual abbreviations.

The references should be arranged in alphabetical order, by last name of first author and numbered consecutively. Only the first author's name and initial should be inverted. *Cite each reference in the text by number.* All references given in the list must be cited in the text. List references according to the style of the following examples.

Paper in journal

Cabedo, L., J. N. Sofos, and G. C. Smith. 1996. Removal of bacteria from beef tissue by spray washing after different times of exposure to fecal material. *J. Food Prot.* 12:1284-1287.

Paper in book

West, D. I., and L. B. Bullerman. 1992. Physical and chemical separation of mycotoxins from agricultural products, p. 52–57. *In* J. E. Smith (ed.), Mycotoxins and animal feeding stuffs, vol. 4. CRC Press, Boca Raton, FL.

Book by author(s)

Pitt, J. I., and A. D. Hocking. 1997. Fungi and food spoilage. Blackie Academic and Professional, London.

Book by editor(s)

Doyle, M. P., L. R. Beuchat, and T. J. Montville (ed.). 1997, Food microbiology: fundamentals and frontiers. ASM Press, Washington, D.C.

Patent

Hussong, R. V., E. H. Marth and D. G. Vakaleris. 1964. Manufacture of cottage cheese. U.S. Pat. 3,117,870. Jan. 14.

Publication with no identifiable author or editor

Anonymous. 1998. Guide to minimize microbial food safety hazards for fresh fruits and vegetables. U.S. Department of Health and Human Services, Food and Drug Administration, Center for Food Safety and Applied Nutrition, Washington, D.C.

References citing "personal communication" or "unpublished data" are discouraged, although it is recognized that sometimes it is unavoidable. An author may be asked to provide evidence of such references.

References consisting of papers that are "accepted for publication" or "in press" are acceptable, but the author may be asked to provide copies of such papers if needed to evaluate the manuscript in question.

Figures and tables should appear on separate pages and not within the text of the manuscript. Placement of tables and figures should be indicated in the text.

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E-mail messages should include the name of the person who sent the message, the date, the subject, the sender's E-mail address, and availability (if appropriate).

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Submission of photographs, graphics or drawings to illustrate the article will help the article. The nature of *FPT* allows liberal use of such illustrations, and interesting photographs and drawings often increase the number of persons who read the article.

Photographs. Photographs which are submitted should have sharp images, with good contrast. Photographs can be printed in color, but the additional cost of doing so must be incurred by the author. Authors wishing to publish color photographs should contact Donna Bahun, Production Editor for cost estimates.

Line drawings. All line drawings (graphs, charts, diagrams, etc.) must be submitted in camera-ready form on laser paper. Graphs must be produced by a laser printer, with sufficiently dark printing of appropriately sized symbols, letters, and numerals. Figures are commonly reduced to a 1-column width (85 mm). Lettering should be of sufficient size to allow for reduction. If symbols are used, they must be identified on the Figure and not in the legend. Data that are presented in Figures should not be repeated in Tables. A well-prepared Figure should be understandable without reference to the text of the paper.

When submitting electronic figures, the preferred formats are TIFF or EPS. The following native application file formats are also acceptable: Adobe Photoshop, Adobe Acrobat, Illustrator, PowerPoint, Word, Excel, InDesign, PageMaker, and QuarkXPress. The resolution required for halftone and color images is a minimum of 300 pixels per inch (ppi); line art should be 1,200 ppi. Please note that images that are in JPEG or GIF format will be 72 dpi and not acceptable for printing. Digital color files must be submitted in CMYK mode. The following media are accepted: 3 1/2" Floppy Disk, Zip Disks, Jazz Disks, CD-ROM, DVD. Large files should be compressed with StuffIt or WinZip if possible. When submitting electronic figures, hard copies must also be submitted.

Labeling of figures. All Figures should be labeled lightly on back, using a soft pencil or a typed adhesive label. Labeling should include:

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- last name of author(s),
- title of manuscript,
- the manuscript number (on revised copies),
- identification of the top of the figure.

COMMON ABBREVIATIONS

Frequently used acceptable abbreviations may be used (i.e., using *wt* for the word *weight*, or *s* for the word *second*). For further details on abbreviations see the current edition of the *CBE Style Manual* or *ASM Manual of Style*. Note that a period is used with some but not all abbreviations. Authors may also contact the Production Editor if they are not sure about acceptable abbreviations.

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INDEXES

Food Protection Trends is indexed in *Agricola, Food Science and Technology Abstracts*, and *CAB Abstracts*.

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95th Annual Meeting

IAFP 2008

Columbus, Ohio • August 3–6

AWARD NOMINATIONS

The International Association for Food Protection welcomes your nominations for our Association Awards. Nominate your colleagues for one of the Awards listed below. You do not have to be an IAFP Member to nominate a deserving professional. Nomination criteria is available at:

www.foodprotection.org

Nominations deadline is March 4, 2008

You may make multiple nominations. All nominations must be received at the IAFP office by March 4, 2008.

- Persons nominated for individual awards must be current IAFP Members. Black Pearl Award nominees must be companies employing current IAFP Members. GMA Food Safety Award nominees do not have to be IAFP Members.
- Previous award winners are not eligible for the same award.
- Executive Board Members and Awards Committee Members are not eligible for nomination.
- Presentation of awards will be during the Awards Banquet at IAFP 2008 – the Association's 95th Annual Meeting in Columbus, Ohio on August 6, 2008.

Contact IAFP for questions regarding nominations.

6200 Aurora Ave., Suite 200W
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Phone: 800.369.6337; 515.276.3344
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Nominations will be accepted for the following Awards:

Black Pearl Award

Award Showcasing the Black Pearl, *Sponsored by Wilbur Feagan and F&H Food Equipment Company*

Presented in recognition of a company's outstanding commitment to, and achievement in, corporate excellence in food safety and quality.

Fellow Award

Distinguished Plaque

Presented to Member(s) who have contributed to IAFP and its Affiliates with distinction over an extended period of time.

Honorary Life Membership Award

Plaque and Lifetime Membership in IAFP

Presented to Member(s) for their dedication to the high ideals and objectives of IAFP and for their service to the Association.

Harry Haverland Citation Award

Plaque and $1,500 Honorarium, *Sponsored by ConAgra Foods, Inc.*

Presented to an individual for many years of dedication and devotion to the Association ideals and its objectives.

Food Safety Innovation Award

Plaque and $2,500 Honorarium, *Sponsored by 3M Microbiology*

Presented to a Member or organization for creating a new idea, practice or product that has had a positive impact on food safety, thus, improving public health and the quality of life.

International Leadership Award

Plaque, $1,500 Honorarium and Reimbursement to attend IAFP 2008, *Sponsored by Cargill, Inc.*

Presented to an individual for dedication to the high ideals and objectives of IAFP and for promotion of the mission of the Association in countries outside of the United States and Canada.

GMA Food Safety Award

Plaque and $3,000 Honorarium, *Sponsored by GMA*

This Award alternates between individuals and groups or organizations. In 2008, the award will be presented to a group or organization in recognition of a long history of outstanding contributions to food safety research and education.

Maurice Weber Laboratorian Award

Plaque and $1,500 Honorarium, *Sponsored by Weber Scientific*

Presented to an individual for outstanding contributions in the laboratory, recognizing a commitment to the development of innovative and practical analytical approaches in support of food safety.

Sanitarian Award

Plaque and $1,500 Honorarium, *Sponsored by Ecolab Inc.*

Presented to an individual for dedicated and exceptional service to the profession of Sanitarian, serving the public and the food industry.

Elmer Marth Educator Award

Plaque and $1,500 Honorarium, *Sponsored by Nelson-Jameson, Inc.*

Presented to an individual for dedicated and exceptional contributions to the profession of the Educator.

Harold Barnum Industry Award

Plaque and $1,500 Honorarium, *Sponsored by Nasco International, Inc.*

Presented to an individual for dedication and exceptional service to IAFP, the public, and the food industry.

95th Annual Meeting

IAFP 2008

Columbus, Ohio • August 3–6

Call for Abstracts

IAFP 2008

General Information

1. Complete the Abstract Submission Form Online.
2. All presenters must register for the Annual Meeting and assume responsibility for their own transportation, lodging, and registration fees.
3. There is no limit on the number of abstracts individuals may submit. However, one of the authors must deliver the presentation.
4. Accepted abstracts will be published in the Program and Abstract Book. Editorial changes may be made to accepted abstracts at the discretion of the Program Committee.
5. Membership in the Association is not required for presenting a paper at IAFP 2008.

Presentation Format

1. Technical – Oral presentations will be scheduled with a maximum of 15 minutes, including a two to four-minute discussion. LCD projectors will be available and computers will be supplied by the convenors.
2. Poster – Freestanding boards will be provided for presenting posters. Poster presentation surface area is 48" high by 96" wide (121.9 cm × 243.8 cm). Handouts may be used, but audio-visual equipment will not be available. The presenter is responsible for bringing pins and velcro. All posters should include the title and author information.

Note: The Program Committee reserves the right to make the final determination on which format will be used for each presentation.

Instructions for Preparing Abstracts

1. All abstracts must be written in English. If the author is non-English speaking, consider having the abstract reviewed by an English-speaking person before submitting.
2. All abstracts must be approved and signed off by all authors before submission.
3. Title – The title should be short but descriptive. The title should be in title case.
4. Authors – List all authors using the following style: first name followed by the surname.
5. Presenter Name and Title – List the full name and title of the person who will present the paper.
6. Presenter Address – List the name of the department, institution and full postal address (including zip/postal code and country).
7. Phone Number – List the phone number, including area, country, and city codes of the presenter.
8. Fax Number – List the fax number, including area, country, and city codes of the presenter.
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10. Format preferred – Check the box to indicate oral or poster format. The Program Committee reserves the right to make the final determination of presentation format.
11. Category – The categories are used by the Program Committee to organize the posters and technical sessions. Please check 2–3 boxes which best describe the categories for which the abstract is suitable.
12. Developing Scientist Awards Competition – Check the box to indicate if the presenter is a student wishing to be considered in this competition. The student will make the initial submission, and IAFP will E-mail the abstract to the major professor, who will complete the submission process. For more information, see "Call for Entrants in the Developing Scientist Awards Competitions."
13. Abstract – Key the abstract into the web-based system. In addition, a double-spaced copy of the abstract, typed in 12-point font in MS Word, should be E-mailed to abstracts@foodprotection.org at the time of submission. Use no more than 300 words. Abstracts are most often rejected because of a failure to follow the instructions below.

In addition to following these instructions, authors should carefully review the sections on selection criteria and rejection reasons as well as the sample abstract before submitting the abstract. Original research abstracts MUST be in the following format:

Methods: State the methodology used in the study (2–3 sentences). The methods should be specific enough that researchers in the same or similar field would understand the basic experimental design or approach.

Results: Describe the results obtained in the study (2–3 sentences). NOTE: Specific results, with statistical analysis (if appropriate), MUST be provided. A statement of "results pending" or "to be discussed" is not acceptable and will be grounds for abstract rejection. Results should be summarized; do NOT use tables or figures.

Significance: State the significance of the findings to food safety and/or public health (1–2 sentences) NOTE: Do not include reference citations in the Abstract. Please see sample abstracts for further guidance on abstract structure.

Education abstracts MUST present an improvement or innovation on a proven method in order to educate others (about a food protection related topic). There should be a way to measure the outcomes and substantiate the improvements and/or outcomes. If measured, the sample size should be sufficiently large to represent the intended population.

Abstract Submission

Abstracts submitted for IAFP 2008 will be evaluated for acceptance by the Program Committee. Please be sure to follow the instructions above carefully; failure to do so may result in rejection. Information in the abstract data must not have been previously published in a copyrighted journal.

Abstracts must be received no later than January 29, 2008. Completed abstract and information must be submitted online. Use the online submission form at www.foodprotection.org. In addition, a double-spaced copy of the abstract, typed in 12-point font in MS Word, should be E-mailed to abstracts@foodprotection.org at the time of submission. You will receive an E-mail confirming receipt of your submission.

Selection Criteria

1. Abstracts must be structured as described above.
2. Abstracts must report the results of original research pertinent to the subject matter. Papers should report the results of new, applied studies dealing with: (i) causes (e.g., microorganisms, chemicals, natural toxicants) and control of all forms of foodborne illness; (ii) causes (e.g., microorganisms, chemicals, insects, rodents) and control of food contamination and/or spoilage; (iii) food safety from farm-to-fork (including all sectors of the chain including production, processing, distribution, retail, and consumer phases); (iv) novel approaches for the tracking of foodborne pathogens or the study of pathogenesis and/or microbial ecology; (v) public health significance of foodborne disease, including outbreak investigation; (vi) non-microbiology food safety issues (food toxiology, allergens, chemical contaminants); (vii) advances in sanitation, quality control/assurance, and food safety systems; (viii) advances in laboratory methods; and (ix) food safety risk assessment. Papers may also report subject matter of an educational nature.
3. Research must be based on accepted scientific practices.
4. Research should not have been previously presented nor intended for presentation at another scientific meeting. Papers should not appear in print prior to the Annual Meeting.

Rejection Reasons

1. Abstract was not prepared according to the "Instructions for Preparing Abstracts." This includes abstracts that are too lengthy.
2. Abstract reports inappropriate or unacceptable subject matter.
3. Abstract is not based on accepted scientific or educational practices and/or the quality of the research or scientific/educational approach is inadequate.
4. Potential for the approach to be practically used to enhance food safety is not justified.
5. Work reported appears to be incomplete and/or data and statistical validity are not presented. Percentages alone are not acceptable unless sample sizes (both numbers of samples and sample weight or volume) are reported. Detection limits should be specified when stating that populations are below these limits. Indicating that data will only appear in the presentation without including them in the abstract is NOT acceptable.
6. Abstract was poorly written or prepared. This includes spelling and grammatical errors or improper English language usage.
7. Results have been presented or published previously.
8. Abstract was received after the deadline for submission.
9. Abstract contains information that is in violation of the International Association for Food Protection Policy on Commercialism.
10. Abstract subject is similar to other(s) submitted by same author. (The committee reserves the right to combine such abstracts.)
11. Abstracts that report research that is confirmatory of previous studies and/or lacks originality will be given low priority for acceptance.

Projected Deadlines/Notification

Abstract Submission Deadline: January 29, 2008

Submission Confirmations: Within 48 hours of submission

Acceptance/Rejection Notification: March 21, 2008.

Contact Information

Questions regarding abstract submission can be directed to Tamara P. Ford, 515.276.3344 or 800.369.6337; E-mail: tford@foodprotection.org

Program Chairperson

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Call for Entrants in the Developing Scientist Awards Competitions

Supported by the International Association for Food Protection Foundation

The International Association for Food Protection is pleased to announce the continuation of its program to encourage and recognize the work of students and recent graduates in the field of food safety research. Qualified individuals may enter either the oral or poster competition.

Purpose

1. To encourage students and recent graduates to present their original research at the Annual Meeting.
2. To foster professionalism in students and recent graduates through contact with peers and professional Members of the Association.
3. To encourage participation by students and recent graduates in the Association and the Annual Meeting.

Presentation Format

Oral Competition – The Developing Scientist Oral Awards Competition is open to graduate students (enrolled or recent graduates) from M.S. or Ph.D. programs or undergraduate students at accredited universities or colleges. Presentations are limited to 15 minutes, which includes two to four minutes for discussion.

Poster Competition – The Developing Scientist Poster Awards Competition is open to students (enrolled or recent graduates) from undergraduate or graduate programs at accredited universities or colleges. The presenter must be present to answer questions for a specified time (approximately two hours) during the assigned session. Specific requirements for presentations will be provided at a later date.

General Information

1. Competition entrants cannot have graduated more than a year prior to the deadline for submitting abstracts.
2. Accredited universities or colleges must deal with environmental, food or dairy sanitation, protection or safety research.
3. The work must represent original research completed and presented by the entrant.
4. Entrants may enter only one paper in either the oral or poster competition.
5. All entrants must register for the Annual Meeting and assume responsibility for their own transportation, lodging, and registration fees.
6. Acceptance of your abstract for presentation is independent of acceptance as a competition finalist. Competition entrants who are chosen as finalists will be notified of their status by the chairperson by April 30, 2008.
7. Entrants who are full-time students, with accepted abstracts will receive a complimentary, one-year Student Membership with *JFP* Online.
8. In addition to adhering to the instruction in the "Call for Abstracts," competition entrants must check the box to indicate if the paper is to be presented by a student in this competition. A copy of the abstract will be E-mailed to the major professor for final approval.
9. You must also specify full-time student or part-time student.

Judging Criteria

A panel of judges will evaluate abstracts and presentations. Selection of up to ten finalists for each competition will be based on evaluations of the abstracts and the scientific quality of the work. All entrants will be advised of the results by April 30, 2008. Only competition finalists will be judged at the Annual Meeting and will be eligible for the awards.

Judging criteria will be based on the following:

1. Abstract – Clarity, comprehensiveness and conciseness.
2. Scientific Quality – Adequacy of experimental design (methodology, replication, controls), extent to which objectives were met, difficulty and thoroughness of research, validity of conclusions based upon data, technical merit and contribution to science.
3. Presentation – Organization (clarity of introduction, objectives, methods, results and conclusions), quality of visuals, quality and poise of presentation, answering questions, and knowledge of subject.

Finalists

Awards will be presented at the International Association for Food Protection Annual Meeting Awards Banquet to the top three presenters (first, second and third places) in both the oral and poster competitions. All finalists are expected to be present at the banquet where the award winners will be announced and recognized.

Awards

First Place – $600 and an engraved plaque
Second Place – $400 and a framed certificate
Third Place – $200 and a framed certificate

Award winners will receive a complimentary, one-year Membership including *Food Protection Trends*, *Journal of Food Protection*, and *JFP* Online.

Policy on Commercialism

for Annual Meeting Presentations

1. INTRODUCTION

No printed media, technical sessions, symposia, posters, seminars, short courses, and/or other related types of forums and discussions offered under the auspices of the International Association for Food Protection (hereafter referred to as to Association forums) are to be used as platforms for commercial sales or presentations by authors and/or presenters (hereafter referred to as authors) without the express permission of the staff or Executive Board. The Association enforces this policy in order to restrict commercialism in technical manuscripts, graphics, oral presentations, poster presentations, panel discussions, symposia papers, and all other type submissions and presentations (hereafter referred to as submissions and presentations), so that scientific merit is not diluted by proprietary secrecy.

Excessive use of brand names, product names or logos, failure to substantiate performance claims, and failure to objectively discuss alternative methods, processes, and equipment are indicators of sales pitches. Restricting commercialism benefits both the authors and recipients of submissions and presentations.

This policy has been written to serve as the basis for identifying commercialism in submissions and presentations prepared for the Association forums.

2. TECHNICAL CONTENT OF SUBMISSIONS AND PRESENTATIONS

2.1 Original Work

The presentation of new technical information is to be encouraged. In addition to the commercialism evaluation, all submissions and presentations will be individually evaluated by the Program Committee chairperson, technical reviewers selected by the Program Committee chairperson, session convenor, and/or staff on the basis of originality before inclusion in the program.

2.2 Substantiating Data

Submissions and presentations should present technical conclusions derived from technical data. If products or services are described, all reported capabilities, features or benefits, and performance parameters must be substantiated by data or by an acceptable explanation as to why the data are unavailable (e.g., incomplete, not collected, etc.) and, if it will become available, when. The explanation for unavailable data will be considered by the Program Committee chairperson and/or technical reviewers selected by the Program Committee chairperson to ascertain if the presentation is acceptable without the data. Serious consideration should be given to withholding submissions and presentations until the data are available, as only those conclusions that might be reasonably drawn from the data may be presented. Claims of benefit and/or technical conclusions not supported by the presented data are prohibited.

2.3 Trade Names

Excessive use of brand names, product names, trade names, and/or trademarks is forbidden. A general guideline is to use proprietary names once and thereafter to use generic descriptors or neutral designations. Where this would make the submission or presentation significantly more difficult to understand, the Program Committee chairperson, technical reviewers selected by the Program Committee chairperson, session convenor, and/or staff, will judge whether the use of trade names, etc., is necessary and acceptable.

2.4 "Industry Practice" Statements

It may be useful to report the extent of application of technologies, products, or services; however, such statements should review the extent of application of all generically similar technologies, products, or services in the field. Specific commercial installations may be cited to the extent that their data are discussed in the submission or presentation.

2.5 Ranking

Although general comparisons of products and services are prohibited, specific generic comparisons that are substantiated by the reported data are allowed.

2.6 Proprietary Information (See also 2.2.)

Some information about products or services may not be publishable because it is proprietary to the author's agency or company or to the user. However, the scientific principles and validation of performance parameters must be described for such products or services. Conclusions and/or comparisons may be made only on the basis of reported data.

2.7 Capabilities

Discussion of corporate capabilities or experiences are prohibited unless they pertain to the specific presented data.

3. GRAPHICS

3.1 Purpose

Slides, photographs, videos, illustrations, art work, and any other type visual aids appearing with the printed text in submissions or used in presentations (hereafter referred to as graphics) should be included only to clarify technical points. Graphics which primarily promote a product or service will not be allowed. (See also 4.6.)

3.2 Source

Graphics should relate specifically to the technical presentation. General graphics regularly shown in, or intended for, sales presentations cannot be used.

3.3 Company Identification

Names or logos of agencies or companies supplying goods or services must not be the focal point of the slide. Names or logos may be shown on each slide so long as they are not distracting from the overall presentation.

3.4 Copies

Graphics that are not included in the preprint may be shown during the presentation only if they have been reviewed in advance by the Program Committee chairperson, session convenor, and/or staff, and have been determined to comply with this policy. Copies of these additional graphics must be available from the author on request by individual attendees. It is the responsibility of the session convenor to verify that all graphics to be shown have been cleared by Program Committee chairperson, session convenor, staff, or other reviewers designated by the Program Committee chairperson.

4. INTERPRETATION AND ENFORCEMENT

4.1 Distribution

This policy will be sent to all authors of submissions and presentations in the Association forums.

4.2 Assessment Process

Reviewers of submissions and presentations will accept only those that comply with this policy. Drafts of submissions and presentations will be reviewed for commercialism concurrently by both staff and technical reviewers selected by the Program Committee chairperson. All reviewer comments shall be sent to and coordinated by either the Program Committee chairperson or the designated staff. If any submissions are found to violate this policy, authors will be informed and invited to resubmit their materials in revised form before the designated deadline.

4.3 Author Awareness

In addition to receiving a printed copy of this policy, all authors presenting in a forum will be reminded of this policy by the Program Committee chairperson, their session convenor, or the staff, whichever is appropriate.

4.4 Monitoring

Session convenors are responsible for ensuring that presentations comply with this policy. If it is determined by the session convenor that a violation or violations have occurred or are occurring, he or she will publicly request that the author immediately discontinue any and all presentations (oral, visual, audio, etc.) and will notify the Program Committee chairperson and staff of the action taken.

4.5 Enforcement

While technical reviewers, session convenors, and/or staff may all check submissions and presentations for commercialism, ultimately it is the responsibility of the Program Committee chairperson to enforce this policy through the session convenors and staff.

4.6 Penalties

If the author of a submission or presentation violates this policy, the Program Committee chairperson will notify the author and the author's agency or company of the violation in writing. If an additional violation or violations occur after a written warning has been issued to an author and his agency or company, the Association reserves the right to ban the author and the author's agency or company from making presentations in the Association forums for a period of up to two (2) years following the violation or violations.

Highlights of the Executive Board Meeting
November 13–14, 2007
Des Moines, Iowa

Following is an unofficial summary of actions from the Executive Board Meeting held in Des Moines, Iowa on November 13–14, 2007:

Approved the following:

- Minutes of July 6–12, 2007 Executive Board Meeting
- Affiliate Charter for the Turkish Food Safety Association
- Use of speaker funds for the European Symposium
- Audit Report for August 31, 2007
- IAFP as a supporter of the Retail Food System Research Conference
- Revision to IAFP's Co-Sponsorship Policy
- David Tharp serving on the Food Allergy & Anaphylaxis Network Board of Directors

Discussed the following:

- E-mail votes taken since the last meeting
- Formation meeting for a Predictive Modeling PDG
- Communication with Committee and PDG Chairs and Vice Chairs
- Status of the Nominating Committee's work
- Position Paper on Milk Pasteurization
- Monday Night Social at IAFP 2008
- Marketing of IAFP and the *Journal of Food Protection*
- Financial results from IAFP 2007
- IAFP 2007 attendee and exhibitor survey comments
- European Symposium 2007 survey results
- Ideas for 2008 European Symposium
- Program development for 2008 Latin American Symposium
- Review of CIFSQ held September 2007
- CIFSQ for 2008
- Speaker suggestions for Dubai Food Safety Conference
- Development of a session to hold with Process Expo
- FSnet
- Pork internships through the National Pork Board
- FMRC donation of funds to IAFP's Foundation
- Non O157 *E. coli* paper
- *FPT* cover re-design
- *FPT* Editor comments
- Member comments
- WHO-NGO Update
- 3-A Sanitary Standards, Inc.
- Retirement plan contribution for staff
- bioMérieux's Foundation proposal
- Foundation contribution recognition by levels
- Annual Meeting Task Force
- Short-term Annual Meeting enhancements
- Timely Topics Symposium on Prepared, But Not Ready-to-Eat Foods

Reports received:

- *IAFP Report*
- *Food Protection Trends*
- *Journal of Food Protection*
- IAFP Web site
- Membership
- Advertising & sponsorship update
- Board Members attending Affiliate meetings
- *Affiliate View* newsletter
- Future Annual Meeting schedule
- Exhibiting (IAFP On the Road)

Next Executive Board meeting – February 17–18, 2008.

NEW MEMBERS

AUSTRIA

Peter Paulsen
University of Veterinary Medicine
Vienna

CANADA

Robert Bell
Porcupine Health Unit
Timmins, Ontario

Enrico A. Buenaventura
Canadian Food Inspection Agency
Ottawa, Ontario

Jodi E. Richards
Panago Pizza, Inc.
Abbotsford, British Columbia

Bradley Waugh
Saputo Foods
Abbotsford, British Columbia

FRANCE

Sebastien Lopez
bioMérieux Industry
Marcy L'Etoile

Nesrine Marouani
AFSSA
Maisons Alfort

GERMANY

Marcel Boursillon
Sig'Dorf

HONG KONG

Belinda Mak
Hai Kang Life Corporation Limited
Hong Kong

ITALY

Sandra Torriani
University of Verona
San Floriano, Verona

MEXICO

Amelia Farres
Ciudad Universitaria
Mexico, Distrito Federa

POLAND

Elzbieta Rozynek
Children's Memorial Health Institute
Warsaw

SOUTH AFRICA

Oluwatosin A. Ijabadeniyi
University of Pretoria
Pretoria

TAIWAN

Tzu-Ming Pan
National Taiwan University
Taipei

TURKEY

Serap Nazir
Migros Turk T.A.S.
Istanbul

Alpay Seyhan
Unilever
Istanbul

UNITED STATES

ALABAMA

Carolyn Suber
Blue Bell Creameries
Sylacauga

ARIZONA

Keith B. Charmasson
Smithfield Beef Group-Tolleson
Tolleson

Joyce E. McCluskey
LaPaz County Health
Parker

CALIFORNIA

James D. Ford
Harris Woolf Almonds
Coalinga

Carla M. Hechler
Sweet Life Enterprises
Santa Ana

Joelle Heidinger
University of California–Davis
Davis

Pete C. Vobecky
Blue Pacific Flavors
City of Industry

COLORADO

Michele Colbert
Meritech
Golden

FLORIDA

Marguerite A. Jensen
Firmenich Inc.
Safety Harbor

Laura K. Strawn
University of Florida
Gainesville

GEORGIA

Lara E. Vaughn
USDA/ARS
Athens

NEW MEMBERS

INDIANA

Michael Druley
ERP Consulting
South Bend

Greg Inman
Boone County Health Dept.
Lebanon

IOWA

Carisa A. Keeling
USDA/APHIS
Ames

KANSAS

Ludek Zurek
Kansas State University
Manhattan

MARYLAND

Janet Graab
McCormick & Co., Inc.
Hunt Valley

MASSACHUSETTS

Richard Andrea
Eastern Mass Food Safety
Braintree

MINNESOTA

Isaac P. Norstad
Malt-O-Meal
Northfield

Petri A. Papinaho
Jennie O Turkey Store
Willmar

Lisa Ramacher
Minnesota Dept. of Agriculture
Watertown

NEW YORK

Kevin O. Byrne
Ridgewood

Charles Lindberg
NYS Dept. Agriculture and Markets
Belfast

NORTH CAROLINA

Siddhartha Thakur
North Carolina State University
Raleigh

NORTH DAKOTA

Lynn C. Burgess
Dickinson State University
Dickinson

OHIO

Mohammad A. Khan
Newark City Health Dept.
Newark

TEXAS

Blair Girard
Choice Chemical
Sunset

Catherine M. Hall
Texas Dept. of State Health Services
Round Rock

VIRGINIA

Kathleen A. Staley
USDA-Quality Management
Fredericksburg

WASHINGTON

Cindy Luna
Ocean Beauty Seafoods, LLC
Seattle

Philip Spiegel
Small Planet Organic Tofu
Newport

NEW GOLD SUSTAINING MEMBER

This membership was previously a Sustaining Membership

Bio-Rad Laboratories
Wendy Lauer
Hercules, California

NEW SUSTAINING MEMBER

Dean Foods
Helen Piotter
Macy, Indiana

UPDATES

DPC® Elects Two New Board Members

The Dairy Practices Council® held its annual meeting in Harrisburg, PA, November 7–9, 2007.

The International Milk Haulers Association held their board meeting in conjunction with the DPC® meeting.

Two new board members were elected – Meikel Brewster, Charm Sciences, Lawrence, MA and Joseph Zulovich, University of Missouri, Columbia, MO. Ellen Fitzgibbons, Massachusetts Dept. of Public Health was re-elected to a second 3-year term. Terry Musson agreed to continue as executive vice president.

The remainder of the DPC® Board are Don Breiner, president DPC, Land O'Lakes; Michael Schutz, vice president DPC, Purdue University; Chris Thompson, University of Kentucky; Kelly Wedding, USDA Milk Market Administrator Office; Jonathan Gardner, Food and Drug Administration; Neil Bendixen, Dairy Marketing Services, LLC; Rebecca Piston, HP Hood; Dr. Robert Roberts, The Pennsylvania State University; and Richard Kersbergen, University of Maine Cooperative Ext.

The president appointed three new task force directors with the executive board consent. They are: Task Force I, Robert Graves, The Pennsylvania State University; Task Force III, Jeff Bloom, JohnsonDiversey, and Task Force IV, Les Wood, California Dept. of Agriculture.

The remainder of the DPC® task force directors are: Task Force II, John Partridge, University of Michigan, Task Force V, Miles Beard, IBA Inc., and Task Force VI, Lynn Hinckley, University of Connecticut.

Exosect Increases Its Quality Assurance Logistics Team with Two New Key Appointments

Exosect, a provider of intelligent pest management solutions, has announced that it has expanded its QA logistics team with the appointment of two new staff members.

Tony Ray joins as quality control and assurance manager from Bacardi-Martini Ltd., where he worked as senior analyst and team leader for four years, after joining the company in 1989 as assistant chief chemist. His CV is certainly impressive. One of his most notable achievements was to identify the need for a significant product recall and then lead the problem resolution program, resulting in the suppliers agreeing to a £6M compensation payment. Comments Ray, "I intend to put my proven track record in Quality Assurance and Control to good use in my new role at Exosect where one of my key tasks will be the analysis of all Exosect product lines to ensure they are correctly formulated and to develop the required validation methods for new formulations."

Phil Jeffrey takes on the role of supply chain manager at Exosect and will look after all aspects of product supply and shipping. Jeffrey joins from Eaton Aerospace where he worked as lead commodity buyer and was responsible for the purchasing of electronics, electro-mechanical, cables and wound products across three sites. He established the strategy for the outsourcing of the company's wound components and took a key role in product development. His priority at Exosect is to take responsibility for all aspects of product supply to its customers.

Says Jeffery, "As supply chain manager, I am clearly focused on the procurement of all materials required for production – liaising with all the necessary departments to ensure our products arrive in the right place at the right time and in excellent condition. Exosect has high standards of customer care and it will be my job to ensure that these are constantly adhered to."

NEWS

Produce Handling Guide Now Available on CD in Spanish from the University of California–Davis

The Postharvest Technology Research & Information Center at the University of California–Davis, has just published and made available for the first time a Spanish language CD version of its renowned *Postharvest Technology of Horticultural Crops* third edition. It is one of, if not "the" most comprehensive and inclusive compendium of information regarding postharvest handling of fresh fruits, vegetables and floral crops.

"We are constantly striving to provide produce practitioners with useful, user-friendly and up-to-date technical resources to assist them in reducing costly postharvest losses and helping them to assure the quality, safety and marketability of fresh produce for consumers. This latest offering for the first time available in Spanish and on CD, gives users the flexibility to access the extensive up-to-date information contained within this world renowned reference resource wherever and whenever they need it," said UC Davis Postharvest Technology Research & Information Center Executive Director Dr. Jim Gorny.

"Our hope is that industry representatives will turn knowledge into actions to enhance consumer satisfaction with produce purchases and thus increase consumption of these healthful, wholesome and nutritious food items," said Adel Kader, UC Davis professor emeritus of postharvest physiology and publication technical editor.

This Spanish language CD compliments the English language print predecessor *Postharvest Technology of Horticultural Crops* third edition most recently updated and published in 2002. This new publication of nearly 600 printed pages and 38 chapters covers in easy-to-understand language essential information regarding the harvest, cooling, packaging, storage, handling, ripening and marketing of fresh produce. It is a must have reference resource for anyone working in the produce industry.

"The Spanish language CD version of the *Postharvest Technology of Horticultural Crops* is a powerful information resource which will assist anyone working with fresh produce to understand core underlying principles of postharvest handling and diagnose commonly encountered problems," said Clara Pelayo-Zaldivar, professor of postharvest physiology Universidad Autónoma Metropolitana-Unidad Iztapalapa, Mexico and publication translation coordinator. "It is useful for everyone working with produce, from technical to sales personnel, to have information like this at their fingertips."

The publication *Tecnología Postcosecha de Cultivos Hortofruticolas* is available for purchase ($65/copy + shipping & handling) from the UC Postharvest Technology Research & Information Center Online Bookstore at: <http://postharvest.ucdavis.edu/Pubs/pub_list.shtml.

Pennsylvania: Agriculture Department Notifies Companies about False or Misleading Milk and Dairy Product Labels

The Department of Agriculture has notified some dairies that sell milk in Pennsylvania that their labels are false or misleading and need to be changed, said Agriculture Secretary Dennis Wolff.

Of the 140 dairy companies whose labels have been reviewed to date, Wolff said 16 use labels that are considered inaccurate or misleading because they contain claims that cannot be verified or implying that their product is safer than others through 'absence labeling' – telling consumers what is not present in the milk as opposed to what is.

Wolff said claims such as "antibiotic-free" and "pesticide-free" are misleading because all processed milk sold in Pennsylvania is tested a minimum of 10 times to guarantee that it is free of such substances, which are illegal for milk to contain.

"Consumers rely upon the labeling of a product to make decisions about what they buy and what to feed their families," said Wolff. "The department must approve the labels for milk sold in Pennsylvania and we're seeing more and more marketing that is making it hard for consumers to make informed decisions."

Label claims that are inaccurate or that cannot be verified are also being seen in the marketplace. For example, some milk labels contain statements such as "hormone-free," but all milk contains hormones. Some labels also claim the absence of synthetic hormones, but there is no scientific test that can determine the truth of this claim.

In addition, Wolff said some of the mislabeled products cost more than those labeled correctly. This has become a degrading factor for low-income families who want to buy safe food for their children but cannot afford more expensive milk that is misleadingly or inaccurately marketed as a safer product.

The Department of Agriculture convened a Food Labeling Advisory Committee made up of dietitians, consumer advocates and food

industry representatives earlier this month to discuss potentially misleading labels. The committee urged Wolff to explore the department's authority in labeling oversight.

The department has authority over food labeling through the Pennsylvania Food Act and the milk sanitation law. Specific to milk and dairy products sold in the state, the department has the authority to disapprove any label deemed false or misleading.

"Consumers are concerned or confused about product labeling," said Wolff. "It's a subject the department continues to receive many calls about."

The 16 permit holders whose products are mislabeled are located in Pennsylvania, New York, New Jersey, Connecticut and Massachusetts and will have until Jan. 1 to correct the labels.

International Collaboration Can Improve Product Safety: United States Eager to Share Best Practices, Listen to Other Countries

Better and more universal ways to ensure food and product safety worldwide can be found through international cooperation, US officials say.

"We must work with our trading partners to share best practices and agree on common standards of science-based approaches for food safety," Health and Human Services Secretary Michael Leavitt said.

According to Leavitt, all relevant US agencies need to make efforts to develop and increase international cooperation that follow a unified strategy.

In response to the public outcry over tainted food and recalls of unsafe consumer products, mostly from China, the US government has launched a review of the US food and product safety system to find a method to make it more effective in the rapidly changing global trade environment. The government also has been surveying US industries to identify best practices. US officials said the United States is willing to share findings produced by these reviews and is eager to hear best practices identified by other countries.

An interagency working group on import safety headed by Leavitt submitted an outline of a new food and product safety strategy to the White House in September. It is scheduled to present specific recommendations to the president.

US lawmakers have joined in the effort by holding hearings on the issue and introducing several bills designed to improve food and product safety systems.

Andrew Krulwich, a partner at the law firm Wiley Rein LLP and a former Consumer Product Safety Commission (CPSC) commissioner, told USINFO product safety incidents earlier in 2007 exposed weaknesses in those systems, particularly in regard to imports. Imports, which constitute an increasing share of foods and consumer goods sold on the US market, are projected to triple in value by 2015, according to US government sources.

Nancy Nord, the acting CPSC chair, has acknowledged that her agency's inspection and enforcement authorities with respect to imported products are "not as strong as they need to be."

Although imported products make up about one-third of all products sold on the US market, about two-thirds of product recalls in recent years concerned imported goods. That share is growing, according to CPSC, the federal regulatory agency charged with ensuring the safety of consumer products.

Homeland Security Secretary Michael Chertoff, a member of the working group, said the existing programs based on bilateral agreements designed to ensure import security also can be used to ensure the safety of imported products, for the most part, before they reach US ports.

But US officials emphasize that, with millions of containers entering US ports every year, "we can't inspect our way to safety," as Leavitt put it.

In its initial September report, the group urged a shift in emphasis in the US import safety strategy from border inspections and interventions to identifying and managing risks through every step of the product lifecycle.

Warren Maruyama, general counsel at the Office of the US Trade Representative, said that a new strategy would require cooperation with foreign governments and producers as well as US importers and retailers to build safety into the design, manufacturing and distribution process. Such cooperative arrangements would be backed up by the government and private sector through verifications, certifications and border inspections, he said.

CPSC has agreements with its counterparts in several countries to cooperate on standards development and harmonization as well as on inspection and enforcement efforts. By the end of 2008, the commission expects to have formal memorandums of understanding (MOUs) with 17 countries and economic areas including the European Union, India, Canada, Mexico, Peru and Chile.

In September, the commission reached agreement with China's product safety agency that goes beyond a 2005 MOU in many respects.

"We will be looking for meaningful cooperation on the ground,

that means not just with the Chinese government, but also with industry at both ends of the supply chain," Nord said in a September 11 news release.

Mr. Krulwich noted, however, that products exported by countries other than China also have had safety problems.

That is why, US officials said, cooperation on the safety of food and consumer products also should take place at a multilateral level and involve more countries. They said that maintaining safety standards is in the interest of both exporting and importing countries because only this can ensure the high level of consumer confidence essential for international trade.

The full text of the CPSC news release on the agreement with China can be found on the agency's Web site. Additional information about the interagency working group on import safety can be accessed at the Group's Web site at http://usinfo.state.gov.

Low-oxygen Modified Atmosphere Packaging Benefits Consumers: Technology Backed by Government and Independent Scientists, Proven in the Marketplace

Low-oxygen packaging systems with minute levels of carbon monoxide keep meat fresher and good tasting longer, which benefits consumers. These products are produced and sealed in plants under federal inspection and the seal is not broken until the product reaches the consumer's home.

Use-by dates on all packages clearly tell the consumer the date by which the product should be used or frozen. Consumers are smart enough to know that if a product was temperature abused by being inadvertently left on a counter or forgotten in the trunk of a car, they should throw it away. Still, if this occurred, the package would show clear signs of spoilage like a noticeable bulge, a slimy appearance and a very offensive odor upon opening.

Dozens of scientists and the USDA and FDA have both affirmed that this technology is safe and appropriate for consumers. While the packaging was designed to keep products fresh, ongoing research is demonstrating that it also has food safety benefits because it inhibits the growth of harmful bacteria if they are present.

In fact, modified atmosphere packaging is used throughout the grocery store to keep foods like snack foods, lettuce and shredded cheese safe. None of these packages require special warnings, as some lawmakers are now seeking.

The market should decide the success or failure of this technology. To date, the market has spoken. A campaign against this technology was only launched two years after low-oxygen modified atmosphere packaging was introduced and after it began to gain market share. A full examination of the facts will show that low-oxygen packaging is a safe and effective technology that maintains freshness and flavor, is backed by government and independent scientists and is proven in the marketplace where consumers have embraced it.

American Meat Institute Unveils New Consumer Friendly Video about Meat Packaging Technologies

The American Meat Institute (AMI) has unveiled a new, consumer-friendly video about meat packaging technologies that is designed to educate consumers about the packaging options available in today's marketplace and how they have changed over time.

The video features AMI Foundation Vice President of Scientific Affairs Randy Huffman, Ph.D., discussing a variety of meat packaging options, ranging from store-cut and wrapped products to more recently introduced 'modified atmosphere packaging' in both high-oxygen and low-oxygen formats.

The video is posted on YouTube at http://www.youtube.com/watch?v=X11q5U7hxlU or may be accessed through AMI's Web sites–meatsafety.org or meatami.com.

The video is the latest offering in AMI's consumer education programs. Earlier this month, AMI introduced www.meatmattersinfo.org, a new series of consumer brochures on key topics in the news. Included in the "Meat Matters" series is a brochure about case ready meats and another that assists consumers in understanding product dating and why these dates are important in ensuring a good eating experience.

"Given the recent focus on how meat is packaged, meat color and use-by dates, we produced this video piece to help consumers understand the evolution and innovation that is occurring in packaging. This innovation is helping to keep meat fresher longer and to keep it good tasting," AMI President J. Patrick Boyle said.

"Case-ready meat products" are produced in federally inspected meat plants and sealed so they may be placed directly into retail cases. The seal is not broken until they reach the consumer's home. These products come in a variety of different packaging formats including vacuum packaging, chub packaging and modified atmosphere packaging in which the ratio of gases in air is modified within the package to maintain freshness and appeal.

"These products offer distinct benefits both to consumers and

retailers," Boyle said. "We hope that these new materials will assist our customers in understanding the benefits these products offer and in making choices that will ultimately satisfy them."

FSAI: No Excuse for Misleading Labelling Warns Food Safety Chief

A new report on food labelling in Ireland and a national campaign to highlight the importance of correct food product labelling was simultaneously announced by the Food Safety Authority of Ireland (FSAI). The report *The Labelling of Food in Ireland 2007*, produced in response to extensive queries, aims to dispel confusion as to what a food label should contain. It will ultimately assist food businesses ensure correct labelling and benefit consumers by enabling them to make informed purchasing decisions based on accurate, clear food labelling information. In addition, the FSAI announced a national radio and print campaign which highlights the difference between 'Use By' and 'Best Before' dates, as well as stressing the onus on the industry for honesty and truth in labelling.

According to Dr. John O'Brien, chief executive, the FSAI advice line has received numerous queries in relation to durability date labels and there is significant confusion over the difference between the two types of dates and which should apply to particular products.

"It is alarming that some businesses are ignorant about this most basic, but critical labelling requirement – the shelf life of the product. Our campaign simply explains that a 'Use By' date is used on products that are highly perishable and if they are consumed after their 'Use By' date they could cause illness. 'Best Before' dates refer to a period that a product remains at its best condition and whilst people can eat products after the 'Best Before' date has passed, they may disappoint in terms of quality but they should not pose a food safety risk," says Dr. O'Brien.

Dr. O'Brien cited a number of labelling breaches the FSAI had investigated. These included a survey of the honey market where 25% of the honey was labelled Irish when in fact it was of foreign origin. A study of 55 noodles for irradiation found that around 25% of products had irradiated ingredients which legally must be stated and were not declared on the label.

"Our investigations have discovered labelling breaches across a host of foods. Examples include a breakfast cereal labelled as 'gluten free' that contained high levels of gluten; fish being sold as cod when it was pollock and 'Cumbrian Crisps' made in Ireland. Problems with pizza labelling have been found including 'cheese toppings' with mostly cheese substitute rather than cheese and pictures/maps of Italy but origin being Ireland. While they may not be life threatening, they are misleading and potentially fraudulent."

The FSAI states that the function of food labelling is to inform purchasers of the properties, ingredients, nature and characteristics of the food they buy and labelling should not mislead consumers. The information contained in food labels should be clear, unambiguous and must not make misleading or false claims. It should provide sufficient information, accurately and clearly, to enable consumers to select products according to their needs; to store and prepare them appropriately and to consume them safely.

The 140-page report *The Labelling of Food in Ireland 2007* brings together in detail all Irish and European law governing the labelling of food. It provides specific information and guidelines relating to the labelling of food with regard to ingredients, additives, storage instructions, nutritional labelling, novel foods and genetically modified foods. In addition, special sections cover organic food labelling, and the specific requirements of commodities such as beef, chocolate, fruit juices, milk and sugar products.

"It is unacceptable that consumers may be purchasing foodstuffs where the labelling is incorrect, lacking clarity or is simply portraying the product as something it is not. With this report, food businesses have no excuse for mischievous, misleading or illegal labelling and cannot claim ignorance of the legal requirements. We are not against strong marketing, but wish to ensure that consumers are being provided with honest, accurate labelling," Dr. O'Brien stated. "Manufacturers should not mislead the consumer by using marketing images that could be misinterpreted, omit significant information or make undue emphasis on certain words."

Consumers who have concerns and wish to report apparently incorrect food labelling are encouraged to contact either the Health Service Executive or the FSAI.

The report is available on the FSAI Web site–www.fsai.ie/.

Australian Men and Young Adults Rate Badly in Food Safety Report

Australian men and young adults rate the worst in their knowledge and practice of food safety according to a report card released by the Food Safety Information Council at the beginning of its 10th Anniversary Food Safety Week.

Dr. Michael Eyles, chair of the Food Safety Information Council, said the Council's tracking research shows that most Australians have greatly improved their food safety

knowledge in the 10 years since the founding of the Food Safety Information Council.

"For example, 97% of Australians now recognize that you should wash your hands using soap and dry thoroughly before handling food. This compares with 54% who weren't aware they should wash their hands in 1997 – a 43 percentage point improvement," Dr. Eyles said.

"Today, 89% of Australians know they have to wash a chopping board in soapy water and dry thoroughly between chopping up meat or chicken and before using it to chop salad. This compares with 70% in 1997 – a 16 percentage point improvement. There has also been a 12 percentage point improvement on knowledge to cook sausages and hamburgers all the way through and a 52 percentage point improvement on knowing to refrigerate leftovers as soon as they have stopped steaming. But with an estimated 5.4 million cases of food poisoning each year in Australia, and with one fifth of these cases linked to practices in the home, we can still do a lot better simply by getting back to basics – clean, chill, cook and separate."

"I am particularly concerned that men's overall knowledge of food safety continues to be lower than women's. This may not have been an issue in the past but today men play an active role in the kitchen and they could be putting their family and friends at risk. Also young adults have less food safety knowledge, although that changes when they reach their thirties and may become parents. Many young people work in the food service industry, even if it is only for a period while they are studying, so it is important they have a sound knowledge of food safety," said Dr. Eyles.

"I am shocked that a Food Safety Information Council survey found that 7% of women and 29% of men didn't wash their hands at all after using the bathroom in the food hall in a shopping centre. There is no excuse for this as we know that nearly all Australians understand how to wash their hands correctly. Correct hand washing is a good way to reduce your risk of food poisoning and you may also find that you also get fewer bouts of colds and flu as well," said Dr. Eyles.

"To celebrate our 10th anniversary we have prepared a Back to the Basics package of material to help consumers understand the key food safety messages of cook, clean, chill and separate. The package includes 4 instructional videos on how to wash hands correctly, how to stock a fridge, how to use a cooler safely and how to separate raw and ready to eat food. There is also a poster and a brochure available free of charge and a Web-based seminar. I urge you to look at all this information on the Web site and to order copies of the printed material," Dr. Eyles concluded.

There is more information on the Food Safety Information Council's Web site at www.foodsafety.asn.au.

WHO Five Keys to Safer Food Adapted to Travellers

A new edition of the *Guide on Safe Food for Travellers* is available in the six WHO official languages. The WHO *Five Keys to Safer Food* to prevent food-borne diseases were specifically adapted to travellers and WHO is looking for partners to disseminate this message. Following the example of the Five Keys poster translated into more than 50 languages, WHO strongly encourages the translation, reproduction and dissemination of these recommendations. As an example of collaboration, the Beijing Food Safety Agency and WHO are cooperating on the promotion of the Five Keys and the Guide for Travellers in connection with the 2008 Beijing Olympic Games. WHO would welcome further collaboration to promote food safety messages in international events, especially from national health authorities and departments for tourism.

INDUSTRY PRODUCTS

Bettcher Industries, Inc.

Bettcher Industries Introduces Pollux On-premises Egg Pasteurizers to North American Market

Bettcher Industries introduces Pollux™ on-premises egg pasteurizers to the North American market. The Pollux™ egg pasteurizers deliver restaurateurs and other foodservice operators worry-free egg safety using a natural pasteurization process that is 100 times more effective than current FDA requirements for killing pathogens such as *Salmonella* and AI that are potentially harmful – or lethal – to customers.

Historically, the FDA estimates that approximately 80% of source-confirmed outbreaks of *Salmonella* Enteritidis are egg-associated. Much effort has been put into safe handling practices and controlling infection sources on the farm, but until recently far less emphasis has been put on ensuring the delivery of bacteria-free shell eggs to the consumer.

Pollux™ appliances feature a unique point-of-use pasteurization system that is capable of eliminating *Salmonella* and avian flu in shell eggs. The technology enables eggs to be pasteurized in the shell and stored safely for long periods of time. No other point-of-use technology is available that eliminates the presence of illness-causing bacteria in shell eggs.

The Pollux™ line is available in two models. The Pollux™ 60 appliance pasteurizes up to 60 eggs at a time while fully retaining the eggs' composition, raw cooking properties and nutritional value. The unit can perform a quick-pasteurization process – or it can pasteurize and cook eggs in one process based on 14 menu-driven cooking options including soft, medium, hard, and Asian style – then store them at the correct consumption temperature for up to five hours without further coagulation or yolk discoloring.

The larger Pollux™ 360 model operates the same way, but can pasteurize and/or cook up to 360 eggs at a time – thereby making it a highly effective option for large-scale institutional foodservice operations.

What makes Pollux™ appliances so appealing is its precise egg pasteurization process that introduces no "foreign" elements to the eggs. As a result, the raw egg properties are indistinguishable from fresh shell eggs, making them ideal for kitchen staff when preparing mayonnaise, mousse and other foods that use raw eggs. The all-natural process of the Pollux™ unit has been independently tested and certified to kill 99.99999% of all bacteria inside shell eggs, while not affecting the eggs' composition, appearance, nutritional value, taste, or cooking properties.

Bettcher Industries, Inc.
440.965.4422
Birmingham, OH
www.bettcher.com

JohnsonDiversey's New Shur-Graph Plus Provides Controllability

Food and beverage manufacturers can now simultaneously monitor, control and document their CIP (cleaning in place) systems with one solution. JohnsonDiversey introduces Shur-Graph Plus™, a system that promotes operational efficiency by reducing manual intervention and time required to clean equipment, decreasing water and energy consumption, and reducing effluent output. "Proper monitoring and control of CIP with Shur-Graph Plus allows manufacturers to rest assured that lines are not being over-cleaned or over-rinsed, which can be costly," said Chris Brink, director of engineering, food and beverage, JohnsonDiversey. "At the same time, this close monitoring and documentation of data provides verification of CIP performance, which helps assure product quality."

Following decades of success with Shur-Graph™ monitoring system, Shur-Graph Plus adds controllability to simply monitoring and documenting CIP system data such as temperature, flow and conductivity (the amount of cleaning agent in water). It has an open-architecture design and is configured using "pie-chart" software that can be installed on any computer. The

encrypted, tamperproof data and reports are accessible through a regular Ethernet network.

"Shur-Graph Plus makes it easy for plant managers to get in, see real-time data and make parameter changes from the convenience of their desks. This is an affordable solution for both large and small plants with the goal to better manage their lines and increase operational efficiency," Brink said.

JohnsonDiversey Inc.
800.233.1000
Sturtevant, WI
www.johnsondiversey.com

New AccuFill™ Dual Bulking Systems for Red Meat from Gainco, Inc.

New AccuFill™ Dual Bulking Systems for Red Meat from Gainco, Inc. automate the collection of bulk-pack products, delivering labor savings and increased process efficiencies for meat processing plants.

The design and construction of Gainco's AccuFill™ dual bulking systems result in significantly faster processing, making it possible for meat processors to achieve labor savings of at least one operator per work shift – all accomplished within a smaller footprint. Moreover, the AccuFill™ system's robust communications platform and superior weighing accuracy means less product "giveaway," along with real-time process reporting capabilities using Ethernet, RF or WiFi connectivity.

Fresh, frozen, whole muscle, trim, offal and virtually all other red meat products are highly suitable for processing using Gainco's new AccuFill™ dual bulkers, as well as a wide variety of further-processed items.

The operation of AccuFill™ dual bulking systems is easy, automated and highly efficient. Products are fed to the bulking system via a conveyor or other material handling device, then collected in the hopper assembly that is connected to a load cell for weighing purposes. Once a pre-programmed target weight is achieved, a gate on the buffer hopper closes and the products are diverted to another hopper assembly for collection and weighing, and from there discharged into a container.

The AccuFill™ bulking system continues cycling in this manner until all product has been collected, batched or dispatched, or until the end of the shift. A washdown mode feature can be activated at the end of production. Washdown procedures are highly effective and easy due to the "sanitary" open-frame design of the AccuFill™ unit, which also simplifies maintenance access and activities.

The AccuFill™ dual bulking system also features Gainco's own Infiniti™ Plus programmable controller, providing protection against washdown water and condensation thanks to a highly durable polymeric housing that protects the weighing apparatus equally well in cold work environments and during hot washdowns and high-pressure washing. Likewise, the housing is impervious to the harsh chemicals typically used in washdown procedures in meat, poultry and seafood processing environments. The unit is NTEP-certified, and third-party tests show that the controller's performance meets the stringent IP69K washdown standard.

Gainco's Dataman® Data Collection System, available for use with AccuFill™ dual bulkers, is a software/hardware combination allowing for the integration of all remote units on the production floor. Operators can set parameters for individual pieces of equipment, monitor yield and throughput, and create customized reports – all from a single location. The data is provided to plant managers and corporate executives via a network interface. The raw data can then be moved to popular databases such as Oracle, SQL Server and DB2.

New AccuFill™ red meat dual bulking systems from Gainco integrate seamlessly into existing meat production operations.

Gainco, Inc.
770.534.0703
Gainesville, GA
www@gainco.com

Package Tester Validates Materials for Use with Reformulated Trans-Fat Free Foods from PBI-Dansensor

High barrier packaging films for product reformulations that remove trans fats from snack food, baked goods and pet foods are tested for oxygen and moisture vapor transmission rate using a total quality control system that includes the LYSSY oxygen and water vapor transmission rate tester and PermMate oxygen permeability tester for finished packages and bottles, available from PBI-Dansensor America.

PBI–Dansensor America Inc.

The quickly degrading, less-stable, trans-fat free formulations require greater reliance on packaging materials and finished package performance to prevent spoilage and changes in flavor and texture. PBI-Dansensor's OPT-5000 oxygen transmission rate tester and PBI-Dansensor L-80-5000 moisture vapor transmission rate permeability tester offer fast, accurate, reproducible real-time gas and moisture vapor transmission rates from a single film sample.

Since film may offer different performance characteristics after it is converted into a dimensional package, the PermMate oxygen permability tester tests oxygen transmission rates (OTR) within a finished package. PermMate, based on a new non-stress volume measuring technology, tests numerous packages at the same time. Packages can be flexible or rigid films or bottles.

PBI-Dansensor America Inc.
201.251.6490
Glen Rock, NJ
www.pbi-dansensor.us

Pinty's Delicious Foods Adopts Innovative SISTEM™ Learning Solution

Pinty's Delicious Foods, a Canadian manufacturer of poultry products, has entered into an agreement with Silliker, Inc. to train its workforce with Alchemy Systems' interactive, group-based training platform, SISTEM™.

SISTEM™ has established itself as a best practice in the industry for verifying and validating critical-skills training to in-plant personnel. SISTEM™ is highly interactive and allows companies to deliver competency-based, streamlined, and consistent training via the Internet or company intranet. The platform allows for local customization, incorporates simple remote control devices with color-coded buttons for students, and features an integrated training management system that tracks participant interactions and automatically updates training records.

With quality assurance as its number one priority, Pinty's recognizes the importance of innovation in the production of safe products for consumers. To this end, the company continuously invests in fresh ideas to improve its processes, products, and people.

"SISTEM™ is an outstanding fit for our company culture. SISTEM™ is a dynamic product that enhances the delivery of training programs and retention of learning materials through advanced technologies. We're excited to bring this 21st Century learning tool to our company and making it an integral part of our safety program," said Satender Toor, Pinty's corporate quality assurance director.

SISTEM™ allows for the training of up to 32 workers at a time, with or without a facilitator, maintains individual training records in a secure, auditable web database. Currently, the product is used to train nearly 85,000 food processing and food service workers in the United States and is garnering impressive results. In a recent report for the Texas Workforce Commission by the non-profit group, Food Training Institute, a survey of food processors using yielded significant reductions in employee turnover, work injuries, sexual harrassment and reportable food product safety incidents. Pinty's will be the first major Canadian food company to implement SISTEM™.

Last year, Silliker and Alchemy entered into a strategic partnership to create custom food training programs to be used in addition to Alchemy's existing library of content. Food allergens, good manufacturing practices, plant sanitation, and HACCP are among the training topics featured in the Silliker-Alchemy alliance.

Silliker, Inc.
708.957.7878
Homewood, IL
www.silliker.com

CEM Introduces New Protein Testing System

CEM Corporation, a provider of innovative microwave laboratory instrumentation, has announced the introduction of the Sprint™ Rapid Protein Analyzer. Sprint uses

CEM Corporation

iTAG™ protein tagging technology to yield accurate test results in two minutes. Accurate protein measurement is of particular importance due to concern in the food and pet food industries over false protein measurements caused by elevated nitrogen levels in some ingredients, as resulted from the addition of melamine to wheat gluten and rice protein concentrates.

"In this era of global resourcing and production, food manufacturers have realized that it is more important than ever to ensure the safety and integrity of their products," said Michael J. Collins, president and CEO of CEM Corporation. "Sprint brings proteomics to food science, giving companies the most accurate protein measurement available. By actually "tagging" the proteins, Sprint is able to distinguish them without being deceived by nitrogen interference, an incredibly important advance in food science."

The Kjeldahl and Dumas methods currently used to test protein in the food industry measure total nitrogen in samples and calculate the protein content based on the nitrogen levels. This has recently proved to be a concern with imported ingredients, as fillers or contaminants have yielded protein results higher then actual protein content. Sprint's protein-tagging technology does not measure nitrogen at all, but attaches to the protein itself to yield an accurate analysis of protein content.

The method has AOAC and AACC approval and is useful for a wide variety of foods and ingredients. Designed to be simple to operate, Sprint automatically homogenizes the sample, adds the tagging solution, and reads the results at the touch of a button. In addition, the compact system is a safer, faster, and more environmentally-friendly alternative to the Kjeldahl and Dumas methods. Kjeldahl uses sulfuric acid heated to high temperatures, which pose a safety and health hazard to employees during the testing and to the environment in terms of disposal.

"CEM has always been a company whose priorities are focused on the research and development of solutions for critical laboratory applications," continued Collins. "Our expertise in both compositional testing and bioscience presented a rare opportunity to capitalize on our knowledge base while expanding our product line. All of the feedback that we have had from the industry thus far, has been overwhelmingly positive."

CEM Corporation
800.726.3331
Matthews, NC
www.cem.com

JSO III Direct Gas Jet Stream® Oven Now Available for Testing from FMC FoodTech

The JSO III Direct Gas Jet Stream® oven from FMC FoodTech is now available for processors to test meat products in the FMC FoodTech Food Processing Technology and Training Center in Sandusky, OH. With a low initial cost, simple design and impingement airflow, this open-flame oven is ideal for high-temperature processing and products requiring a unique, flame-broiled flavor profile, such as burgers, sausage and other red meat products.

Unmatched in performance, the JSO III is a continuous-process, high-intensity impingement oven that utilizes vertical airflow to deliver fast cooking with excellent product browning. Dual burners and dual fans provide high-heat-intensity power to deliver the desired product color and flavor profiles on the most challenging applications.

The high-efficiency gas burners and direct-spark ignition in the JSO III oven eliminate the need for maintaining a pilot light, lowering the cost of ownership. The oven's explosion doors increase safety, while a patented floor-cooling mechanism prevents the burning of product remnants on the oven floor. Reliable, maintenance-free, high-efficiency plug fans also offer better air circulation.

"In addition to the cost savings, the oven's expanded temperture flexibility is a big plus for meat processors," says Ramesh Gunawardena, manager of technology and process development for FMC FoodTech. "The adjustable impingement nozzles can cook products from 2 to 6 inches high. The modular 40- and 48-inch-wide belts are available in a variety of designs from standard flat-flex to chain-edged mesh, allowing processors to easily add cooking capacity when required."

With the option to cook meat products in a high-humidity

environment first, followed by a combination of steam and heated air at temperatures up to 500°F (260°C), processors receive a higher production yield and throughput with the JSO III oven. The patented HUMITRoL® technology for automatic steam control complements superior containment mechanisms that include a water seal between the tank and hood to maintain high moisture content in the oven box at high fan speeds. This technology ensures less than + 2°F (1°C) cross-belt air temperature variation.

The fully automated clean-in-place (CIP) system in the JSO III oven maintains the highest degree of hygiene and sanitation with a continuous belt wash system and clam-shell hood design that permits easy inspection and secondary cleaning of internal components.

FMC Food Tech
312.861.6000
Chicago, IL
www.fmcfoodtech.com

Three Channels-in-One Data Logger from TandD Corporation

TandD Corporation has introduced the new TR-73U data logger which monitors three channels: temperature, humidity, and barometric pressure.

This compact, lightweight unit is approximately 2″ × 3″ and operates on one AA battery.

There is a large easy-to-read 4 digit display that shows all three channels. Front panel buttons control start, stop and setting of parameters.

The TR-73U has a large data capacity which can store up to 8,000 readings in one-time or endless recording mode. Simply by connecting to a computer via a USB port, the recorded data can be quickly downloaded with the easy-to-use software.

The product is an all-in-one package that includes the data logger unit, sensor and software.

The TR-73U is part of a family of data loggers which include temperature loggers and temperature/humidity loggers. These units are also compatible with TandD's RTR-57U Handheld Data Shuttle.

TandD Corporation
518.669.9227
Saratoga Springs, NY
www.tandd.com

Neogen Launches Semi-quantitative Aflatoxin Test, Improved Lateral Flow Reader

Neogen has developed an even easier method to accurately determine the general level of possible aflatoxin contamination in corn.

Neogen's new Reveal® for Aflatoxin SQ is the easiest and quickest quantitative test available for aflatoxin, a carcinogenic toxin in grain. In a format similar to a home pregnancy test, all a tester has to do is immerse a test strip into a sample after a simple extraction. In only 5 minutes, Reveal for Aflatoxin SQ can return sample test results in the ranges of less than 10 parts per billion (ppb); 10 to 20 ppb; or greater than 20 ppb using the Reveal AccuScan® III System.

"Our new semi-quantitative Reveal test is an even easier tool to accurately screen corn for aflatoxin, the most widely regulated mycotoxin in the world," said Ed Bradley, Neogen's vice president of food safety.

Neogen's new test adds to its line of aflatoxin tests. Test formats range from the simple Reveal test strips to a highly-sensitive fully quantitative test capable of rapidly detecting aflatoxin in numerous samples simultaneously at the FDA's 20 ppb standard for most human food, or 4 ppb–the European Union's regulatory standard.

To complement its expanding line of simple test strips and devices, and greatly simplify accurate record keeping, Neogen has also introduced the improved Reveal AccuScan® III System. Like previous versions, the AccuScan III system consists of a lateral flow test reader combined with a personal data assistant (PDA), and intuitive data management computer software. Unlike previous versions, the new AccuScan III provides an easier user interface, significantly improved test reading times, self-calibrations, and a more robust unit housing.

AccuScan provides an easy method to objectively read, store, and analyze results from Neogen's line of lateral flow tests for pathogens, mycotoxins, food allergens, dairy antibiotics, GMOs, and ruminant material in animal feed.

"Lateral flow tests are extremely popular in the food industry because they are very quick and easy to use," said Bradley. "AccuScan eliminates the subjectivity that can exist with interpreting the lateral flow devices, and provides a permanent result that can be incorporated into a company's food safety plan, such as HACCP. Quick and easy test results are good. But, permanent, traceable results are often necessary."

Neogen Corporation
800.234.5333
Lansing, MI
www.neogen.com

COMING EVENTS

FEBRUARY

- **13–15, International Food Safety Conference,** Hotel Okura, Amsterdam, The Netherlands. For more information, call 33.1.44.69.84.84 or go to www.ciesfoodsafety.com.
- **19–21, The Grocery Manufacturers Association (formally GMA/FPA) 2008 Food Claims and Litigation Conference,** The Ritz-Carlton, New Orleans, LA. For more information, call 202.639.5900 or go to www.@gmabrands.com.
- **19–21, Kentucky Association of Milk, Food and Environmental Sanitarians Annual Education Meeting,** Holiday Inn South, Louisville, KY. For more information, contact Tony Hall at 859.234.0054; E-mail: tony.hall@ky.gov.
- **21–23, Molds and Mycotoxins in Foods Short Course,** Hilton-Qwest Center, Omaha, NE. For more information, call Jana Hafer at 402.472.2817 or go to www.fpc.unl.edu.
- **23–27, AFFI Frozen Food Convention,** Sheraton San Diego Hotel & Marina, San Diego, CA. For more information, call 703.821.0770 or go to www.affi.com.
- **24–27, 6th ASM Biodefense and Emerging Diseases Research Meeting,** Baltimore, MD. For more information, call 202.737.3600 or go to www.asm.org/Meetings/index.asp.
- **26, Georgia Association for Food Protection Annual Meeting,** H. C. Brill, Tucker, GA. For more information, contact Pam Metheny at 770.393.5455; E-mail: pamela.metheny@pilgrimspride.com.
- **27–29, QA/QC Strategy for Biologicals and Biopharmaceuticals Conference,** Costa Mesa, CA. For more information, call 1.610.688.1708 or go to www.rapidmicrobiology.com.

MARCH

- **2–5, ASM Conference on Manipulation of Nuclear Processes by DNA Viruses,** Charleston, SC. For more information, call 202.737.3600 or go to www.asm.org/Meetings/index.asp.
- **12–15, FPSA 2008 Conference,** Hyatt Regency Coconut Point, Bonita Springs, FL. For more information, call 703.761.2600 or go to www.fpsa.org.
- **17, Ohio Association of Food and Environmental Sanitarians Spring Meeting,** Ohio State University, Columbus, OH. For more information, contact Don Barrett at 614.645.6195; E-mail: donb@columbus.gov.
- **17–19, 10th Annual Food Safety and Security Summit,** Convention Center, Washington, D.C. For more information, contact BNP Media at 847.405.4000 or go to www.foodsafetysummit.com.

APRIL

- **2, Information Systems & Logistics Distribution (IS/LD),** Westin Mission Hills Resort and Spa, Rancho Mirage, CA. For more information, call 202.639.5900 or go to www.gmabrands.com.
- **2–4, Missouri Milk, Food and Environmental Health Association Annual Educational Conference,** Stoney Creek Inn, Columbia, MO. For more information, contact Gala Miller at 573.659.0706; E-mail: galaj@socket.net.
- **9, SfAM 2008 Spring Meeting – Broadening Microbiology Horizons,** Aston University, Birmingham, UK. For more information, call 44.0.1234.328330 or go to www.sfam.org.uk.
- **10, Indiana Environmental Health Association Spring Educational Conference,** Emergency Services Education Center, Wayne Township, Indianapolis, IN. For more information, contact Kelli Whiting at 317.221.2256; E-mail: kwhiting@hhcorp.org.
- **11–16, The Conference for Food Protection Biennial Meeting,** The Omni San Antonio Hotel at the Colonnade, San Antonio, TX. For more information, contact Jeff Lineberry at executivedirector@foodprotect.org.
- **17, Ontario Food Protection Association Spring Technical Session, Mississauga Convention Centre,** Mississauga, Ontario, Canada. For more information, contact Gail Seed at 519.463.5674; E-mail: seed@golden.net.
- **27–29, 2008 ADPI/ABI Annual Conference,** Marriott Downtown, Chicago, IL. For more information, call 630.530.8700 or go to www.adpi.org.

MAY

- **4–7, The FMI Show Plus MARKETECHNICS®,** Mandalay Bay Convention Center, Las Vegas, NV. For more information, call FMI at 202.452.8444 or go to www.fmi.org.
- **13–15, Florida Association for Food Protection Annual Education Conference,** St. Petersburg Hilton-Bayfront, St. Petersburg, FL. For more information, contact Zeb Blanton at 407.618.4893 or go to www.fafp.net.
- **14–15, Pennsylvania Association of Milk, Food and Environmental Sanitarians Annual Meeting,** Nittany Lion Inn, Penn State University, State College, PA. For more information, contact Gene Frey at 717.397.0719; E-mail: erfrey@landolakes.com.
- **18–20, 2008 APHL Annual Meeting,** St. Louis, MO. For more information, call APHL at 240.485.2745 or go to www.aphl.org.
- **19–22, 3-A SSI 2008 Annual Meeting,** Four Points Sheraton, Milwaukee Airport, Milwaukee, WI. For more information, call 703.790.0295 or go to www.3-a.org.
- **26–28, IAFP Latin America Symposium on Food Safety,** Campinas, São Paulo, Brazil. For more information, go to our Web site at www.foodprotection.org.

JUNE

- **10, Ontario Food Protection Association Professional Development Day and Golf Tournament,** Springfield Golf Course, Guelph, Ontario, Canada. For more information, contact Gail Seed at 519.463.5674; E-mail: seed@golden.net.
- **24–26, New Zealand for Food Protection *Listeria* Workshop in Association with New Zealand Institute of Food Science and Technology (NZIFST) Annual Meeting,** Rotorua, New Zealand. For more information, contact Lynn McIntyre at 64.3.351.0015; E-mail: lynn.mcintyre@esr.cr.nz.

IAFP UPCOMING MEETINGS

AUGUST 3-6, 2008
Columbus, Ohio

JULY 12-15, 2009
Grapevine, Texas

AUGUST 1-4, 2010
Anaheim, California

ADVERTISING INDEX

IAFP Welcomes A New Affiliate

Turkish Food Safety Association

Journal of Food Protection®

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International Association for Food Protection
Reg. U.S. Pat. Off.

Vol. 70 December 2007 No. 12

Research Notes

Review

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- ❒ D1060 Frozen Dairy Products
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- ❒ D1090 Managing Milking Quality
- ❒ D1100 Mastitis Prevention and Control
- ❒ D1105 Milk Hauling Training
- ❒ D1110 Milk Plant Sanitation: Chemical Solution
- ❒ D1120 Milk Processing Plant Inspection Procedures
- ❒ D1125 Ohio Bulk Milk Hauling Video
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- ❒ D1140 Pasteurizer: Operation
- ❒ D1150 Processing Fluid Milk
- ❒ D1180 10 Points to Dairy Quality

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- ❒ E3031 Allergy Beware
- ❒ E3040 Asbestos Awareness
- ❒ E3055 Effective Handwashing – Preventing Cross-Contamination in the Food Service Industry
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- ❒ E3070 EPA Test Methods for Freshwater Toxicity Tests (Using Fathead Minnow Larva)
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- ❒ E3080 Fit to Drink
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- ❒ E3128 Integrated Pest Management (IPM)
- ❒ E3150 Kentucky Public Swimming Pool and Bathing Facilities
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- ❒ E3180 Tape 2 – Changes in the Removal Process Removal and Additional Program Requirements
- ❒ E3190 Tape 3 – Enforcement & Federal Facilities
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- ❒ E3230 Tape 6 – Research & Development Closing Remarks
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- ❒ F2005 A Lot on the Line
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- ❒ F2037 Cooking and Cooling of Meat and Poultry Products
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- ❒ F2045 Food Microbiological Control
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- ❒ F2070 Food Safe Series II (4 videos)
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- Food Safety for Food Service Series I
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- ❒ F2101 Tape 2 – Food Safety for Food Service: HACCP
- ❒ F2102 Tape 3 – Food Safety for Food Service: Personal Hygiene
- ❒ F2103 Tape 4 – Food Safety for Food Service: Time and Temperature Controls
- Food Safety for Food Service Series II
- ❒ F2191 Tape 1 – Basic Microbiology and Foodborne Illness
- ❒ F2105 Tape 2 – Handling Knives, Cuts, and Burns
- ❒ F2106 Tape 3 – Working Safely to Prevent Injury
- ❒ F2107 Tape 4 – Sanitation
- ❒ F2110 Food Safety is No Mystery
- ❒ F2111 Controlling *Salmonella*: Strategies That Work
- ❒ F2120 Food Safety: For Goodness Sake Keep Food Safe
- ❒ F2121 Food Safety the HACCP Way
- Food Safety Zone Video Series
- ❒ F2125 Tape 1 – Food Safety Zone: Basic Microbiology
- ❒ F2126 Tape 2 – Food Safety Zone: Cross-Contamination
- ❒ F2127 Tape 3 – Food Safety Zone: Personal Hygiene
- ❒ F2128 Tape 4 – Food Safety Zone: Sanitation
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- ❒ F2143 GMP Basics: Guidelines for Maintenance Personnel
- ❒ F2147 GMP Basics: Process Control Practices
- ❒ F2148 GMP – GMP Employee
- ❒ F2150 GMP: Personal Hygiene and Practices in Food Manufacturing
- GMP Food Safety Video Series
- ❒ F2151 Tape 1 – Definitions
- ❒ F2152 Tape 2 – Personnel and Personnel Facilities
- ❒ F2153 Tape 3 – Building and Facilities
- ❒ F2154 Tape 4 – Equipment and Utensils
- ❒ F2155 Tape 5 – Production and Process Controls
- ❒ F2160 GMP: Sources and Control of Contamination during Processing
- GMPs for Food Plant Employees: Five-volume Video Series Based on European Standards and Regulations
- ❒ F2161 Tape 1 – Definitions
- ❒ F2162 Tape 2 – Personnel and Personnel Practices
- ❒ F2163 Tape 3 – Building and Facilities
- ❒ F2164 Tape 4 – Equipment and Utensils
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- ❒ F2341 Science and Our Food Supply
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	Pocket Guide to Dairy Sanitation (minimum order of 10)	.75	1.50	
	Before Disaster Strikes…A Guide to Food Safety in the Home (minimum order of 10)	.75	1.50	
	Before Disaster Strikes…*Spanish language version* – (minimum order of 10)	.75	1.50	
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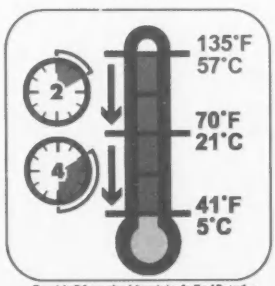

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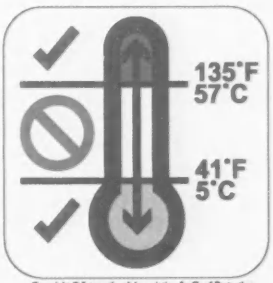

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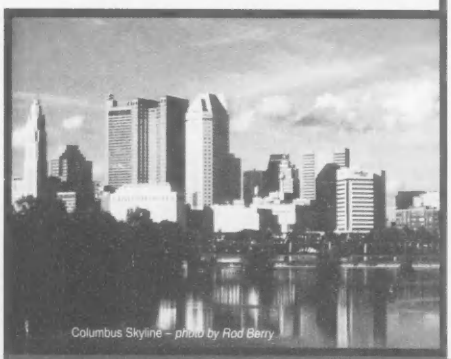

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