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Food Protection Trends

Science and News from the International Association for Food Protection

Observed Hand Washing Behaviors

Adoption of Interventions to Improve Food Safety at Meat and Poultry Processing Plants

www.foodprotection.org

WTI INC.
WORLD TECHNOLOGY INGREDIENTS

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WTI – A World Leader in Food Safety and Functional Food Ingredients

World Technology Ingredients Company, Inc. (WTI, Inc) is a specialty ingredients company founded in 1978 to provide ingredients and technology to the meat, poultry and seafood industries. Since 1988, World Technology Ingredients has been issued 12 patents in ingredient and food process technology.

WTI manufactures dry and liquid ingredients for use by food manufacturers to enhance finished product performance and inhibit a broad range of bacteria, yeast and molds. All ingredients manufactured and sold by World Technology Ingredients are approved for use in USDA and FDA regulated products. All WTI ingredients are Generally Recognized As Safe (GRAS), nonallergenic and safe for direct contact.

WTI opened its new state of the art production facility in Jefferson, Georgia in December 2005 with additional capacity to do Custom Blending and Contract Packaging. The facility, carefully designed to exceed all Good Manufacturing Practices (GMP's) requirements received a SUPERIOR rating by the AIB on its very first inspection.

WTI is committed to providing safe, new and innovative technologies for its customers. Through leading edge research and technical initiatives, WTI is able to meet the needs of its customers, both large and small. Our goal is simple – to continuously identify and develop new ingredients/technology which provides our customers the tools to profitably succeed.

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The World Technology Ingredients products portfolio consists of six different brands of product, each designed to profitably enhance selected performance attributes of a wide variety of foods. The brands are: *IONAL, Myosol, MOstatin, TenderIn, Marinal and FlavorIn.*

IONAL Products

The *IONAL* brands of antimicrobials consist of three basic product lines: *IONAL, IONAL Plus* and *IONAL LC* – all based upon blends of buffered citrates alone or in combination with diacetate or acetate. Since it's approval as an antimicrobial for meats and poultry in 1995 extensive research has been conducted into the use of buffered citrates to inhibit the growth of microorganisms in/on raw and ready to eat meats and poultry.

IONAL

IONAL is straight buffered sodium or potassium citrate. As the name implies it increases ionic strength. In muscle protein systems this equates to increased marinade/brine retention and yield during processing with less moisture migration and purge in the finished package.

IONAL Plus

IONAL Plus products are buffered citrates with diacetate or acetate. They are used to increase the shelf life of perishable foods, especially raw marinated meats, fish and poultry. Typically incorporation of *IONAL Plus* into a food system will double the products shelf life.

IONAL LC

IONAL LC products are buffered citrates with diacetate or acetate which have been specifically formulated to inhibit the growth *Listeria monocytogenes* in/on foods, especially ready-to-eat meats (RTE). In RTE meats, *IONAL LC* has also been shown an effective means of preventing the outgrowth of *Clostridium perfringens* spores.

Myosol Products

Myosol brand phosphates are supersaturated tetrapotassium pyrophosphate solutions which are pH optimized to meet your specific needs. *Myosol* and *Myosol Plus* are performance enhanced functional ingredients designed to improve product/process yield and meat tenderness. They are readily soluble in cold water and instantaneously reactive in meat systems.

MOstatin Products

MOstatins are all natural, consumer friendly, clean label ingredients designed to inhibit the growth of microorganisms in/on food. MO for microorganism; statin for stasis or no growth. *MOstatins* have been successfully validated as an all natural CCP for *Listeria* for RTE meats, soups and salads.

MOstatin LV

MOstatin LV is an all natural blend of lemon juice concentrate and vinegar designed to enhance the organoleptic properties of foods while inhibiting a broad spectrum of bacteria, yeast and molds. *MOstatin LV* increases the water holding capacity of muscle protein systems. At low concentrations *MOstatin LV* does not have any flavor impact on the finished product. At higher concentrations, its slight citric taste enhances the natural flavors of meats, fish, poultry and vegetables.

MOstatin V

MOstatin V is a vinegar based product designed as a surface treatment to inhibit a broad spectrum of microorganisms.

MOstatin VE

MOstatin VE is a vinegar based system with native starches designed to increase marinade retention in ready to eat muscle foods while inhibiting a broad spectrum of bacteria, yeast and molds. At low concentrations *MOstatin VE* does not have any flavor impact on the finished product. At higher concentrations it yields a slight vinegar taste and odor.

FlavorIn Products

FlavorIns are all natural flavor systems derived from fruit, vegetable and vinegar based ingredients designed to enhance the organoleptic attributes of food systems. They are available in both a dry and liquid form depending upon the desired functionality in the finished product.

TenderIn Products

TenderIns are all natural, consumer friendly, clean label alternatives to phosphates for use in muscle foods. *TenderIns* are derived from fruit juices and vegetable bi-products. They are species specific products – each formulated to accommodate the different functional characteristics encountered by different muscle foods: a.k.a. beef, chicken, pork, turkey or fish.

TenderIn DL

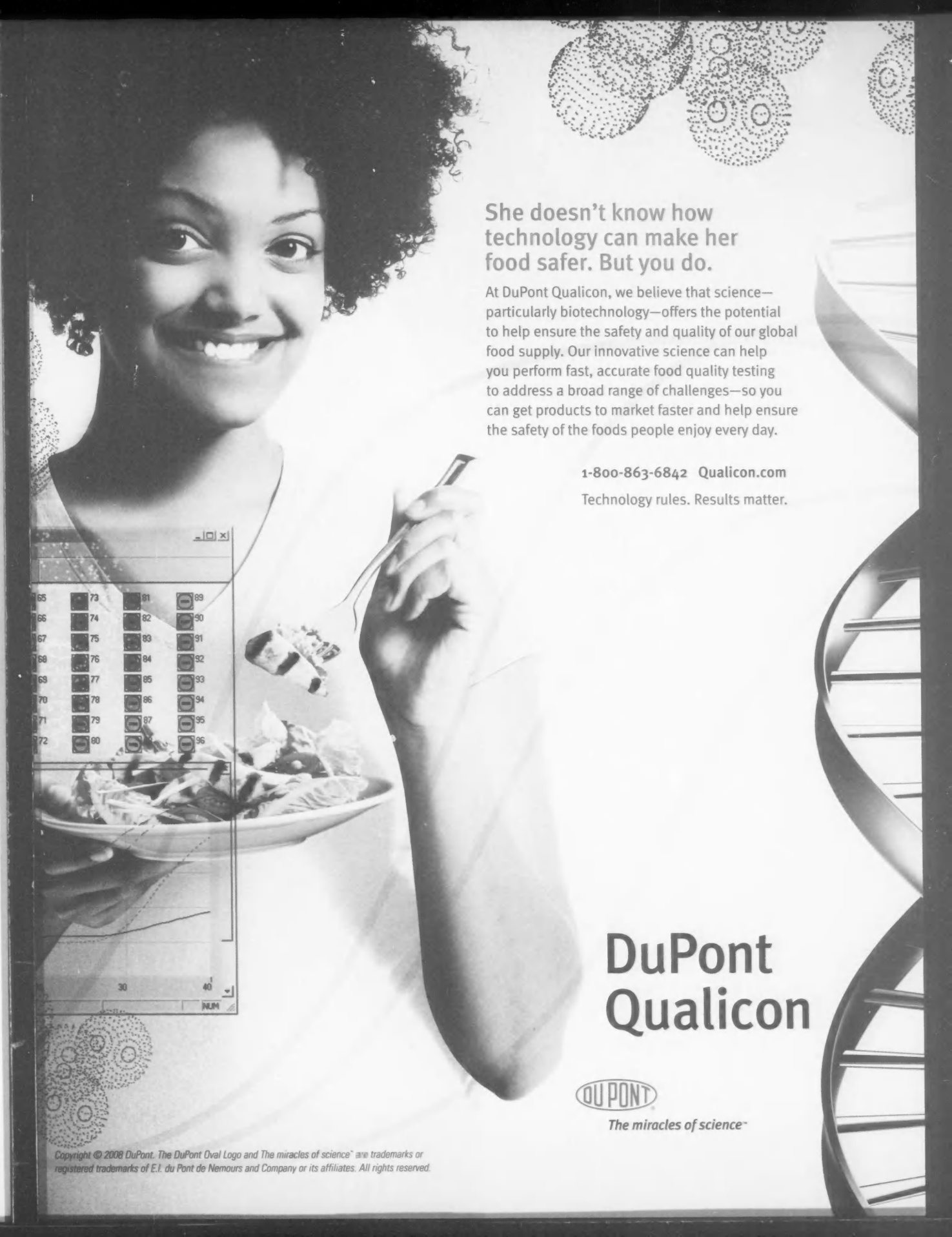
TenderIn DL is processed lemon juice concentrate dried onto a rice flour carrier designed to increase the cook yield of ready to eat meats and overall viscosity of food systems. The rice flour is a specialty blend formulated to deliver the optimum amylose and amylopectin concentrations. Its unique properties in cooked systems make *TenderIns* a viable alternative to phosphates.

TenderIn L

TenderIn L is the liquid form of *TenderIns*, each custom blended to meet the specific performance requirements of a wide range of food systems.

Marinal Products

Marinal brand marinades are customized systems designed to deliver performance at an affordable cost. They are specially formulated to maximize the interactions between substrate, process and packaging in order to achieve the customers' desired performance objectives.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International Association for Food Protection

FOOD PROTECTION TRENDS

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ARTICLES

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EXTRAS

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FOOD PROTECTION TRENDS
SCIENCE AND NEWS
FROM THE INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION

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IAFP 2009

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Gaylord Texan Resort
Grapevine, Texas

IAFP 2010

AUGUST 1–4

Anaheim Convention Center
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"PERSPECTIVES" FROM YOUR PRESIDENT

By STAN BAILEY
PRESIDENT

"Leaders must acknowledge that the cost of food safety is not optional, it is a cost of doing business"

Leadership, the ability to lead by providing effective guidance and direction, is an attribute that is always needed and often missing. Leadership is not a single trait or action. It is the process by which a person influences an organization or group of people to efficiently and effectively accomplish an objective or goal. These extraordinary times we are in present real challenges and opportunities for our global food safety leaders.

As I write this month's column, the Presidential election for the United States is only one week away. This election is occurring at a time of unprecedented economic turmoil in the United States and around the world. There are many reasons for this economic crisis. Poor judgment (we probably could say greed) on the part of big banks and Wall Street led to the explosion of subprime loans and the housing bubble. The results of these actions include a frozen credit market and a loss of confidence in both the financial industry and the government's ability to regulate and monitor this industry.

From my perspective, it is clear that poor leadership contributed to the situation we are now in today. It is unreasonable to think that most ordinary citizens would have an understanding of the complex national and international money markets or the broad implications of borrowing more for a home than they can ultimately afford to pay back. There has been an almost total void of effective leadership on these issues in both the public and private sector.

You might ask what does this have to do with food safety? Now, more than ever, leadership is critical for food safety. No one sector can fully assure that foods will be completely free of bacterial pathogens at all times. Particularly at this time of financial instability, we need leadership at all levels. Food producing companies have an implicit (and legal) requirement to produce foods that are safe. Regulatory and Public Health Agencies have a statutory requirement to assure the safety of foods. Finally, consumers must be educated to handle foods safely.

Effective leaders will not only acknowledge the importance of food safety, but they will also recognize that there is a cost associated with assuring the safety of foods and will resist the temptation to cut food safety programs in these difficult financial times. It is likely that the current financial condition of the United States and many countries around the world will pose even more challenges to our ability to fully fund food safety programs in both the private and public sectors. As budget deficits grow, many countries will face pressure to reduce funding for regulatory and public health agencies likely hindering their ability to monitor the safety of our foods.

Food producing companies are facing unprecedented challenges. Companies are pressured to keep food cost low because reduced consumer spending on foods as a result of high unemployment and high inflation. At the same time, rising grain prices and increased energy costs are putting upward pressures on food prices. All of these challenges in a time when we have seen numerous outbreaks of bacterial associated foodborne illnesses around the world.

How will we be able to reconcile these opposite pressures of reducing food costs without compromising the safety of foods? The answer is leadership. First, leaders, whether in government or private industry, must acknowledge that there can be no wavering on the issue of food safety, and they must accept that there is a cost for food safety. Leaders must demand at all times that everyone involved in the production and regulation of foods – from the president of the company

– to the line worker – to the farmer in the field – to the congressman allocating fund for FDA, USDA, or CDC– must never forget that what they are doing may effect the safety of foods. From my perspective, every time any of these individuals makes a decision, they should ask themselves if they would feel comfortable with their child eating the food they are producing or regulating?

Former IAFP President, Frank Yiannas has often talked about the concept of a "culture of food safety." I believe that Frank is absolutely correct, and this "culture of food safety" has to start at the top. From a government perspective, the government leaders, whether federal, state, or local, must adequately fund regulatory and public health agencies and demand accountability from everyone involved from the head of agencies, to inspectors, to research scientists. In food production, everyone from the president of the company producing the food to the deli clerk in the grocery store must understand the importance of their role in producing safe foods and recognize that they can never "take a day off" when it comes to food safety. Leaders must acknowledge that the cost of food safety is not optional, but it is a cost of doing business. Leaders must never waiver and demand nothing less than the best at all times.

In closing, this past week we lost a true leader, pioneer, and visionary if the field of food microbiology, Dr. James Jay. Many of you know Dr. Jay because one of his food microbiology books was your first exposure to food microbiology. But, for those of us who have had the honor and pleasure of knowing Dr. Jay on a personal level, he was much more than his books. Dr. Jay was a man of incredible intelligence and a true gentleman. Dr. Jay, you will be missed, and the world is a much better place because of you.

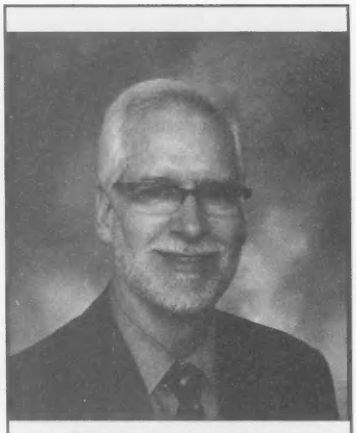
Please join us in Grapevine, Texas for the IAFP Annual Meeting on July 12–15, 2009. I welcome your comments or feedback. Please email me at stan.bailey@na.biomerieux.com.

"COMMENTARY" FROM THE EXECUTIVE DIRECTOR

It is hard to believe, but here we are at December and the end of another year! The conclusion of a year provides a good opportunity to look back and to look ahead, so we will do both in this month's column. To look back, we will review IAFP's accomplishments and our financial outcome. Then to look forward, we'll report on plans for 2009.

Let's begin with the look back. During 2008, IAFP organized and held four conferences (or symposia) around the world. They ranged between the much focused, "Prepared, but Not Ready-to-Eat Foods" symposium in January (held in the Washington, D.C. area) to the Latin America Symposium on Food Safety covering a broad section of subject matter (held in Campinas, SP, Brazil). In November this year, we held our Fourth European Symposium on Food Safety in Lisbon, Portugal looking into the issues of "Advancements in Food Safety." Since I am writing prior to the start of this Symposium, we cannot report details, but all indications point to a record attendance and standing room only for the facility we will use.

The fourth conference, of course, was our Annual Meeting! We had a very successful meeting this year in Columbus, Ohio with more than 1,840 attendees. The conference was our second best in terms of adding net revenue to the General Fund. Other accomplishments include working with organizers in Beijing, China and Dubai, United Arab Emirates on conferences held in those locations. Although these were not technically "IAFP" conferences, they both provided an excellent opportunity for IAFP to become more recognized in those regions.



By DAVID W. THARP, CAE
EXECUTIVE DIRECTOR

"A new service provided to members is that* Food Protection Trends *is available for online access"

In addition to our conference activities, we also expanded our Membership by 11% over the last two years. We have seen a 50% increase in international Membership while Canada and Mexico (combined) and the US have increased by 18% and 4% respectively. This is surely an indication that IAFP is providing the information needed by food safety professionals worldwide! Members can now access the *Journal of Food Protection* Online, 24 hours a day, anyplace in the world.

A new service provided to Members is that *Food Protection Trends* is available for online access. As with *JFP* Online, this journal is now available online to Members around the globe for instant access any time of the day! There is no need to wait for the postal service to deliver IAFP journals when you purchase online access!

As for our financial report, let's just say it could have been better. IAFP's year ends on August 31, so the financial activity report is shown on page 956 of this issue. You will see that the change in our General Fund balance declined by almost $92,000. This loss for fiscal year end (FYE) August 31, 2008 can be directly linked to the loss we incurred on our investment accounts. We budgeted for $40,000 to come from investments when in reality; we lost $73,000 for a difference of $113,000 in net results. There were a number of other factors, both positive and negative, that influenced the final results; but the end result is still the same – a loss of $92,000.

As disturbing as this is, it is a not catastrophic for IAFP. If you have followed my reports over the past years, you will notice that as an organization, we have focused on building the General Fund balance so that we can sustain losses such as the one incurred this year. We still have a substantial dollar amount in the General Fund ($668,000) and that allows us to be very strong financially.

We surely don't like the position we found ourselves in this year, but it is one we can continue to work to overcome. I'm sure you know, FYE 2009 has not started off very well on the investment side either, but we are making adjustments to soften the effects that investment losses could have on our financial results. One thing to put it in perspective is that the monies IAFP has invested are all long-term investments of more than 10-years in length. Therefore, we have time to allow the markets to recover without needing to pull the monies from these investments.

Now let's look at the future. In the coming year, you can expect to see IAFP continue to organize pertinent food safety conferences around the world. We will continue our involvement with the China International Food Safety and Quality Conference (CIFSQ) along with the Dubai International Food Safety Conference (DIFSC). Plans for the IAFP European Symposium (Germany, October 2009) and our International Symposium (Korea, November 2009) are progressing. All of these plans advance while we work feverishly on IAFP 2009 being held this year in Grapevine, Texas (Dallas-Fort Worth area).

IAFP will continue to monitor opportunities that warrant a "Rapid Response" or a "Timely Topics" symposium format. There could be topics that we can bring food safety professionals together whereby government, industry and academia can discuss historical perspective, current knowledge and future plans to solve food safety issues. We stand ready to provide this type of forum.

During this coming year, we expect to charter additional new Affiliate organizations from both North America and outside of North America. A number of groups have expressed interest! We will move forward on establishing an "IAFP Press" where books on food science and food safety will be published. The *IAFP Report* will continue to strengthen in its ability to communicate food safety information to professionals around the globe. *Food Protection Trends* will become more accessible as an online publication.

Another exciting change for IAFP will be the remake of our Web site. We expect this to evolve during the first quarter of 2009 and this will put additional resources at the fingertips of all IAFP Members. The Web site will be easier to use, more eye-appealing and allow users to find IAFP information much quicker.

Each of these areas of emphasis is being concentrated upon to provide additional value for your Membership. They are also designed to continue to attract new Members so that our Membership base continues to grow.

As this month's column concludes, I want to thank each and every IAFP Member for your support of IAFP and more importantly, for the efforts you put forth to make the food supply safe for all consumers. You are protecting the public's health and what can be more important than continuing this effort? Without our health, we truly have nothing.

Best wishes from IAFP for a happy holiday season and for a healthy and prosperous New Year!

ARTICLES
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International Association for Food Protection

Observed Hand Washing Behaviors of Young Adults during Food Preparation

JACLYN MAURER ABBOT,* CAROL BYRD-BREDBENNER, VIRGINIA WHEATLEY, ELLEN COTTONE and MICHELE CLANCY

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SUMMARY

Identifying populations in which hand washing behaviors are less than optimal is a vital first step in improving the focus of food safety education efforts. The purpose of this study was to observe the hand washing behaviors of young adults (n = 153, age 18–26 years) while they prepared two dishes in a controlled kitchen laboratory. Trained researchers observed participants, who were blinded to the study purpose. Subsequent to the observations, participants completed a survey designed to assess their hand washing knowledge and self-reported hand washing behaviors. Young adults reported that they performed half of all recommended hand washing behaviors, yet they were observed performing only 25 percent of recommended practices. Young adults washed their hands more frequently prior to starting food preparation and after handling raw poultry and least frequently after handling unwashed fresh produce and after occasions when contamination was likely to occur (e.g., answering cell phone). Although overall mean hand washing knowledge was high (72% correctly answered questions), only 37 percent knew the most hygienic way to wash hands. These findings indicate that young adults could benefit from food safety education interventions designed to expand knowledge and increase actual practice of recommended hand washing techniques.

INTRODUCTION

Hand washing has long been recognized as an important health behavior that can reduce the risk and spread of illness *(23)*. Poor hand hygiene in those preparing food can both introduce and spread foodborne disease. Few fully appreciate the control they can exert in their own kitchens to reduce their risk of foodborne disease *(19)* or recognize that food mishandling, including inadequate hand washing during food preparation, likely causes a significant amount of foodborne disease *(1, 4, 6, 19, 25)*.

Young adults (ages 18 to 29) and individuals with education beyond high school are more likely than others to engage in risky food handling *(2, 14, 15, 18, 26)*. This, along with reduced opportunities to learn about safe food handling (including hand washing) in school, suggests that the current population of young adults may unknowingly pass along their risky food handling behaviors and increase the risk for foodborne disease not only to themselves, but also to those for whom many may eventually assume responsibility (e.g., aging parents, children). Further, the most common jobs held by youth are in the food service industry, ranging from cashier to table buser to server to cook *(12)*, putting them in direct and indirect control of the food safety of meals being served to dining patrons.

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TABLE 1. Hand washing observation checklist: percent of young adults[a] observed engaging in each practice

	Hands were washed	Running water was used	Soap was used	Hands were rubbed together ≥ 20 seconds
Hand washing occasion	**% Observed**	**% Observed**	**% Observed**	**% Observed**
Before Food Preparation Began	60	60	54	16
After Handling Raw Produce	14	14	7	0
After Handling Raw Poultry	63	63	41	10
As Necessary[b]	4	5	4	1

[a]n = 153

[b]As necessary = hands were washed following: each absence from the food preparation work station (e.g., bathroom breaks, telephone call); touching body parts (e.g., wiping hands on clothes, touching face, hair); coughing/sneezing or blowing nose

Evaluating the extent of risky food handling behavior, in particular hand washing during food preparation, is vital to understanding how to tailor and focus food safety education to this population. One purpose of this study, therefore, was to observe young adults' hand washing behaviors during food preparation and compare their compliance to established guidelines for the prevention and spread of foodborne disease *(22)*. Additional purposes were to determine how observed hand washing behaviors compared to self-reported behaviors as well as to assess young adults' knowledge of recommended hand washing procedures.

METHODS

Young adults enrolled at a major US university were recruited via official university student email listservs and campus newspaper advertisements. Interested participants completed a brief screening questionnaire to identify those meeting eligibility requirements [i.e., age 18 to 26 years, did not hold a sanitation certification, had good or excellent health, and were not at increased risk of foodborne disease (i.e., pregnant, immune compromised)]. Of the 167 eligible individuals accepting the invitation, 153 honored their scheduled appointment time.

These participants, blinded to the study purpose, followed two simple recipes that involved handling a raw food of animal origin that was to be cooked and one raw vegetable ingredient that was to be chopped and served uncooked. Trained observers recorded participant's hand washing practices, using a 16-point criterion-based checklist. Specifically, the trained observers observed whether participants washed their hands on these four occasions: (a) before beginning food preparation, (b) after handling unwashed produce, (c) after handling raw poultry, and (d) as necessary (e.g., after touching hair, taking a break to answer the phone, use the restroom). For each occasion on which the participant was observed washing his or her hands, one point was earned, up to a maximum of four points. An additional point was awarded for each of the four hand washing occasions when participants washed their hands with running water, used soap, and/or rubbed their hands for at least 20 seconds (see Table 1) *(24)*. Thus, if a participant washed his or her hands before beginning food preparation, using running water and soap, and rubbed the hands for at least 20 seconds, four points were earned. Ten percent (n = 16) of the observations were randomly selected for independent observation by two researchers; a comparison of the observations indicated a 92% inter-rater reliability. The food preparation protocol, observation checklist validation procedures, and observer training methods have been described previously *(7)*.

Following food preparation, young adults completed a 10-item hand washing knowledge test (e.g., most hygienic way to wash hands, when hands should be washed) [Livingston Reliability = 0.83 *(5, 11, 20)*] and 4-item self-report hand washing practices questionnaire (e.g., when during food preparation participant reports washing hands, whether soap is used) that were part of a comprehensive food safety survey *(9, 10, 21)*. Using standard procedures, experts developed, validated, pilot-tested, and refined these instruments [published previously *(7–9)*]. Participants earned 1 point for every correct knowledge response and recommended self-reported practice. Thus, scores could range from 0 to 10 and 0 to 4 for the knowledge and self-reported practices questionnaires, respectively. Analysis of variance was conducted using the statistical analysis software program StatView, version 5 (SAS Institute, 2002) to compare observed and self-reported hand washing practices. This study was approved by the authors' Institutional Review Board. All study participants signed informed consent forms prior to participation.

RESULTS

Participants had a mean age of 20.73 ± 1.30 (standard deviation, SD) with a range of 18 to 26 years and were from a wide array of college majors. The majority (99%) prepared at least one meal weekly and were female (56%), white (67%), and upperclassmen (85%). Most did not believe that they or a house-

TABLE 2. Selected self-reported handwashing behaviors and knowledge

Self-Reported Handwashing Behaviors	Participant Answer (%)
1. Right after handling raw meat, raw chicken or raw fish, what do you usually do?	
– Continue cooking	3
– Rinse my hands with water	27
– Wipe my hands on a paper/dish towel	2
– Wash my hands with soap[a]	63
– I never handle raw meat or chicken	5
2. Before you begin preparing food, how often do you wash your hands with soap?	
– All of the time[a]	39
– Most of the time	37
– Some of the time	17
– Rarely	7
Handwashing Knowledge	
Which is the most hygienic way to wash your hands?	
1. Apply sanitizer, run water, rub hands together for 20 seconds, rinse hands, dry hands, rub on an antiseptic hand lotion	11
2. Apply soap, rub together for 20 seconds, rinse hands under water, dry hands, apply sanitizer	25
3. Run water, moisten hands, apply soap, rub hands together for 20 seconds, rinse hands, dry hands[b]	36
4. Run water, moisten hands, apply sanitizer, rub hands together for 20 seconds, rinse hands, dry hands, rub on antiseptic hand lotion	28

[a]Best practice

[b]Correct answer

hold member had food poisoning in the past year (85%) and had never held a job serving (60%) or preparing (79%) food. More than 90 percent had never completed a university course in nutrition, food science, or microbiology. Most (97%) rated their food safety knowledge and skills as at least fair.

A majority (60%) were observed washing their hands before beginning food preparation with at least water, slightly over half (54%) used soap, and only 16 percent rubbed their hands together for the recommended 20 seconds (Table 1). During food preparation, close to 60 percent did not wash their hands with soap and water after touching raw poultry and before continuing with food preparation activities (including touching produce that was to be served raw). In this sample of young adults, hand washing compliance was best prior to the start of food preparation, followed by after handling raw poultry, after handling unwashed produce, and lastly at other times during food preparation when hand washing is necessary. Females scored significantly higher than males on the hand washing compliance scale ($P = 0.03$) and were more likely than males to wash their hands with soap after handling raw poultry (45% vs. 35%).

The majority (76%) reported hand washing with soap before preparing food all or most of the time, which is significantly ($P < 0.0001$) higher than the 54 percent observed doing this (Table 2). Sixty-three percent reported usually hand washing with soap after handling raw poultry, whereas only 41 percent were observed doing so ($P < 0.0001$). Although mean hand washing knowledge was high at 72 percent (7.2 ± 2.0), only 36 percent knew the most hygienic way to wash hands, and at most only 16 percent were observed actually engaging in this practice at any time during food preparation ($P < 0.0001$). Overall, participants were observed performing only 25 percent of recommended hand washing practices (mean = 4.1 ± 2.7; range 0 to 12), yet they reported that they performed half of the recommended practices (mean = 2.0 ± 1.3; range 0 to 4).

DISCUSSION

The findings of this study indicate that young adults fail to follow recommendations for hand washing before and during food handling. Further, young adults report better hand washing behavior than is actually observed. Inad-

equate hand washing practices like those observed in this study have been observed worldwide. Videotapes of food handling practices in 40 Australian households revealed that nearly half of those observed did not wash their hands with soap nor did they wash their hands at all after handling raw meat *(17)*. Among adults in the United Kingdom, 58 percent did not wash their hands after handling raw meat or poultry *(27)*. Videotaped observation of primary food preparers in American households revealed that one-fifth did not wash their hands after handling raw meat or poultry and that time spent washing hands was significantly less than recommended *(3)*.

Poor hand hygiene extends beyond failure to wash after handling raw foods of animal origin. An observational study of secondary level school children found that only 58 percent of females and 48 percent of males washed their hands after using the bathroom *(16)*. Perhaps more shocking, a recent news report indicated that only 65 percent of physicians at a major medical center in the United States complied with hand hygiene guidelines *(13)*.

The findings of this cross-sectional study must be considered in light of its limitations. The sample was limited to a small number of self-selected young adults. Also, the direct observation of participants may have encouraged hand washing. Nonetheless, the observed inadequate hand hygiene before and during food preparation and the discrepancy between reported and observed behaviors highlights the need to improve both knowledge and practice of recommended hand washing techniques in young adults.

When developing informational messages that teach young adults about food safety and hand washing, health professionals should focus efforts on the hand washing problem areas identified by this study. First, young adults report better hand washing behaviors than they are observed practicing. This discrepancy should be addressed, since young adults may falsely believe they are engaging in safe food handling practices (i.e., washing their hands more frequently) when in fact they overestimate their practice of hygienic behaviors and are actually at increased risk for contaminating food during food preparation. Second, young adults fail to engage in appropriate hand washing at all suitable times during food preparation. Third, young adults do not follow the recommended hand washing guidelines of using soap and rubbing their hands together for 20 seconds under running water. Fourth, it appears that young adults may be aware that they should wash their hands before beginning food preparation and after handling raw poultry, but they are unaware of the importance of hand washing after handling unwashed produce and following common behaviors (e.g., answering a cell phone, touching the face) that occur frequently during food preparation. Hand washing education efforts focused on specific problem areas have the potential to reduce the foodborne disease risk of this population.

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International Association for Food Protection

Adoption of Interventions to Improve Food Safety at Meat and Poultry Processing Plants in the United States

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SUMMARY

To learn how meat and poultry processors promote food safety, we conducted a nationally representative mail survey of processing plants (944 completed surveys, 66% response rate). Plants employ a variety of sanitation and other food safety practices to control *Salmonella*, *E. coli*, *Listeria* and other pathogens. Most plants sanitize hand tools during operations (89%) and treat drains with sanitizers for pathogen control (84%). About 64% of plants have purchase specifications to control pathogens in raw meat and poultry. However, less than one-third of plants apply antimicrobial chemicals. Seventy-one percent of plants conduct voluntary microbiological testing, and 70% conduct environmental sampling. Analysis by HACCP size suggests that large and small plants are more likely than very small plants to use many types of food safety practices and technologies ($P < 0.01$). Furthermore, plants that produce ready-to-eat products or inputs to further processing are more likely than plants with no such production to use some types of food safety practices and technologies. The findings can be used to establish a baseline of current industry practices, to conduct analyses of plant practices that might contribute to risk-based inspection initiatives, and to conduct required economic analyzes of proposed regulations.

INTRODUCTION

Meat and poultry processors debone, fabricate, grind, or further process (for example, cook, cure, or smoke) meat and poultry products. These processors must address problems of foodborne pathogens on meat and poultry products, both incoming and during processing and packaging. Three foodborne pathogens that are of primary concern to meat and poultry processors are *E. coli*, *Salmonella*, and *Listeria monocytogenes*. Although some consider the United States food supply to be one of the safest in the world, millions of Americans contract foodborne illness each year *(8)*. For example, more than 40 Americans became ill and 21 were hospitalized after consuming ground beef contaminated with *E. coli* O157:H7 during the country's third largest beef recall in September 2007. Although some point to this large recall as a random event, others fear it as a sign of a decline in improvements made by the meat industry to reduce *E. coli* *(15)*. In any case, meat processors need to remain diligent in their efforts to promote food safety.

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Salmonella and *E. coli* O157:H7, both of which are found in the intestinal tracts of infected animals, are pathogens of concern for processors that produce raw ground meat and poultry products. If not eliminated during slaughter operations, these pathogens can be present on raw meat and poultry entering the grinder. The prevalence of *Salmonella* spp. in ground beef decreased from a baseline value of 7.5% in 1996 to 2.0% in 2006 *(21)*, yet outbreaks of human *Salmonella* infections associated with ground beef continue to occur *(6)*. The prevalence of *Salmonella* in ground turkey also has decreased, from a baseline value of 49.9% in 1996 to 20.3% in 2006 *(21)*. However, *Salmonella* levels have remained the same in ground chicken, with a prevalence of about 45% *(21)*. The overall incidence of foodborne illness from *Salmonella* has risen to 14.81 cases per 100,000 in 2006, from a baseline value of 13.7 cases per 100,000 in 1997 *(7)*. The prevalence of *E. coli* O157:H7 in raw ground beef decreased from 0.80% in 2001 to 0.18% in 2004, and then remained stable until 2006. However, the prevalence increased in 2007 to 0.23% *(24)*. Similarly, the number of beef recalls associated with *E. coli* O157:H7 increased from 8 in 2006 to 20 in 2007 *(23)*.

The pathogen *L. monocytogenes* is of particular concern to meat and poultry processors because it can survive and grow in refrigerated, packaged, ready-to-eat (RTE) products as well as in vacuum-packaged products and because it resists high levels of salt, nitrite and acid as well as freezing and drying *(10)*. Although the incidence of foodborne illness from *L. monocytogenes* decreased from 0.50 cases per 100,000 in 1997 to 0.31 cases in 2006, this is still higher than the Healthy People 2010 goal of 0.25 cases per 100,000 *(7)*.

Under the Federal Meat Inspection Act and the Poultry Products 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 safety of the nation's meat and poultry supply. In 1999, FSIS set performance standards for cooked beef, roast beef, and cooked corned beef products; fully and partially cooked meat patties; and certain fully and partially cooked poultry products (9 CFR 301, 317, 318, 320, and 381). In 2003, FSIS passed an interim final rule (9 CFR 430) requiring establishments that produce certain ready-to-eat (RTE) meat and poultry products to control for *L. monocytogenes*. Additionally, all plants producing raw ground beef, chicken, and turkey are subject to *Salmonella* testing by inspection personnel, and plants producing ground beef are subject to testing for *E. coli* O157:H7 *(18, 20)*. Processing plants may have implemented pathogen-control practices and other food safety practices in response to these requirements as well as to the 1996 Pathogen Reduction and Hazard Analysis Critical Control Point rule (PR:HACCP), and other FSIS regulations.

FSIS contracted with RTI International to conduct a national survey of meat and poultry processing plants (i.e., plants without slaughter operations) to collect uniform information on practices and technologies used to control biological, chemical, and physical hazards and to promote food safety *(3)*. This survey follows earlier surveys of meat slaughter plants *(5)*, poultry slaughter plants *(4)*, and egg packing and processing plants *(25)*. Survey results are aggregated by HACCP size and by the type of product produced. FSIS can use these aggregated results to guide regulatory policy making, to conduct analyses of food safety risk management practices that might contribute to risk-based inspection initiatives, and to conduct required economic analyses of proposed regulations. Additionally, the survey findings can be used to establish baseline measures of current practices and technologies for regulated establishments.

METHODS

The sampling methods, questionnaire development, survey administration, and analysis procedures are described below.

Sampling methods

An FSIS database of active meat, poultry, and egg products establishments was used to develop the sampling frames for federally inspected and state-inspected plants. The sampling frame included meat and poultry processing plants that produce RTE products, not-ready-to-eat (NRTE) products, or products that are to be processed further (such as raw ground product). Plants that conduct slaughter activities may also conduct processing activities, but because those plants were surveyed previously *(4, 5)*, they were excluded from the sampling frame. Plants that operate for objectives that are not strictly commercial (e.g., nonprofit, prison, education, and government facilities) and plants located in a US territory (because of the potential for language barriers to completing the survey) were also excluded.

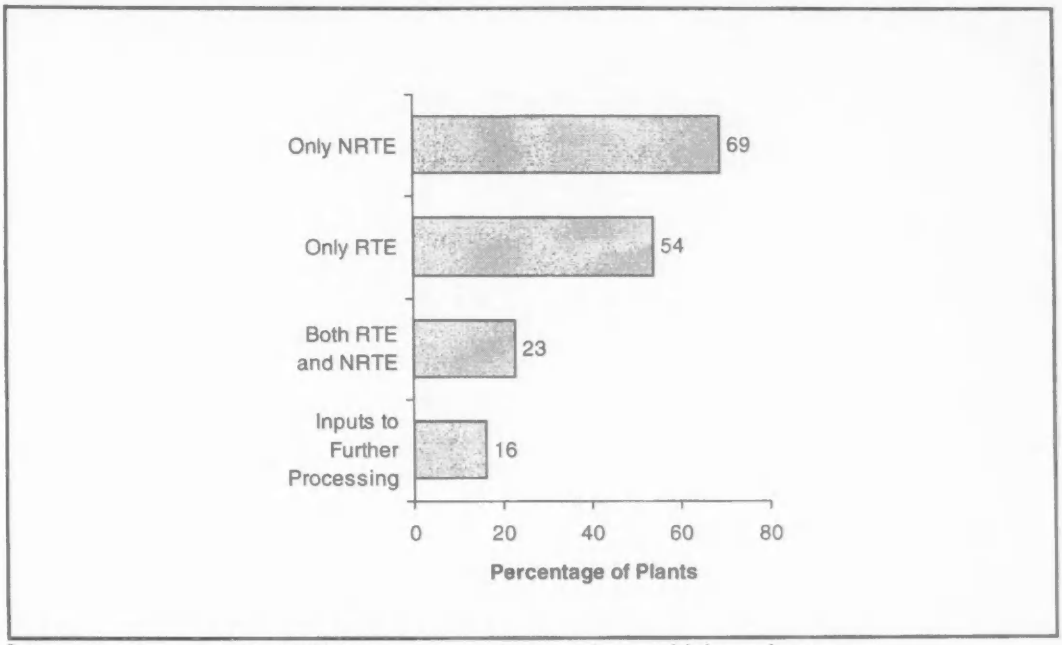
The sample design specified a sample size that was expected to yield ± 5 percent or better for estimates of all proportions. The sample was stratified by inspection status (federal versus state) and HACCP size (large plants have 500 or more employees, small plants have 10 or more employees but fewer than 500, and very small plants have fewer than 10 employees or less than $2.5 million in annual sales). For federally inspected plants, we selected a systematic sample of very small and small plants, and we took a census of large plants because of the relatively small number of these plants. For state-inspected plants, none of which were classified as large, we selected a systematic sample of very small plants and took a census of small 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.

Questionnaire development

We designed the survey instrument as a paper-and-pencil self-administered questionnaire. The questionnaire asked about use of food safety technologies and practices, frequency of sanitation practices, methods and frequency of microbiological testing, employee food safety training, and plant characteristics.

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

FIGURE 1. Types of products produced by meat and poultry processors[a]



[a] Responses do not sum to 100% because some plants produce multiple product types.

RTE = ready-to-eat; NRTE = not ready-to-eat.

and evaluated the structure and effectiveness of the questionnaire form. We also tested the questionnaire with personnel at processing plants and with industry trade associations; we subsequently revised the questionnaire based on their suggestions. The survey instrument and study design were approved by the Office of Management and Budget's (OMBs) information collection clearance process.

Survey administration

We implemented a variety of procedures aimed at maximizing the response rate to the survey, including many of the procedures recommended by Dillman *(11)*. Various industry trade associations sent e-mails and posted information in their newsletters to encourage their membership to participate in the survey. We administered the survey over a period of approximately 18-weeks from July to November 2005. We contacted plants by telephone to screen for eligibility and to identify the target respondent for the survey, mailed the questionnaire via Federal Express to target respondents, sent a thank-you/reminder postcard, and made a series of follow-up telephone calls to non-respondents to encourage participation.

We received 944 completed surveys; 423 plants were eligible but did not complete the survey (i.e., non-respondents); 183 plants were ineligible (e.g., they conducted slaughter activities or were out of business); and, for 102 plants, we were unable to determine their eligibility for the survey. We calculated weighted response rates (respondents / [non-respondents + respondents]) by stratum, using the initial sampling weights adjusted for unknown eligibility so that cases with unknown eligibility were distributed between those eligible (non-respondents) and those ineligible 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 was 66%. Response rates were higher for federally inspected plants than for state-inspected plants, and response rates were higher for large and small plants than for very small plants.

Analysis procedures

Before tabulating the survey data, we conducted data editing and coding. The edited and coded questionnaires were double-keyed for quality control purposes. To prepare the analysis dataset, we systematically reviewed the keyed data to identify and address any inconsistencies and outlying values. We weighted the survey data to reflect the selection probabilities of sampled establishments and to compensate for differential non-response. We performed χ^2 tests to determine if differences in responses between HACCP plant sizes were statistically significant (i.e., large versus very small and small versus very small). Additionally, for some analyses, we performed χ^2 tests to determine if differences in responses between plant types were statistically significant (i.e., plants producing RTE product versus NRTE product and plants producing RTE product versus inputs to further processing). All analyses were conducted using Stata, a statistical analysis software tool that takes the stratified sample design into consideration when computing variances *(16)*.

TABLE 1. Plant characteristics of meat and poultry processors

Plant Characteristics	Percentage of Plants
Number of processing shifts operated daily	
One	81.7
Two or three	17.4
No response	0.9
Number of clean-up shifts operated daily	
None	3.6
Clean-up shift is not operated daily	3.1
One	75.5
Two or three	16.8
No response	1.0
Number of USDA- or state-inspected plants owned by the company that owns this plant	
1	79.6
2 to 5	12.2
6 to 20	3.1
21 or more	2.9
No response	1.0
Total plant sales revenue	
Under $2.5 million	53.4
$2.5 million to $49.9 million	31.6
$50.0 million to $249.9 million	7.5
$250.0 million or more	1.6
No response	5.9

RESULTS AND DISCUSSION

Survey results are presented for plant characteristics, food safety technologies and practices, microbiological testing practices, and employee food safety training. Although meat and poultry processing plants are regulated by FSIS, they are allowed to use a variety of technologies and practices to achieve food safety. Many plants use voluntary microbiological testing to confirm that their processes are working.

Plant characteristics

The majority of meat and poultry processing plants are very small (62%), although very small plants account for only 14% of total industry revenue. Thirty-six percent of plants are small; these account for the largest share of total industry revenue (63%). Large plants comprise only 2% of the industry but account for 22% of revenue. More than half of the plants were built or renovated after 1990. The mean plant size is 36,704 square feet (with a range of 64 to 4 million square feet), and the mean number of employees is 71 (with a range of 1 to 13,000 employees). Additional information on plant characteristics, such as number of shifts operated and number of plants owned by the company, is displayed in Table 1.

The majority of plants use pork (82%), beef (79%), and chicken (59%) as inputs to production. Figure 1 shows the percentage of plants producing RTE, NRTE, or both RTE and NRTE products. Most meat and poultry product volume is raw product and fully cooked, not-shelf-stable product (e.g., fully cooked hams, corned beef, and meat and poultry salads). More than one-third of plants import raw meat or poultry from other countries for further processing.

Food safety technologies and practices

The interim final rule on the control of *L. monocytogenes* in RTE meat and poultry products encourages producers of RTE products to use antimicrobial ingredients such as sodium acetate or sodium diacetate in formulation, postlethality treatments, and other intervention technologies, to reduce the presence or growth of *Listeria (2)*. Additionally, plants producing RTE and NRTE products may implement technologies and practices to control *Salmonella*, *E. coli*, *C. perfringens*,

TABLE 2. Food safety technologies used by meat and poultry processors, by HACCP size (percentage of plants)

Technology	Very Small	Small	Large	All Plants
Metal detection equipment	7.6	60.5+++	92.9***	29.3
Conveyor belts made of materials to prevent bacterial growth	13.8	40.6+++	39.3***	24.3
Bioluminescent testing system for preoperative sanitation checks	6.9	29.9+++	64.4***	16.8
Decontamination interventions				
Application of antimicrobial chemicals	25.3	42.2+++	63.1***	32.5
High-pressure processing	2.1	7.2+++	10.7***	4.2
Infrared technology	0.5	4.2+++	9.6***	2.1
Irradiation equipment	0.8	0.3	1.2	0.6
Other types of pasteurization	7.5	14.6+++	20.2***	10.4

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

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

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

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

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

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

and other pathogens during processing operations to meet current and proposed performance standards. These technologies might include conveyor belts made of materials designed to prevent bacterial growth, or decontamination interventions such as the use of antimicrobial chemicals, pasteurization, or high-pressure processing.

Table 2 presents the percentage of plants that use various food safety technologies, by HACCP size. Less than one-third of all plants use each of the technologies asked about in the survey, although small and large plants report significantly higher usage of these technologies than very small plants ($P < 0.01$). Large plants can justify the investment in new technologies because of economies of scale and the possibility of a large loss of market share in the event of a food safety incident *(12)*. Table 3 shows the percentage of plants that use various food safety technologies, by the type of product produced. Generally, plants that produce RTE product or produce inputs used in further processing are more likely to use these technologies than plants that produce NRTE product (note that some plants produce multiple product types). This is not surprising, given that NRTE products will later go through lethality treatments and that plants producing inputs to further processing often must meet buyers' purchase specifications for food safety. For example, plants producing RTE product are more likely to use other types of pasteurization or antimicrobial chemicals than plants that produce NRTE product ($P < 0.01$). Irradiation is used infrequently but most often used by plants that produce raw, not ground, primal cuts of beef, pork, or chicken. High-pressure processing and infrared technology are also used infrequently but are most often used by plants that produce fully cooked, not-shelf-stable beef, pork, chicken, or turkey products.

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. Sanitation is particularly important for establishments producing RTE products because of the high risk of foodborne illness due to postlethality contamination prior to packaging. More than two-thirds of all plants used each of the sanitation practices that we asked about in the survey, as shown in Table 4. Use of sanitation practices and other food safety practices were similar across plant size. Smaller plants are more likely to use sanitation practices rather than technologies to achieve food safety, presumably because of the higher cost of installing and maintaining food safety technologies.

Other practices that processors might employ to assist in achieving food safety include conducting audits of their operations, protecting against bioterrorism, and controlling hazardous chemicals (see Tables 4 and 5). Many of these practices are similar to those in the best practices guidelines developed by the Beef Industry Food Safety Council (BIFSCO). For producers of raw ground product, BIFSCO recommends selecting raw material suppliers based on their controls for food safety and foreign material contamination and their product testing *(1)*. Furthermore, based on Scanga et al. *(14)*, one of the most

TABLE 3. Food safety technologies used by meat and poultry processors, by type of product produced (percentage of plants)

Food Safety Technology	RTE Products	NRTE Products	Inputs to Further Processing	All Plants
Metal detection equipment	34.6	26.8+++	54.7***	29.3
Conveyor belts made of materials to prevent bacterial growth	24.1	23.2	32.6**	24.3
Bioluminescent testing system for preoperative sanitation checks	20.1	14.7+++	30.9***	16.8
Decontamination interventions				
Application of antimicrobial chemicals	42.4	30.3+++	45.4	32.5
High-pressure processing	4.9	3.8	7.4	4.2
Infrared technology	3.0	2.4	5.5*	2.1
Irradiation equipment	0.3	0.7	1.1	0.6
Other types of pasteurization	14.5	8.3+++	22.3**	10.4

RTE = ready-to-eat; NRTE = not ready-to-eat.

Note: Plants may produce products in more than one category and thus may be represented in more than one column of this table.

+++ = Difference between plants producing RTE product versus NRTE product is statistically significant at 0.01 level.

++ = Difference between plants producing RTE product versus NRTE product is statistically significant at 0.05 level.

+ = Difference between plants producing RTE product versus NRTE product is statistically significant at 0.10 level.

*** = Difference between plants producing RTE product versus inputs to further processing is statistically significant at 0.01 level.

** = Difference between plants producing RTE product versus inputs to further processing is statistically significant at 0.05 level.

* = Difference between plants producing RTE product versus inputs to further processing is statistically significant at 0.10 level.

important ways for meat processors to reduce pathogens is to reduce the microbial load of incoming product. About two-thirds of all plants stipulate practices for controlling pathogens in purchase specifications for raw meat and poultry; based on the survey results, very small plants are somewhat more likely than large plants to use this practice ($P < 0.05$). Plants that produce NRTE products are also more likely to use this practice than plants that produce RTE products ($P < 0.01$). Compared with plants that produce RTE products, plants that produce inputs for further processing are more likely to identify and track products by lot, backward to suppliers ($P < 0.05$) and forward to specific buyers ($P < 0.01$). These plants are also more likely to conduct independent audits and have a quality control or quality assurance department ($P < 0.01$).

Microbiological testing practices

Seventy-one percent of meat and poultry plants conduct voluntary testing of raw product and/or finished product for pathogens of concern, such as *Salmonella* and *E. coli* (Table 6). Processors conduct microbiological testing as a means to check their suppliers, satisfy contracts with their customers, and verify that their processes produce safe food *(22)*. Meat and poultry plants that manufacture RTE product that is exposed to the environment after lethality treatments may also conduct testing of food contact surfaces to verify that their activities for controlling *L. monocytogenes* are effective.

One-half of plants that receive raw meat test it before fabrication, grinding, or further processing. The majority of these plants test raw meat for *E. coli* O157:H7 (75%), *Salmonella* species (57%), and generic *E. coli* (56%). Surprisingly, 48% test

TABLE 4. Sanitation and other food safety practices used by meat and poultry processors, by HACCP size (percentage of plants)

Sanitation and Food Safety Practice	Very Small	Small	Large	All Plants
Sanitation Practices				
Routinely sanitizes equipment that contacts RTE product[a]	87.3	94.6+++	100.0**	90.6
Routinely sanitizes hands after contacting RTE product[a]	81.0	87.1+	93.2**	83.8
Routinely sanitizes hands after contacting raw meat or poultry[b]	72.6	75.1	72.6	73.5
Sanitizes hand tools during operations	88.3	89.1	83.3	88.5
Sanitizes drains for pathogen control	80.3	88.8+++	90.5**	83.7
Rotates sanitizers annually or more frequently	62.8	74.7+++	75.0**	67.5
Other Practices				
Treats food contact equipment and surfaces to remove biomatter during operations	59.0	57.3	61.9	58.5
Uses antimicrobial treatment for food contact equipment during operations	44.6	49.4	58.4***	46.7
Stipulates practices for controlling pathogens in purchase specifications for raw meat and poultry[b]	64.2	65.1	51.1**	64.2
Stipulates practices for controlling chemical residues in purchase specifications for raw meat and poultry[b]	32.8	42.6+++	47.0***	36.8
Has written policies and procedures for recalls	72.5	86.5+++	97.6***	78.3
Has written policies and procedures to control hazardous chemicals	66.5	79.3+++	96.4***	72.0
Has written policies and procedures to protect against bioterrorism	29.8	56.9+++	89.3***	41.3
Identifies and tracks products by production lot, backward to specific suppliers	69.4	82.9+++	96.4***	75.0
Identifies and tracks products by production lot, forward to specific buyers	61.9	79.2+++	94.0***	69.1
Conducts independent audits of processing operations	21.1	64.5+++	96.4***	39.0
Has quality control/quality assurance department	34.3	72.2+++	97.6***	49.9

RTE = ready-to-eat; NRTE = not ready-to-eat.

[a]For respondents that produce RTE product.

[b]For respondents that purchase raw meat and poultry.

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

raw meat for *Listeria* species. Twenty-one percent of plants that receive raw poultry test it before fabrication, grinding, or further processing. The majority of these plants test raw poultry for generic *E. coli* (69%), total coliforms (62%), aerobic plate count (53%), and *Salmonella* species (53%); nearly one-half test for total plate count (47%) and *Listeria* species (49%). For plants that conduct microbiological testing and produce RTE products, 79% test RTE product after packaging. Table 6 identifies the pathogens for which testing is conducted.

In testing raw meat, plants use a variety of testing methods, including traditional cultural methods (27%), enzyme-linked immunoassay (ELISA) (8%), polymerase chain reaction (5%), and other rapid methods (12%). Sixty-two percent of plants did not know which

TABLE 5. Sanitation and other food safety practices used by meat and poultry processors, by type of product produced (percentage of plants)

Sanitation and Food Safety Practice	RTE Products	NRTE Products	Inputs to Further Processing	All Plants
Sanitation Practices				
Routinely sanitizes equipment that contacts RTE product[a]	90.6	92.0	87.6	90.6
Routinely sanitizes hands after contacting RTE product[a]	83.8	84.8	81.9	83.8
Routinely sanitizes hands after contacting raw meat or poultry[b]	74.5	74.5	73.1	73.5
Sanitizes hand tools during operations	90.5	88.6	87.7	88.5
Sanitizes drains for pathogen control	89.3	83.9+++	91.1	83.7
Rotates sanitizers annually or more frequently	70.5	68.1	74.4	67.5
Other Practices				
Treats food contact equipment and surfaces to remove biomatter during operations	62.8	58.5+	51.9***	58.5
Uses antimicrobial treatment for food contact equipment during operations	53.6	45.5+++	44.0**	46.7
Stipulates practices for controlling pathogens in purchase specifications for raw meat and poultry[b]	60.4	67.5+++	65.1	64.2
Stipulates practices for controlling chemical residues in purchase specifications for raw meat and poultry[b]	36.1	37.2	44.5**	36.8
Has written policies and procedures for recalls	81.6	76.9++	85.6	78.3
Has written policies and procedures to control hazardous chemicals	72.4	71.8	81.1**	72.0
Has written policies and procedures to protect against bioterrorism	44.8	39.1+	53.8**	41.3
Identifies and tracks products by production lot, backward to specific suppliers	74.2	74.8	82.5**	75.0
Identifies and tracks products by production lot, forward to specific buyers	70.9	66.6++	82.3***	69.1
Conducts independent audits of processing operations	44.9	35.4+++	62.9***	39.0
Has quality control/quality assurance department	56.1	45.1+++	67.5***	49.9

RTE = ready-to-eat; NRTE = not ready-to-eat.

Note: Plants may produce products in more than one category and thus may be represented in more than one column of this table.

[a]For respondents that produce RTE product.

[b]For respondents that purchase raw meat and poultry.

See Table 3 for description of notation used to indicate statistical significance.

TABLE 6. Microbiological testing practices of meat and poultry processors, by HACCP size (percentage of plants)

Microbiological Testing Practice	Very Small	Small	Large	All Plants
Conducts voluntary microbiological testing	62.6	83.1+++	95.2***	71.0
Has company-owned lab for microbiological testing	11.3	41.0+++	78.5***	23.9
For plants that conduct microbiological testing and produce RTE product				
Tests RTE product after it is packaged	69.4	90.5+++	94.9***	79.3
Tests RTE product for specific pathogens:				
Salmonella species	77.0	83.5	91.1**	80.8
Salmonella Enteritidis	65.0	48.9+++	26.8***	55.5
Generic *E. coli*	65.7	74.7+	66.0	70.1
E. coli O157:H7	68.7	64.6	44.7***	65.7
Listeria species	93.2	81.1+++	69.6***	86.3
L. monocytogenes	90.1	76.8+++	67.8***	82.7

RTE = ready-to-eat; NRTE = not ready-to-eat.

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

TABLE 7. Environmental sampling by meat and poultry processors, by HACCP size (percentage of plants)

Environmental Sampling	Very Small	Small	Large	All Plants
Conducts environmental sampling	61.3	82.9+++	98.8***	70.2
For plants that conduct environmental sampling, routinely tests product contact surfaces for *Listeria* species	84.3	83.4	86.8	84.0
For plants that conduct environmental sampling and produce RTE product				
Tests product contact surfaces in RTE areas of plant	99.2	98.9	100.0	99.1
Tests nonproduct contact surfaces in RTE areas of plant	69.2	90.5+++	100.0***	79.1

RTE = ready-to-eat.

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

testing method was used. (Note that respondents could select multiple responses; thus, the responses do not sum to 100%.) These results were similar for testing of raw poultry, RTE finished product, and NRTE finished product.

Seventy percent of plants conduct environmental sampling in addition to product testing (Table 7). Environmental sampling includes sampling of equipment surfaces and facility surfaces such as walls, drains, and floors. Of those plants that perform environmental sampling, 56% use traditional cultural methods and 84% routinely test product contact surfaces for *Listeria* species. *L. monocytogenes* can be found on drains, processing floors, and equipment within meat and poultry processing plants *(17)*. Furthermore, biofilms of *L. monocytogenes* may exist in areas of meat and poultry processing plants that are not easy to clean or sanitize, such as welding joints or corners *(13)*.

Employee food safety training

The majority of meat and poultry processing plants conduct food safety training with newly hired production employees and with current employees on a continuing basis, as shown in Table 8. Large plants and small plants are more likely to provide food safety training than very small plants ($P < 0.10$). The training may be formal training conducted by plant personnel or professional trainers,

TABLE 8. Employee training on food safety for meat and poultry processors, by HACCP size (percentage of plants)

Employee Training	Very Small	Small	Large	All Plants
Food safety training is provided for newly hired production employees	95.3	99.7+++	98.8*	97.0
Continuing food safety training is provided for production employees	89.5	96.8+++	100.0**	92.5
One or more production employees has completed formal HACCP training	85.9	94.6+++	98.8***	89.5

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

informal on-the-job training, or use of written materials. For newly hired production employees, plants are more likely to provide on-the-job food safety training (scheduled, 36%; unscheduled, 66%) and written materials (36%). To train production employees on an ongoing basis, 73% of plants provide informal, on-the-job food safety training. Some plants also use written materials (24%), scheduled on-the-job training (27%), and formal course work conducted by plant personnel (20%) as methods of continually training production employees.

CONCLUSIONS

We conducted a mail survey of meat and poultry processing plants to collect uniform information on practices and technologies used to control pathogens and promote food safety. The survey was nationally representative and had a high response rate (66%). Although the data are self-reported and the extent of self-reporting bias is unknown, the survey results provide a unique and comprehensive view of food safety practices used by meat and poultry processors.

The majority of plants conduct voluntary microbiological testing of product and environmental sampling to ensure that their procedures are effective in reducing or eliminating pathogens. Plants test for a variety of pathogens, including *Salmonella*, *E. coli*, and *Listeria*. Almost all plants provide food safety training for newly hired employees and offer training on a continuing basis for production employees.

As expected, the survey findings suggest that most plants, particularly very small plants, use sanitation and other practices, rather than technologies, to achieve food safety. Sanitation of hands, tools, and equipment were the most prevalent methods of preventing or eliminating microbial contamination. Increased adoption of technologies, including the use of antimicrobial chemicals such as sodium acetate and sodium diacetate, would help reduce pathogen loads *(2)*. Similarly, increased use of practices such as independent food safety audits would have a positive effect and help produce safer meat and poultry products.

In general, large and small plants are more likely than very small plants to use many types of food safety practices and technologies. To enhance adoption of food safety practices and technologies among small and very small plants, FSIS is targeting those plants with specific outreach activities *(19)*. These activities include the establishment of a group at the Policy Development Division to respond to technical questions from small and very small plants, the creation of compliance guidelines to aid in understanding regulatory requirements, and the creation of a section of the FSIS Web site devoted to small and very small plants. In addition, FSIS is offering Web seminars to owners and operators of small and very small establishments to further aid in their understanding of regulations. FSIS also is identifying technologies that are feasible for smaller plants to implement in order to achieve food safety. As smaller plants generally have less scientific expertise, less automation, fewer resources, and a greater variety of products, these plants will likely benefit from these initiatives *(9)*.

Practices and technologies implemented by meat and poultry processing plants for controlling foodborne pathogens and other hazards subsequently may help reduce the risk of foodborne illness. The survey findings, coupled with other data, can be used to characterize meat and poultry processing plants' food safety risk management practices and may help inform the process for risk-based inspection and sampling, whereby plants with higher relative risk are inspected more rigorously or sampled more frequently.

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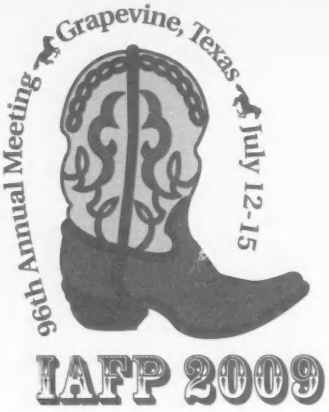

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In Memory

James Jay

We extend our deepest sympathy to the family of James Jay who recently passed away. IAFP will always have sincere gratitude for his contribution to the Association and the profession. Dr. Jay has been a member of IAFP since 1982. In 1995, Dr. Jay presented the Ivan Parkin Lecture at the 82nd Annual Meeting. He has served on the editorial board of the *Journal of Food Protection* and is a fellow of IAFP, ASM, IFT and the American Publich Health Association.

International Association for
Food Protection®

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December 2008

Fellow IAFP Members:

As we prepare for a new year, I want to encourage you to become involved in the International Association for Food Protection's (IAFP) Committees and Professional Development Groups (PDGs). Committees and PDGs are a vital part of the life of the Association. They are intended to be a forum whereby professionals with common interests in specific aspects of food safety come together to discuss, inform one another, and serve IAFP in the organization of symposia, preparation of white papers, and other scientific endeavors. The Committees and PDGs meet during the Annual Meeting and also share information throughout the year via conference calls or e-mail. Therefore, even if you are unable to attend IAFP 2009 in Grapevine, Texas, your involvement is still possible and your insight important. Please review the list of Committees and PDGs and their respective mission statements found on the following pages. If you find one that sounds interesting or relevant to you, simply contact the IAFP office to let us know which group you want to join. Getting started is really that simple.

On a more personal note, I have found participation in IAFP's Committees and PDGs to be a truly rewarding experience. Committee and PDG involvement allows you to serve the greater good in so many ways. Firstly, it provides a forum for exchange of ideas with other professionals having similar food safety interests and expertise. It also allows you to serve our Association and your peers by providing your own unique talents and time in the promotion of food safety. And, while you are helping the Association and others, you'll also be networking with leading experts in the field, learning from their experiences, and developing valued relationships. So, it's a professional win-win. And that's not even to mention the many friends that you'll find in your IAFP colleagues!

For those of you who have participated in our Committees or PDGs in the past, I want to thank you for your service. We could not be the Association we are today without your valued participation. I encourage you to stay involved; your continued participation remains critical to the success and growth of IAFP.

As usual, your comments, questions, and suggestions are welcomed, and do not hesitate to contact the IAFP office or myself if we can be of help. And please join me in making 2008-2009 an active and vital year for the IAFP Committees and PDGs. We need the efforts of everyone as we seek to *Advance Food Safety Worldwide*.

Best Regards,

Lee-Ann Jaykus
Vice President, IAFP

IAFP Committee, Professional Development Group, Task Force and Affiliate Council Mission Statements

STANDING COMMITTEES

FPT Management Committee

The mission of the *FPT* Management Committee is to provide guidance to the Executive Board on matters concerning *Food Protection Trends*.

JFP Management Committee

The mission of the *JFP* Management Committee is to provide guidance to the Executive Board on matters concerning the *Journal of Food Protection*.

Program Committee

The mission of the Program Committee is to develop the Annual Meeting program, evaluate abstracts, identify symposia and speakers, identify all sessions' convenors, and oversee Developing Scientist Awards Committee.

SPECIAL COMMITTEES

3-A Committee on Sanitary Procedures

The mission of the 3-A Committee on Sanitary Procedures is to serve as IAFP representatives to the 3-A Sanitary Standards Committee; to review and provide comments on proposed changes and revisions to the 3-A Sanitary Standards.

Audiovisual Library Committee

The mission of the Audiovisual Library Committee is to review and evaluate audiovisual materials for accuracy and appropriateness of content, make recommendations regarding the purchase of audiovisual materials, and provide guidance on matters concerning the AV Library.

Awards Committee

The mission of the Awards Committee is to select recipients for the IAFP awards.

Black Pearl Selection Committee

The mission of the Black Pearl Selection Committee is to select the recipient of the Black Pearl Award.

Committee on Control of Foodborne Illness

The mission of the Committee on Control of Foodborne Illness is to review information on epidemiology and control of communicable diseases of primary concern to food safety and related areas, and prepare manuals and articles addressing investigation and control of food safety-related problems.

Constitution and Bylaws Committee

The mission of the Constitution and Bylaws Committee is to review and study the Constitution and Bylaws of IAFP and make recommendations to the Executive Board for changes to be considered for submission to the Membership for ratification.

Developing Scientist Awards Committee

The mission of the Developing Scientist Awards Committee is to select finalists and judge the Developing Scientist Awards Competition at the IAFP Annual Meeting.

Fellows Selection Committee

The mission of the Fellows Selection Committee is to solicit nominations and make recommendations to the Executive Board for eligible Members to be confirmed as Fellows by the Executive Board.

Foundation Committee

The mission of the Foundation Committee is to oversee IAFP Foundation monies, solicit gifts to the Foundation, and identify and fund programs which further the goals and objectives of the Association.

Membership Committee

The mission of the Membership Committee is to develop strategies to retain current members and attract new members.

Nominating Committee

The mission of the Nominating Committee is to select and submit names of nominees for the office of Executive Board Secretary for election by the IAFP Membership.

Past Presidents' Committee

The mission of the Past Presidents' Committee is to serve as an advisory committee to the Executive Board.

Tellers Committee

The mission of the Tellers Committee is to count and certify the results of each election and other membership votes.

PROFESSIONAL DEVELOPMENT GROUPS

Applied Laboratory Methods PDG

The mission of the Applied Laboratory Methods PDG is to provide a forum for the exchange and sharing of information related to the development and use of laboratory methods for the analysis of food and related commodities.

Beverage PDG

The mission of the Beverage PDG is to provide a forum to discuss and develop symposia on issues facing the beverage industry.

Dairy Quality and Safety PDG

The mission of the Dairy Quality and Safety PDG is to promote the production and processing of safe, high quality dairy products and to develop program topics and symposia for presentation at the IAFP Annual Meetings.

Food Chemical Hazards and Food Allergy PDG

The mission of the Food Chemical Hazards and Food Allergy PDG is to facilitate communication on topics in food toxicology including food allergens.

Food Hygiene and Sanitation PDG

The mission of the Food Hygiene and Sanitation PDG is to provide information on the developments in hygiene and sanitation in the food industry.

Food Law PDG

The mission of the Food Law PDG is to provide an international forum for the exchange of information on the scientific issues associated with food laws, regulations and policy.

Food Safety Education PDG

The mission of the Food Safety Education PDG is to provide IAFP members and their clientele information on food safety education.

Fruit and Vegetable Safety and Quality PDG

The mission of the Fruit and Vegetable Safety and Quality PDG is to provide a forum to discuss items of interest to the safe production of fruit and vegetable products and to develop program topics and symposia for presentation at the IAFP Annual Meetings.

International Food Protection Issues PDG

The mission of the International Food Protection Issues PDG is to provide a forum to discuss scientific issues of interest to the international food protection community.

Meat and Poultry Safety and Quality PDG

The mission of the Meat and Poultry Safety and Quality PDG is to provide a forum to discuss items of interest to the safe production of meat and poultry products and to develop program topics and symposia for presentation at the IAFP Annual Meetings.

Microbial Modelling and Risk Analysis PDG

The mission of the Microbial Modelling and Risk Analysis PDG is to facilitate communication on the topic of microbial risk analysis (MRA), promote application and use of MRA and encourage research and data reporting methods that support MRA.

Retail Food Safety and Quality PDG

The mission of the Retail Food Safety and Quality PDG is to provide the retail food safety industry worldwide with information to prepare and serve safe food.

Seafood Safety and Quality PDG

The mission of the Seafood Safety and Quality PDG is to provide a forum to discuss items of interest to the safe production of seafood products and to develop program topics and symposia for presentation at the IAFP Annual Meetings.

Student PDG

The mission of the Student PDG is to provide students of food safety with a platform to enrich their experience as members of IAFP.

Viral and Parasitic Foodborne Disease PDG

The mission of the Viral and Parasitic Foodborne Disease PDG is to promote awareness of non-bacterial causes of foodborne disease by encouraging food safety professionals and others to seek education and training that will enable them to contribute to preventing non-bacterial foodborne infections and outbreaks.

Water Safety and Quality PDG

The mission of the Water Safety and Quality PDG is to provide a forum to discuss items as to the role the safety and quality of water plays globally in the farm-to-table chain and to develop program topics and symposia for presentation at the IAFP Annual Meetings.

TASK FORCE

Rapid Response Series Task Force

The mission of the Rapid Response Series Task Force is to identify developing conditions affecting food safety and organize meetings on these issues to educate IAFP members.

AFFILIATE COUNCIL

The Affiliate Council is an advisory body to the IAFP Board, represents Affiliate Associations' interests, responsible for IAFP Awards Committee, interchanges ideas and recommendations on programs, awards and procedures between Affiliates and the Board.

China International Food Safety & Quality Conference + Expo 2008

The China International Food Safety & Quality Conference (CIFSQ) + Expo was held in Beijing, China on September 24 and 25, 2008 with more than 600 attendees. IAFP is proud to be a supporting partner of this conference and assisted conference organizers by encouraging IAFP Members to participate in the program. In addition, many of IAFP's industry supporters extended their financial and physical support to this all important conference.

Stan Bailey, IAFP President and David Tharp, Executive Director, met with Ge Zhirong, Chairman of China Entry-Exit Inspection & Quarantine Association (CIQA) to discuss cooperative efforts including establishing a Memorandum of Understanding between the organizations. Both Stan and David had highly visible presentations to attendees which provided direct benefit to publicize IAFP and our activities.

More than 70 presentations over the two-day conference focused on global food safety management systems, innovative technologies, food safety hot topics, novel programs and approaches to food safety, among other topics. A substantial portion of the program content was provided by IAFP Members including Tom Ford, Nancy Eggink, Jeffrey Cawley, Bart Weimer, Leon Gorris, Gary Dykes, T. J. Fu and Gale Prince. Other IAFP Members also participated as speakers or in the exhibit hall. The World Health Organization and the Food and Agriculture Organization were also represented.

There were 37 exhibitors and sponsors for this year's event. Plans are now underway for a third CIFSQ Conference + Expo to be held in September of 2009. IAFP will again be an avid supporter and will continue our work of "Advancing Food Safety Worldwide®."

NEW MEMBERS

CANADA

Sophia Baker-French
University of British Columbia
Vancouver, British Columbia

Tim D. Byrne
Chandler Sales
Moncton, New Brunswick

DENMARK

Nicoline F. Baek
Foss Analytical
Hilleroed

GERMANY

Claudia Wolff
Nestle Product Technology Centre
Singen

ISRAEL

David Rosenblatt
PDCA, Ltd.
Sarigim

Sima Yaron
Technion
Haifa

JAPAN

Hiromi Kubota
Kao Corporation
Haga, Tochigi

MEXICO

Elsy Genny M. Solis
Instituto Tecnologico De Estudios Superiores De Monterrey
Monterrey, Nuevo Leon

THE NETHERLANDS

Kjeld Bangma
DSM Food Specialties
Delft, Zuid

Erik Van Bommel
PURAC
Gorinchem

Diana Visser
PURAC
Gorinchem

NORWAY

Dag Lillehaug
Elopak AS
Spikkestad, Akershus

PORTUGAL

Fatima Castro
Silliker Portugal S.A.
Canelas, Vila Nova de Gaia

Rui Nogueira
Silliker Portugal S.A.
Canelas, Vila Nova de Gaia

Cristina S. Pintado
Castelo Branco, Beira Baixz

QATAR

Joegi C. Ramos
Hamad Medical Corporation
Doha

SWITZERLAND

Christophe Lacroix
ETH Zurich
Zurich

TURKEY

Zuhal Basaran
Danone Tikvesli Turkiye
Istanbul

Hulya Ibrahim
Ecolab
Istanbul Maltepe

Sebnem S. Karasu
Steamlab
Izmir, Gaziem

UNITED ARAB EMIRATES

Mouza S. Almuhairi
Abu Dhabi Food Control Authority
Al Ain, Abu Dhabi

UNITED KINGDOM

Cheryl M. Mooney
Thermo Fisher-Scientific–Oxoid
Basingstoke, Hampshire

VIETNAM

Long N. Ha
Intertek Testing Service (Vietnam)
Ho Chi Minh

UNITED STATES

CALIFORNIA

Megan Arnold
C.H. Robinson Company
Solvang

Deirdre A. Dillon
Raley's
Sacramento

Belinda L. Salazar
Golden State Foods
City of Industry

Clement A. Saseun
Golden State Foods
City of Industry

NEW MEMBERS

FLORIDA

Deann Akins
University of Florida
Gainesville

GEORGIA

Brad Collins
Church's Chicken
Sandy Springs

ILLINOIS

Matthew C. Jenkins
Sodexo
Chicago

LOUISIANA

Sonja T. Jones
Louisiana State University
Baton Rouge

Shuaihua Pu
Louisiana State University
Baton Rouge

MARYLAND

Kristy A. Kubota
Association of Public Health Laboratories
Silver Spring

Cha-Mei Tang
Creatv MicroTech, Inc.
Potomac

MASSACHUSETTS

Norm J. Robillard
STR Inc.
Watertown

MINNESOTA

Katie M. Aguilar
CHS Inc.
Mankato

Trish Q. Larson
Cargill
Wayzata

MISSISSIPPI

Jose M. Rodriguez
Mississippi State Chemical Lab
Mississippi State

MISSOURI

Jeffrey J. Ryan
Swiss Valley Farms
Willard

NEBRASKA

Joseph A. Elrefaie
ConAgra Foods, Inc.
Omaha

NEW JERSEY

Jeffrey Abels
Foreign Trade Service Corp.
Newark

OKLAHOMA

Tam Doan
Bio-Cide International, Inc.
Norman

SOUTH DAKOTA

Phyllis A. Antonacci
AEGIS Food Testing Laboratories
North Sioux City

WASHINGTON

Jon Brandt
Ozone International
Bainbridge Island

NEW GOLD SUSTAINING MEMBERS

This membership was previously a Sustaining Membership

Kellogg Company
Mark A. Moorman
Battle Creek, Michigan

SGS North America
Kevin S. Edwards
Fairfield, New Jersey

NEW SUSTAINING MEMBERS

Lester Schwab Katz & Dwyer, LLP
Paul L. Kassirer
Short Hills, New Jersey

Siemens Building Technologies, Inc.
Philip B. Atteberry
Buffalo Grove, Illinois

WHAT'S HAPPENING IN FOOD SAFETY

ISO Standards Contribute to Meeting World Food Day 2008 Challenge

World Food Day 2008 addresses what has been categorized by many as one of the greatest challenges of our time: climate change and its impact on food security. ISO has an important contribution to make, not only through its numerous International Standards on food related issues, but also through standards that help quantify and mitigate climate change.

World Food Day is organized by the United Nations Food and Agriculture Commission (FAO) each year on the 16 October. The event provides an opportunity to highlight the plight of the 862 million undernourished people in the world – a number that FAO warns could be pushed even higher if the threat of global warming and the consequences of a rising demand for bioenergy are not addressed.

ISO's portfolio of environmental standards provides practical tools for addressing these issues. Among these are ISO 14001 which has become the global benchmark for environmental management systems, ISO 14064 which gives the requirements for quantifying, monitoring and reporting on greenhouse gas (GHG) emissions and ISO 14065 which specifies accreditation requirements for organizations validating or verifying GHG emission assertions.

ISO Secretary, General Alan Bryden comments: "Climate change mitigation, energy efficiency, water supply and food security are interrelated challenges – all of which ISO addresses through its existing standards and current developments."

Issues directly related to food are mainly addressed through ISO/TC 34, the ISO technical committee developing standards on food products. The committee currently offers 725 standards and related documents.

Its work covers practically all agricultural products for human consumption and animal feeding stuffs ranging from fruits to cereals to poultry and coffee to name a few. About 65% of its standards concern testing and analytical methods, and are directly targeted at agricultural producers, food manufacturers, laboratories, merchants/retailers, consumers and regulators.

Among ISO developments of recent years relating to the concerns of World Food Day are the following:

- a new subcommittee of ISO/TC 34 to develop standards on the topical subject of biomarkers
- the ISO 22000 series of standards for safe food supply chains, already implemented by an estimated 4,000 organizations in 93 countries at the end of 2007
- standards for the detection of genetically modified organisms and derived products in food
- guidelines for quantitative ingredient declarations to help consumers know what they are eating
- waste reduction by biotechnological methods and enhancement of the conversion of waste materials for the manufacturing of new added value products.

Fifty-four countries participate in the work of ISO/TC 34 and another 53 have observer status. Representatives from these countries came together on 16–17 October, 2008 for a plenary meeting in Paris, France. The event provided an opportunity to discuss current projects and propose new areas of work, as well as addressed organizational and administrative issues.

Other ISO committees develop standards that can contribute to the goals of World Food Day, including ISO/TC 234, a recently formed committee developing standards for sustainable fishing and aquaculture.

ISO has a strong partnership with many United Nations agencies concerned with food issues. They participate as liaison organizations in a number of ISO committees, among them are the World Health Organization (WHO), FAO, and the Codex Alimentarius Commission (CAC).

Another noteworthy example of partnership is that between ISO and the International Dairy Federation (IDF) who work together to prepare and publish analytical methods. Following recent concerns with melamine found in milk products, IDF and ISO are jointly investigating how to tackle this issue through the standards they develop.

New 3-A/ANSI Standard Being Developed for Rubber and Rubber-Like Materials Used in Food and Beverage Equipment

3-A Sanitary Standards, Inc. (3-A SSI) announces the development of a new Standard (to be submitted to the American National Standards Institute (ANSI) as a new American Nation Standard), for Rubber and Rubber-Like Materials Used as Product Contact Surfaces In Equipment. Interested and materially affected parties are invited to participate in the development of this standard. There is no cost to participate.

The Rubber and Rubber-Like Materials standard will cover the material and serviceability requirements of rubber and rubber-like materials intended for multiple-use as product or solution contact surfaces in equipment used in the production, processing and handling of food and beverage products. Test procedures and criteria are provided for rubber materials as a means of determining their acceptance as to their ability to be cleaned and to receive effective bactericidal treatment or steam sterilization and to maintain their essential properties in these accelerated use-simulating conditions. This standard does not cover design and fabrication criteria for individual rubber or rubber-like components, because such criteria are provided for in other 3-A Sanitary Standards and 3-A Accepted Practices.

3-A Standard 18-03, bearing the same title, will be used as the starting point for developing this new ANSI/3-A Standard.

Those interested in participating in this activity should contact Nate Wall, 3-A SSI, at nwall@3-a.org or 703.790.0295, ext. 101.

Ethical Naturals Inc. Commissions New QC and R&D Lab with Renowned Phytochemist

Ethical Naturals Inc., has recently commissioned their new quality control and research and development lab with Dr. Xianguo He as laboratory director.

One of the earliest scientists to develop standardized extracts from botanicals in the US, Dr. He has a strong reputation in the botanical industry for his work in the field of phytochemistry, the chemistry of plants and their metabolic processes.

In 1992, after three years as a visiting professor at the University of Washington, Dr. He began to work as laboratory director for East Earth Herb. His specialty is purification, structural elucidation and biosynthesis of natural products from plants and microorganisms.

Dr. He has authored over 20 peer-reviewed published papers on the subject of plant phytochemistry and analysis. These include an invited 35 page review paper for the Journal of Chromatography on HPLC-MS for studies of botanical extracts, and papers relating to the chemistry of Echinacea, Ginkgo, Kava and several medicinal mushrooms.

Hotel and Restaurant Training Services® Launch Food Handler Online (First Principles)

HRTS, in collaboration with the National Registry of Food Safety Professionals, has just launched Food Handler Online (First Principles) food safety training and certification course which is 100% online. The materials have been developed with an international perspective, including sources in the UK, etc.

People working with food in the US in states such as Florida must be trained in how to prepare, serve and store food safely within 60 days of commencing employment. Many owners and supervisors have been in violation of the states directive and the often used excuse to inspectors from the DBPR is, "I do not have time to train; I have a business to run." HRTS® believes that to allow untrained people to work with food for up to 60 days, or even longer, is to say the least taking a risk with the safety of customers. This online program has bridged that gap in food safety training. Now, anybody who has access to a computer can take a comprehensive training course in food safety (First Principles), and can be tested on their knowledge by answering questions after each section (students are not permitted by the program to move on until they submit the correct answer). At present, the program is available in English and Spanish at www.hrtsonline.net. Presented in several sections, it can be completed with or without the pleasant voice-over narrative, and consists of legal responsibilities, personal hygiene, microbiology and illness, potentially hazardous foods, contamination and prevention of illness, time and temperature control, people most at risk from contaminated foods and food spoilage. Each section has a review and questions. Once completed, a confirmation is sent to the student, followed by a laminated wallet card and certificate in approximately seven business days, and is valid for 3 years from the date of completion. National Registry of Food Safety Professionals approved training program is accepted by the DBPR.

BioControl Acquires PickPen Business Unit from BioNobile Oy

BioControl Systems, Inc. has acquired the PickPen® business unit from, BioNobile Oy, located in Turku, Finland. The acquisition encompasses all tangible and intangible assets of the PickPen business including all intellectual property.

The PickPen business centers around a series of devices designed to transfer magnetic particles providing speed and flexibility in a wide variety of biological separation and purification applications. "We immediately recognized the PickPen's significant advantages in speed, ease of use and improved particle recovery when we incorporated it into the sample preparation procedures for the Assurance GDS™ pathogen detection system," says Phil Feldsine, BioControl Systems CEO. "The acquisition of the PickPen technology is an excellent compliment to our

existing core competencies in the area of rapid antibody and molecular-based diagnostic kit development for the food and beverage industries," explains Mr. Feldsine.

Unlike conventional magnetic purification systems that work by immobilizing the magnetic particles and removing the surrounding liquid, the PickPen removes particles directly from the liquid. The particles can thus be moved rapidly and effortlessly from one stage of the purification to the next. Additionally, introduction of the magnets directly into the sample solution allows for greater particle recovery and improved target isolation.

For more information, visit www.biocontrolsys.com.

New CEO Named at American Dairy Products Institute

The association for manufactured dairy products, American Dairy Products Institute, recently announced the appointment of Dale Kleber as the organization's new chief executive officer. He assumed the new role on October 27. A proven industry leader, Mr. Kleber will be responsible for guiding ADPI's executive team and furthering ADPI's mission.

Mr. Kleber offers ADPI a diverse dairy industry background with more than 20 years of experience in dairy and food-related businesses, including service as a senior executive officer of one of the country's largest, publicly-traded dairy companies. During the course of his career, he has practiced as a corporate attorney and brings to the position additional expertise in government relations, having served as a senior congressional staff member.

After graduating from Vanderbilt University in 1978 with a degree in business administration, he served as the press secretary and the chief legislative aide, respectively, for two US congressmen. Thereafter, he returned to Vanderbilt and graduated from the School of Law in 1983, while serving on the school's Law Review.

Beginning his legal career with one of Chicago's largest law firms, now know as DLA Piper, Mr. Kleber soon moved in-house to work for a publicly-held food manufacturing company. He then joined Dean Foods Company where he worked for fourteen years, holding the position of vice president, secretary and general counsel. He also served on the company's operating committee while Dean Foods was headquartered in the Chicago area. After the company was acquired, he was a founding member of a dairy cost consulting firm also based in the Chicago area.

FMI CEO Search Committee Announces Selection of Leslie G. Sarasin

The FMI (Food Marketing Institute) CEO Search Committee announced its selection of Leslie G. Sarasin as president and CEO of FMI. Ms. Sarasin was presented to the FMI Board at its October meeting in Boston and started in early November.

Ms. Sarasin has been president and chief executive officer of the American Frozen Food Institute (AFFI) since 1999. She also serves as president of the National Yogurt Association, an association that AFFI manages, and has oversight responsibility for the National Frozen Pizza Institute, Frozen Potato Products Institute, International Frozen Food Association, Texas Mexico Frozen Food Council and Food Processing Environmental Conference. She joined AFFI in 1989.

Previously, she worked as director, government relations, and legal counsel with the National Food Brokers Association and as legal counsel and assistant to the president at Crest International Corporation. Early in her career, she worked for Salomon Brothers Investment Bankers and for Senator Wendell H. Ford.

Ms. Sarasin holds a JD from the University of San Diego and a BA in economics from Smith College. She is a member of the American Bar Association and is admitted to practice law in California and Washington, D.C. She serves on the Board of Directors of the Texas Mexico Frozen Food Council and as chairman of the Food Industry Environmental Council. She also serves on the Boards of Directors of the Produce for Better Health Foundation, the Partnership for Food Safety Education and the National Chamber Foundation. She is a board member and past treasurer of the US Former Members of Congress Auxiliary. Ms. Sarasin also is a member of the US Chamber of Commerce's Committee of 100.

Previously, Ms. Sarasin served on the Board of Directors of the American Society of Association Executives (ASAE). In 1998, she was awarded ASAE's Certified Association Executive (CAE) designation and was recertified in 2002 and 2005.

INDUSTRY PRODUCTS

Sperian Hearing Protection, LLC

Sperian Hearing Protection Field Attenuation Study Shows Individual Training Key to Hearing Protector Effectiveness

A recent field attenuation study conducted by the Howard Leight Acoustical Laboratory on the performance of hearing protection devices showed that individual, one-on-one training was the most significant factor in predicting good earplug performance. The study, which was conducted on over 100 workers at eight different facilities, showed that fully one third of workers achieve attenuation higher than published Noise Reduction Ratings (NRR) for their earplugs, and that another third achieve attenuation within 5 dB of those ratings. Only the remaining third had attenuation that was more than 5 dB below published NRRs.

"This reinforces the need for individual fit testing of earplugs, especially in light of the Environmental Protection Agency's proposed labeling changes," said Brad Witt, MA, CCC-A, director of hearing conservation for Sperian hearing protection, LLC, and a principal author of the study. "No generalized rating scheme for hearing protectors can be effective without knowing how much attenuation individual workers actually attain. If a safety manager were to supply earplugs based on the assumption that all earplugs only achieve half of their published NRR in the field, then clearly two-thirds of the workers in this study would be seriously overprotected, since they are achieving much higher protection than 50%."

In this study, workers were tested during their standard work shifts. They were not pre-screened, and were tested with their own earplugs that they routinely wear on the job, with no modifications. The tested earplugs were from four different hearing protection device manufacturers, and workers received no training or coaching as part of the test. The workers were simply asked to insert the earplugs as they normally did on the job. No feedback or correction was offered if they fit the earplug incorrectly.

According to Witt, the purpose of the study was to identify factors which contributed to good earplug fit, and hence, good attenuation in use. "A variety of personal as well as program factors were evaluated to determine which factors would correlate the best to a good earplug fit among these 100 workers," he said. Factors evaluated included: gender, age, years working in a hazardous noise environment, ear canal size, familiarity with hearing protection devices, model of product used, amount of group training received, amount of individual training received and enforcement.

"Of all these factors," said Witt, "only one stood out as having a strong correlation: one-on-one training. That is, the more often a worker had received individual training in the proper use of hearing protectors, the higher the probability of a good fit." The same could not be said for Group Training, according to Witt. "It appeared to make no difference at all whether a worker had attended zero, five or ten group training sessions in hearing protection, when measuring good attenuation in the field."

Enforcement, he added, was also a good predictor of good earplug performance, but only when it was coupled with one-on-one training.

Another question posed by the study was whether workers who achieved low attenuation with one type of earplug would also attain low attenuation with all types of earplugs. "We tested this by inviting some workers to try a second pair of earplugs—different earplugs, perhaps a model they had never tried before," said Witt. Workers who tried a second pair of earplugs often had major leaps in attenuation, bringing them closer to the published NRR.

"Field testing of hearing protectors bridges the gap between the laboratory estimates of attenuation and the real-world attenuation achieved by workers as they normally wear the protectors," Witt concluded. "This test confirmed the value of individual, one-on-one training, and the wisdom of offering workers a variety of suitable hearing protectors."

Sperian Hearing Protection, LLC
800.430.5490
San Diego, CA
www.howardleight.com

Be sure to mention, "I read about it in *Food Protection Trends*"!

World's First Ever Simultaneous Same-Day Dual Test for *E. coli* O157 and *Salmonella* Launched by Matrix MicroScience

Matrix MicroScience has announced the launch of its new simultaneous same-day (8 h) dual test for *E. coli* O157 and *Salmonella* in raw ground beef and produce.

The Pathatrix® same-day "dual" test is unique in that it can simultaneously detect the presence of low levels 1–10 CFU/sample in eight hours. The high volume of sample that the Pathatrix® can analyze is the key to this approach coupled to the use of highly specific antibody coated beads. Pathatrix® is the only commercially available system that can analyze 100% of the sample!

The benefits of the same-day dual test for *E. coli* O157 and *Salmonella* are as follows:

- Uses a single non-proprietary enrichment broth leading to significant savings in labor and media
- Can be completed within 8 hours when coupled to real-time PCR
- Can be done individually or in a "5 Pooled" format
- Sensitivity of 1–10 CFU per sample of both organisms in raw ground beef and raw produce.

For the first time the Pathatrix® dual test can make positive release a realistic option for food processors in the produce and beef industries, by giving a true < 8 hour turnaround in results.

Dr. Adrian Parton, CEO of Matrix MicroScience said, "The release of the dual *Salmonella* and *E. coli* O157 test targeted at the raw ground beef and produce industries represents a revolution in microbial diagnostics. It is further evidence of the commitment to our customers and to the industry to provide them with better diagnostic products."

Matrix MicroScience Ltd.
303.277.9613
Golden, CO
www.matrixmsci.com

New Highly Sensitive AgraQuant® ELISA Test Kit for Dairy Products from Romer Labs

Romer Labs® proudly launches a new, highly sensitive Agra Quant® ELISA test kit that has been designed to meet the coming regulatory limits for melamine in food products.

The European Food Safety Agency (EFSA) and the US Food and Drug Administration (FDA) have both concluded that the level of melamine in food products, other than baby food, should not exceed 2.5 mg/kg. Hong Kong has set its maximum concentration limit for melamine in baby food at 1.0 mg/kg, and 2.5 mg/kg for other foods.

Romer Labs® new AgraQuant® Melamine Sensitive immunoassay has been validated for dairy products such as milk, milk powder, yogurt and yogurt drinks. The test's quantitation range for milk, yogurt and yogurt drinks is 0.1–5.0 mg/kg, and 0.5–25.0 mg/kg for milk powder.

Melamine, a nitrogen-rich chemical normally used in plastics, has been widely used in China to give livestock feed the appearance of higher protein content. Most recently involved in the deaths of at least 3 and illnesses of more than 6,200 babies in China when illegally used to disguise the protein content in baby milk formulas, melamine first made the headlines last year when it was found as an additive in the pet food that caused the deaths of dogs and cats in the US. Melamine by itself is nontoxic in low doses, but when combined with cyanuric acid it can cause fatal kidney stones.

Romer Labs® Group
636.583.8600
Union, MO
www.romerlabs.com

Vacci-Test Demonstrates the First Same-Shift Test for *E. coli* O157:H7

With food safety top of mind for consumers and the food industry, Vacci-Test Corporation ("Vacci-Test") is pleased to announce that its first food safety test, FoodChek™-E. coli, has successfully completed a field trial at a major meat packaging facility and has shown that it can accurately test for *E. coli* O157:H7 in less than 6 hours, including enrichment. FoodChek™-E. coli is a revolutionary new same-shift test that is rapid, accurate and cost effective. FoodChek™-E. coli is a breakthrough solution for meat-processors enabling them to deliver high quality and safe products to consumers.

FoodChek™-E. coli uses magnetic nanotechnology and a proprietary, inexpensive and easy-to-use magnetic reader that provides a very sensitive, specific and quantitative test result.

The field trial was conducted at Vantage Foods Inc., a leading processor of retail ready fresh meats, at their facility in Chilliwack, British Columbia. Mr. Gary Haley, president and CEO of Vantage Foods stated, "We are pleased to have been able to work with Vacci-Test in field test-

ing their new rapid *E. coli* product. Vantage Foods prides itself on using leading edge technology such as FoodChek™-E. coli to compliment our best business practices philosophy of distributing the highest quality and safest products to our customers."

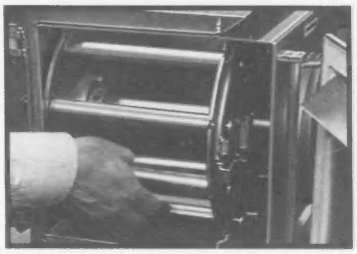
Sandy MacPherson, chairman of the executive operating committee of Vacci-Test, stated "Our FoodChek™-E. coli test will have a major impact for both regulatory agencies and meat-processors. Potential food contaminants such as *E. coli* O157:H7 can now be tested on site and identified prior to the end of a production shift. FoodChek™-E. coli eliminates the need for slaughterhouses and meat-processors to hold finished products in cold storage until testing can be completed by off-site third parties."

Vacci-Test Corporation
403.269.9424
Calgary, Alberta, Canada
www.vaccitest.com

Eriez® Rota-Grates® Remove Clogging Contaminants from Processing Lines

Eriez® Rota-Grates® feature a unique rotating design to remove both large and small ferrous contaminants that tend to stick, clog and bridge when passed through flat grate magnets. Rota-Grates provide exceptional efficiency on many finely ground cohesive materials such as gypsum, barium carbonate, Fuller's earth, lime, cohesive chemicals, confectionary sugar, cornstarch, cocoa, flour, wood flour and fibrous materials.

Eriez Rota-Grates feature a rugged structure including magnetic elements that are completely encased and fastened to stainless



Eriez

steel end plates. The durable units are equipped with steel shaft and hubs to ensure many years of service.

Rota-Grates are offered in 24 sizes, including multiple lengths and widths. Standard units allow simple manual cleaning, but a self-cleaning Rota-Grate model is available for applications where routine cleaning is problematic. Rota-Grates in housing are ideal for dusty installations where an enclosed unit is necessary.

Optional features include adapters to transition the product flow into grate housing, removable tube assemblies for easy cleaning and explosion-proof drives for hazardous operations.

Eriez
888.300.3743
Erie, PA
www.eriez.com

BFM™ Fitting Distributed by Powder-Solutions, Inc. Helps Reduce Risks of Bulk Powder Processing Plant Explosions

Powder-Solutions, Inc., American distributors of the USDA-accepted/3-A certified BFM™ fitting, expresses the need for bulk powder processing plants to incorporate appropriate explosion mitigation procedures and equipment to ensure the safety of both plant and personnel.

Over the past 30 years, more than 300 dust explosions have killed more than 120 workers in grain silos, sugar plants, and food processing plants. In 2008, after a catastrophic dust explosion in a Georgia sugar factory, the US House of Representatives passed a bill requiring the Occupational Safety and Hazards Administration (OSHA) to set standards for regulating combustible dusts.

All this has been carefully observed by Marv Deam, CEO of Powder-Solutions, Inc., and he believes his company has a worthwhile product to offer any industry dealing with production of bulk powders, dusts, or granular products. "Now more than ever, it is imperative that bulk powder processing plants are prepared with equipment that not only is efficient during processing, but also protects from the possibility of plant explosions," states Mr. Deam. "Sophisticated explosion venting and suppression systems can only be successful if the primary explosion is contained within the process equipment. Independent lab tests have confirmed that whereas the hose clamp is likely to release in the event of an internal explosion, the BFM™ fitting distends with the sudden pressure shock, but it does not fail."

Available from Powder-Solutions since 2007, the BFM fitting was initially designed for food and pharmaceutical production facilities to stop powder leakage from process piping. "We see now that there are opportunities in disparate industries, where the inherent design of the BFM™ fitting has great potential to increase safety in a wide variety of industrial applications."

The BFM™ fitting system represents a new paradigm in flexible

connectors. Instead of slipping over the outside of process piping or connections, the BFM sleeve snaps securely and perfectly into the inside of the matched spigots. Where old style connectors required the use of a hose clamp with all its inherent flaws, the BFM™ fitting simply snaps into place without the use of external clamps or the tools needed to secure them. There are no crevices to trap powder in the line and no cracks to leak powder to atmosphere. There are no wear points to abrade and degrade that could rupture in the event of an internal explosion. By virtue of the integral internal snap band seals, the BFM™ fitting actually seals even tighter in such events.

"Unique in its resistance to over pressure incidents, the BFM™ fitting is not only an efficient connective solution, it is a significant safety measure," continues Mr. Deam. "From industries as varied as dairy and food to pharmaceutical and chemical to wood production, the BFM™ fitting is an effective tool in an overall explosion mitigation strategy."

Powder Solutions, Inc.
877.236.3539
Chanhassen, MN
www.powder-solutions.com

Techno-Sommer's New Specialized Gripper Expands Product Line into "Food-Handling" Business

The newest edition to the Techno-Sommer Automatic product line is the GGL3060 "Food" gripper. Designed specifically for food-handling applications the GGL3060 is sealed according to IP69K standards, allowing it to withstand both high-pressure and high-temperature (wash down) cleanings. The Techno GGL3060 gripper has a compact form with a matching corrosion-resistant, stainless steel design. It also meets DIN 1672-2 guidelines for hygienic food production machinery, making it food safe.

This specialized gripper features jaws that swing open to a full 180°. This makes it very easy to have the gripper clear material below it. Additionally, the angular design of this gripper provides up to 33Nm (24 lb ft) of gripping torque and the unit includes sensors that sense jaw position.

Techno-Sommer
800.819.3366
New Hyde Park, NY
www.techno-sommer.com

Cygnus Mfg. Co. Signs Agreement with Hanson Technologies to Build OmniFresh 1000™ Food Contaminant Screening System

Cygnus Manufacturing Company, a contract manufacturer of products and components used in health and safety, medical, scientific, transportation, aerospace and energy applications, has partnered with Hanson Technologies (Carlisle, PA), a food safety technology company, to fabricate the automated OmniFresh 1000™ System. OmniFresh 1000™ screens large-volume fresh produce lots in near-real time for contamination by *E. coli, Salmonella* and other bacteria. It provides test results in two hours or less, compared to 12–36 hours for conventional lab testing methods that sample only a tiny percentage of produce lots. The OmniFresh 1000™ System represents a significant improvement in pathogen screening, identifying 99%+ of harmful pathogens vs. 5.8% using conventional testing methods.

According to the US Food and Drug Administration, more than 5,000 people in the United States die each year from diseases caused by eating contaminated food. The economic cost of those incidents is more than $10 billion annually.

OmniFresh 1000™ may be installed "on-line" with standard processing equipment and can be customized to meet the specific needs of food growers, processors, distributors and retailers. The system has been pilot tested at fresh produce production facilities in Pennsylvania and California. Hanson will begin delivering the OmniFresh 1000™ to customers this fall. The OmniFresh 1000™ System is beneficial to food growers, processors, distributors and retailers because it enables them to: protect their brands by delivering superior products to customers; reduce overhead costs by lowering the probability of pathogen-related outbreaks, and subsequent recalls and legal actions; improve quality control, including lot traceability; and maximize product freshness and shelf life.

Hanson Technologies
717.245.9890
Saxonburg, PA
www.hansontechnologies.com

COMING EVENTS

JANUARY

- **4–10, Ice Cream Short Course**, Penn State University, University Park, PA. For more information, call 814.865.8237, or go to http://conferences.cas.psu.edu/.
- **16–22, ILSI 2008 Annual Meeting,** JW Marriott Starr Pass Resort, Tucson, AZ. For more information, go to www.ilsi.org/Events/2009 Annual Meeting.
- **22–23, An International Meeting on *Cronobacter* (*Enterobacter sakazakii*),** O'Reilly Hall, University of Dublin, Ireland. For more information, go to www.ucd.ie/crono09.
- **24–25, Ice Cream 101**, Penn State University, University Park, PA. For more information, call 814.865.8237, or go to http://conferences.cas.psu.edu/.
- **25–28, NMC 48th Annual Meeting,** Westin Hotel, Charlotte, NC. For more information, go to www.nmconline.org/meetings.html.
- **27, Silliker Scientific Seminar – Assessment and Perspectives for European Union Regulations,** Lyon, France. For more information, contact Catherine Macret at Catherine.Macret@silliker.fr.
- **28–30, IPE/IFE 2009,** Georgia World Congress Center, Atlanta, GA. For more information, go to www.ipe08.org.

FEBRUARY

- **3–4, Industrial Cheese Making Workshop,** University of Idaho, Food Science and Toxicology Dept., Twin Falls, ID. For more information, contact Paula Peterman at 208.364.6188; E-mail: paulap@uidaho.edu.
- **4–6, CIES International Food Safety Conference,** Barcelona, Spain. For more information, contact Marjo Jarvinen at 33.1.44.69.84.82 or go to www.ciesfoodsafety.com.
- **9–12, Dairy Technology Workshop,** Birmingham, AL. For more information, contact Randolph Associates, Inc. at 205.595.6455; E-mail: henry.randolph@raiconsult.com.
- **17, Georgia Association for Food Protection Winter Meeting,** CDC Tom Harkin Global Communications Center, Atlanta, GA. For more information, contact Pam Metheny at 678.450.3061; E-mail: pam.metheny@waynefarms.com or or visit www.gaafp.org.
- **18–19, Kentucky Association of Milk, Food and Environmental Sanitarians Meeting,** Executive West Hotel, Louisville, KY. For more information, or visit www.kamfes.com.
- **21–25, 2009 AFFI Frozen Food Convention,** Monterey, CA. For more information, go to www.affi.com.
- **24–26, Dubai International Food Safety Conference,** Dubai Convention and Exhibition Centre, Dubai. For more information, go to www.foodsafetydubai.com.
- **24–26, GMA Food Claims and Litigation Conference: Emerging Issues in Food-Related Litigation,** Rancho Mirage, CA. For more information, contact Mary Olsen at 202.639.5968; Web site: www.gmalitigationconference.com.
- **24–27, 6th ASM Biodefense and Emerging Disease Research Meeting,** Baltimore, MD. For more information, go to www.asm.org.

MARCH

- **2–3, 9th Annual ASQ Lean Six Sigma Conference,** Phoenix, AZ. For more information, call 800.248.1946 or go to www.asq.org.
- **18–20, Idaho Environmental Health Association Annual Education Conference,** Boise State University, Boise, ID. For more information, contact Bob Erickson at 208.788.4335; E-mail: berickson@phd5.idaho.gov or visit www.idahoenvironmentalhealth.org.
- **25, Advanced Artisan Cheese Making Workshop,** University of Idaho, Food Science and Toxicology Dept., Gooding, ID. For more information, contact Paula Peterman at 208.364.6188; E-mail: paulap@uidaho.edu.

APRIL

- **1–3, 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 or go to www.mmfeha.org.
- **22, SfAM Spring Meeting,** Aston University, Birmingham, UK. For more information, go to www.sfam.org.uk/spring_meetings.php.
- **26–28, 2009 ADPI/ABI Annual Conference,** Hyatt Regency, Chicago, IL. For more information, go to www.adpi.org/Events/tabid/83/Default.aspx.
- **27–29, 2009 Food Safety Summit,** Washington D.C. Convention Center, Washington, D.C. For more information, go to www.foodsafetysummit.com.

MAY

- **4–6, Food Marketing Institute Futue Connect Conference,** Hyatt Regency, Dallas, TX. For more information, go to www.fmifutureconnect.com.
- **6, Metropolitan Association for Food Protection Spring Seminar,** Rutgers University, Cook College Campus Center, New Brunswick, NJ. For more information, contact Carol Schwar at 908.475.7960; E-mail: cschwar@co.warren.nj.us or visit www.metrofoodprotection.org.
- **10–13, VTEC 2009 7th International Symposium on Shiga Toxin (Verocytotoxin) Producing *Escherichia coli* Infections,** Centro Cultural Borges, Bueno Aires, Argentina. For more information, go to www.vtec2009.com.ar/.
- **18–22, 2009 3-A SSI Education Meeting and Annual Meeting,** Milwaukee Airport Hotel and Convention Center, Milwaukee, WI. For more information, call 703.790.0295 or go to www.3-a.org.
- **25–27, Brazil Association for Food Protection Annaul Meeting,** Conselho Regional de Quimica, São Paulo, Brazil. For more information, visit www.abrappa.org.

IAFP UPCOMING MEETINGS

JULY 12-15, 2009
Grapevine, Texas

AUGUST 1-4, 2010
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General Fund Statement of Activity For the Year Ended August 31, 2008

Revenue:	
Advertising	$149,001
Membership & Administration	374,969
Communication	745,058
Annual Meeting	906,891
Workshops & Symposia	78,175
International Symposia	120,272
Total revenue	$2,374,366
Expense:	
Advertising	113,412
Membership & Administration	798,004
Communication	765,049
Annual Meeting	620,487
Workshops & Symposia	36,553
International Symposia	132,698
Total expense	$2,466,203
Change in General Fund	**$(91,837)**
Net Assets as of 8/31/08:	
General Fund	668,637
Foundation Fund	726,631
Restricted Fund	34,745
Speaker Travel Fund	113,561
Total net assets	$1,543,574

ADVERTISING INDEX

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ERRATUM

In the article "Effects of Potassium Sorbate on Postharvest Brown Rot of Stone Fruit" by R. Gregori, F. Borsetti, F. Neri, M. Mari, and F. Bertolini that appeared in the *Journal of Food Protection* 71(8):1626–1631, there were data missing in Table 2. A corrected table appears below.

TABLE 2. *Effect of K-sorb treatment (15 g/liter) on* Monilinia *rot in naturally infected fruits after 4 days at 20°C*[a]

Cultivar	Control (% of infected fruit)	K-sorb (% of infected fruit)	EI (%)[b]
May Crest (peach)	45 a	29 n	35.3
Maria Marta (peach)	77.5 a	6.2 n	92
Elegant Lady (peach)	81.2 a	8.3 n	89.8
Springbelle (peach)	48.3 a	5 n	89.6
Big Top (nectarine)	42.5 a	5 n	88.2

[a] Fruits were treated by dipping for 2 min. Values for each treatment correspond to the mean of 20 fruits per five replicates. Within each cultivar, the values followed by the same letters are not significantly different according to the least significant difference test ($P \leq 0.05$).

[b] EI, effectiveness index (%) = [(control infected fruits − treated infected fruits)/control infected fruits] × 100.

* Asterisk indicates author for correspondence.

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- ❒ D1100 Mastitis Prevention and Control
- ❒ D1105 Milk Hauling Training
- ❒ D1120 Milk Processing Plant Inspection Procedures
- ❒ D1130 Pasteurizer: Design and Regulation
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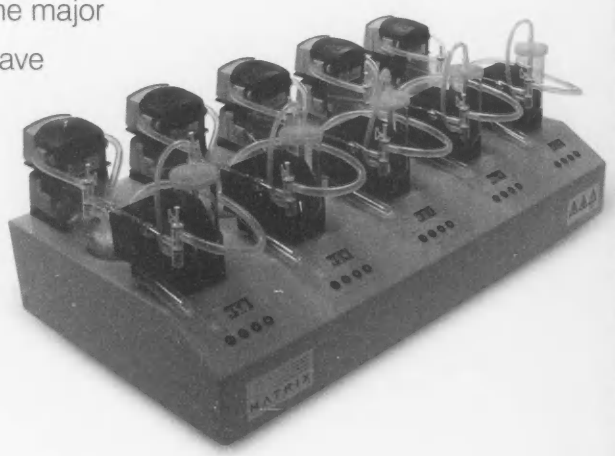
In fact many customers have reported the **elimination of "false positives"** and **increased** specificity and sensitivity.

We have customers using a wide variety of PCR systems from all of the major manufacturers and have successfully delivered the benefits of PATHATRIX Pooling to all of them.



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If you want to know more...
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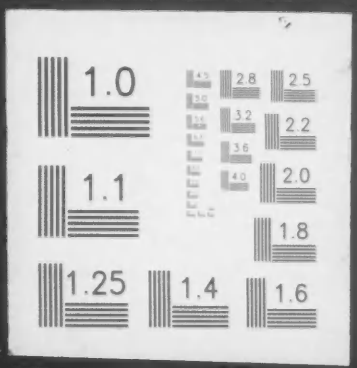
www.matrixmsci.com


1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0