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Periodicals

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# Food Protection Trends

**Science and News** from the International Association for Food Protection



Tool to Assist Understanding of Routine  
Microbiological Monitoring Results  
of Sheep Carcasses

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Rose, Bonnie E. 2001. Isolation and identification of *Salmonella* from meat, poultry, and egg products in Microbiology laboratory guidebook, 3rd ed., Food Safety and Inspection Services, U.S. Department of Agriculture, Washington, D.C.

U.S. Food and Drug Administration. 2003. Bacteriological Analytical Manual (online), AOAC International, Gaithersburg, MD.  
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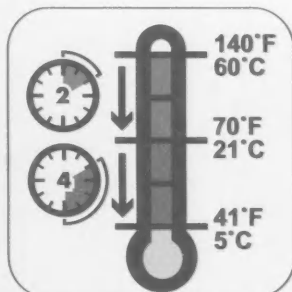
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In the June 2009 issue of *Food Protection Trends* 29:(6):335–341 on page 336 an incorrect figure was printed. The correct figure is on page 459 of this issue. We apologize for this error.

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## "PERSPECTIVES" FROM YOUR PRESIDENT

**H**appy, sad, proud, confident – these are just a few of the feelings that I have as I write this, my last column as the President of IAFP. Happy that I will not have to think of a new topic to write about next month and that I will have the opportunity to work on the Board with Katie Swanson in the coming year. Sad that I will no longer be working on the Board with Gary Acuff, whom I have had the pleasure of working with for the past four years and who I sincerely admire for his kindness, intellect, and devotion to IAFP. Proud of David Tharp, the IAFP staff, and the many volunteers who make IAFP the great organization that it is. Confident that the initiatives that the Board has made this year and for the last four years will continue to help IAFP grow and fulfill its mission.

As I reflect on the past year, there have been many changes and challenges in the production and distribution of foods. The past year has also been challenging to the US and global economy in many ways. The food industry has been the reoccurrence of *Salmonella* in nuts and other low moisture foods and continued problems with *Listeria monocytogenes*, and *E. coli* O157:H7, all at a time when many companies and regulatory laboratories have been asked to reduce the money they are spending in their laboratories.

The movement of foodstuffs around the globe continued to grow in 2009. Assuring the safety of imported/exported raw foods, processed foods, and food ingredients is currently and will continue to be a major challenge for the regulatory agencies in all countries. Perhaps the biggest challenge in the import/export area is to try and develop harmonization of both food production standards and inspection criteria. No country wants to lose their independence when determining how to produce and inspect foods, but



By **STAN BAILEY**  
PRESIDENT

***"I am particularly proud of the role that IAFP has and will continue to play in this movement toward a safer food supply"***

every country having a different set of standards and regulations places a huge and expensive burden on the food companies trying to certify that their products meet each of the different standards. Although an arduous process, most countries are working through CODEX to determine minimally acceptable production and inspection standards.

Just as food companies are challenged by different standards and criteria, microbiology diagnostic companies are challenged to produce and validate microbiological assays that do the same thing no matter where they are used but which must be certified by different validating bodies in different countries and areas of the world. In the US and some other areas, methods that have been validated by AOAC are accepted by most of the food industry and FDA. FSIS does not necessarily accept AOAC as sufficient validation and insists that food companies inspected by FSIS used methods that they recognize or that have been validated independently to standards specified by FSIS. In Europe and other areas of the world, methods must be validated to ISO standards. This is most often done through AFNOR or MicroVal. As you can see, this can be cumbersome and very expensive to companies developing new assays. Fortunately, AOAC and some of the other validating bodies have been working to develop a process that would allow the different validating bodies to accept one another's data and lead to the global recognition and acceptance of validated methods.

I do not want my last column to reflect too much on the negative challenges that companies, regulatory agencies, and individuals have faced this year. We have many success stories to celebrate and new opportunities and directions to grow. As I discussed in a recent column, I sincerely believe that our food supply is safer today than in previous years because we continue to develop technologies to detect pathogens more efficiently and improved technologies to compare the "genetic fingerprint" of these pathogens to each other, thus allowing more and more frequent detection of foodborne outbreaks. As a global food society, I expect the use and strength

of PulseNet to increase as more countries get the technology to run the tests and become linked into a global database. Even as PulseNet grows, we know that our colleagues at CDC and in other countries are working to develop the next generation of tests to allow even better discrimination of pathogens.

Among the negative stories of outbreaks, many industries and companies are making great strides in the control of pathogens in our food supply. In almost all categories, the number of people getting sick from foods has decreased in the past 10–15 years. This can be directly attributable to improvements in HACCP, more stringent testing, pressure from regulatory and public health agencies, and improvements in production and processing technologies within the food industry.

In both my previous careers at USDA, ARS and in my current position with bioMérieux, I have been fortunate

to visit many of our leading food-producing companies, most of our regulatory and public health agencies, and many of our leading universities. My experiences and the individuals I have met give me great confidence in where we are going in the future. Although progress has been made in food safety, I believe that the next few years will see tremendous breakthroughs in all areas of food safety. Many new technologies are being developed that will assist in the production and processing of safe foods, better technologies are being developed to assist in the rapid detection and differentiation of pathogens from foods, and regulatory and public health agencies are developing new strategies and programs to verify the safety of foods.

I am particularly proud of the role that IAFF has and will continue to play in this movement to a safer food supply. IAFF is unique in

our equal division among industry, academia, and government members. Food safety has always been and will continue to be challenging. By bringing together the best from each of these segments, we provide an environment where breakthroughs and progress are stimulated. I am very proud of the strides that IAFF is making in bringing individuals from different countries and areas of the world together to learn from each other. I believe that I am not alone in the recognition of the value of IAFF. In the past year, when most other professional societies have lost membership, IAFF has increased from about 3,200 members to over 3,400 members (7.5% growth). I invite you to continue to be an active partner with your colleagues at IAFF.

As always, I welcome your comments or feedback. Please E-mail me at [stan.bailey@na.biomerieux.com](mailto:stan.bailey@na.biomerieux.com). Please join us in Grapevine, Texas for the 96th Annual Meeting of IAFF on July 12–15, 2009.

## IS YOUR PROGRAM CRUMBINE MATERIAL? PUT IT TO THE TEST!

**The Samuel J. Crumrine Consumer Protection Award for Excellence in Food Protection at the Local Level is seeking submissions for its 2010 program.** Achievement is measured by:

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



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

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

For more information on the Crumrine Award program, please go to [www.fpi.org](http://www.fpi.org) or call the Foodservice Packaging Institute at (703) 538-3550. **Deadline for entries is March 15, 2010.**

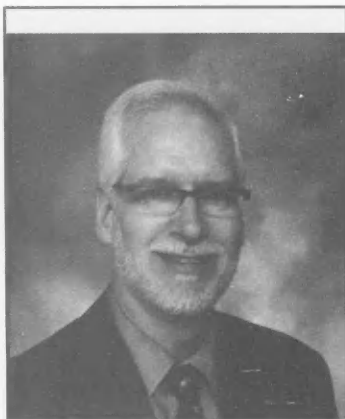
## “COMMENTARY” FROM THE EXECUTIVE DIRECTOR

I AFP now has 45 affiliated organizations around the world. Our international reach has expanded greatly through our international meeting participation and issuance of charters to new international Affiliates. Over the past 12 years, we have chartered eleven international Affiliates in addition to a few new ones in the USA and Canada.

We now have Affiliates in Australia, Brazil, Hungary, Korea, Mexico, New Zealand, Portugal, Spain, Turkey, United Arab Emirates, and the United Kingdom! Our newest international Affiliate is the Hungarian Association for Food Protection. Representatives of this Affiliate were unable to be with us at IAFP 2009, but they will receive their Charter in a presentation to take place at our European Symposium in Berlin this October. There was a Charter presentation to the Arkansas Association for Food Protection at IAFP 2009, making them the newest IAFP Affiliate from the USA.

Affiliation with IAFP offers a number of benefits including access to the IAFP Executive Board Speaker Program. Affiliates can call upon IAFP Board Members to come to their local meetings to give presentations on subject matter where the Board Member has expertise. IAFP supports the travel expenses to get the Board Member to the Affiliate meeting. This allows the Affiliate group to improve their program offerings to attract attendees to their meeting. The speaker program has proven to strengthen ties between our Affiliates and IAFP.

Many of our Affiliates take advantage of the speaker program, but even if they don't we are able to send printed materials along with a DVD to each Affiliate meeting. This, in addition to a tri-fold poster presentation, provides Affiliate members with information about IAFP.



By **DAVID W. THARP, CAE**  
EXECUTIVE DIRECTOR

***“Affiliation with  
IAFP offers a  
number of benefits”***

One of the most important changes to affect Affiliate members is the reduction in base membership fees for IAFP. We have seen a dramatic increase in the number of new IAFP Members as a result of the lower, more economical fee structure.

What are some reasons that groups want to become affiliated with IAFP? For one, each Affiliate organization has one representative (known as an Affiliate Delegate) who serves

on the Affiliate Council. The Affiliate Council keeps in contact throughout the year and trades information on holding meetings and educational conferences along with providing tips on newsletters or communication methods (Web sites, E-mail, etc.) with each other. Additionally, the Affiliate Council selects its leadership, a Council Chairperson and the Council Secretary, and the Affiliate Council Chairperson serves a one-year term on the IAFP Executive Board. Therefore, the Affiliate Council provides direction to the overall Association through the Affiliate Council Chairperson.

Other reasons for Affiliation include increasing the stature or prominence of the Affiliate and to serve as the host organization for an IAFP meeting. Last year, both our Brazil and our Portugal Affiliates served as hosts for our meetings outside of North America while our Ohio Affiliate served as host for the Annual Meeting in Columbus. This year, the Texas Affiliate was host for IAFP 2009 and the Korean Affiliate will host the Asia Pacific Symposium on Food Safety in Seoul in November.

IAFP Affiliates provide an important service for their members by holding localized, educational sessions. Some do this on an annual basis; others hold sessions more often such as quarterly or monthly. Each Affiliate can be comprised of members with a certain focus. Some may be more dairy oriented (similar to the roots of IAFP) while some direct their attention to sanitation issues at the state level. Others have evolved with IAFP and cover a broader topic of food safety and food science. Whatever the focus of an Affiliate organization, IAFP does not “force” the Affiliate to fit within a certain mold. This has ensured that each Affiliate organization has its



own purpose and is directed at the local level. In fact, there are no direct financial ties between the Affiliate organizations and IAFP.

The only requirements for Affiliation with IAFP are:

1. The Affiliate must maintain a minimum of five members within IAFP;
2. The Affiliate must maintain its president and delegate as IAFP members;

3. The Affiliate must hold at least one meeting per year;

4. The Affiliate must file an annual report with IAFP.

Pretty simple. Of course the Affiliate must take into consideration their local laws which must be followed. This is their responsibility to be sure they obey regulations where they operate.

I hope this column provided information about IAFP's Affiliate

structure and the important service that the Affiliates bring to the local level. On the IAFP Web site under "About Us," there is additional information that can familiarize you with IAFP's Affiliate structure. If there is an Affiliate in your area, we encourage your active participation. If there is not an Affiliate close to you and should you be interested in formation of an Affiliate in your area, you may contact our office for additional details.

## *Advancing Food Safety Worldwide*® **Starts Locally**

If you are an IAFP Member, or an IAFP Annual Meeting attendee, we encourage you to contribute to the force of IAFP's growing number of Affiliate associations dedicated to the daily advancement of food safety in their region. Forty-three Affiliates are presently at work on five continents, providing local forums for the exchange of information on protecting the food supply. Get involved today!

**Start where you are by joining or forming an IAFP Affiliate in your area.**

Find IAFP Affiliate opportunities and contacts at [www.foodprotection.org](http://www.foodprotection.org), or call Leilani McDonald, Affiliate Council Liaison, at +1 515.276.3344 or +1 800.369.6337



International Association for  
**Food Protection**®

# Tool to Assist Understanding of Routine Microbiological Monitoring Results of Sheep Carcasses

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## SUMMARY

A software tool has been developed to assist sheep meat producers evaluate the microbiological effectiveness of their pre-slaughter, slaughter and dressing procedures. The tool consists of a series of questions to be answered by the user. Four questions on livestock are summarized as a "Problem Score" while twenty-two questions on how the slaughter floor is managed and operated are combined into a "Process Score". From the two scores, a Total Score is calculated. The tool was evaluated at six sheep processing plants in Australia, and Total Scores were assessed against summary microbiological data for indicator organisms gained during the industry's third national baseline study of sheep carcass hygiene, carried out in 2004. There was close alignment between Total Scores and microbiological status of carcasses. It is intended that the tool be used by Quality Assurance and Production staff as an aid to process improvement.

## INTRODUCTION

The Australian sheep industry is currently based on a herd approximating 100 million head. Annually, around 620,000 tons of sheep meat is produced, of which almost 300,000 tons is exported, making Australia the world's second largest exporter of sheep meat after New Zealand (12).

Very small plants may dress animals on a cradle or a frame, with one operator carrying out all operations, so-called solo butchering. The vast majority of sheep processed in medium and large abattoirs, some of which slaughter up to 10,000 animals/day, are processed by one of two methods: conventional or inverted dressing. Both conventional and inverted dressing are carried out on sheep that are suspended from a moving chain, with operators undertaking only one or two operations each. Chain speeds vary according to stock being processed and typically range from 350-750 carcasses/hour.

In conventional dressing, each carcass is suspended by its hind legs, opening cuts are carried out on the rear, and the pelt is removed over the head. In inverted dressing, the animal hangs by all four legs, initial cuts are made on the forequarters and, after the hind legs are

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released, the fleece is pulled downwards, over the rump. The sequence of slaughter and dressing procedures is fully described in process flow diagram form by Bell and Hathaway (3).

The industry collects systematic data on *Escherichia coli* and *Salmonella* at export establishments, which are collated via the *E. coli* and *Salmonella* Monitoring (ESAM) program by the Australian Quarantine and Inspection Service (AQIS). Typically, the ESAM database accrues around 13,000 test results for ovines each year; because the program has been in operation since 1998, a great many test data are available. The database has proven useful for setting performance standards for each livestock category, including ovines (17). The database can also provide individual establishments with temporal summaries, together with an industry average over the same period.

For those companies close to, or "better" than, the industry average, the data provide confidence in their processing system. By contrast, those that have summary data "worse" than the industry average may find it difficult to explain their apparent inability to meet industry norms.

To assist establishments in evaluating their process, a software tool has been developed similar to one that was developed to assist beef processors (11). The *modus operandi* quantifies a "Problem Score" associated with the live animal and then combines this with a "Process Score", by assessing unit operations in the slaughter plant.

This article describes the scientific underpinning for the tool and its validation against microbial populations on carcasses in six processing plants.

## MATERIALS AND METHODS

The tool consists of a series of questions to be answered by the user. It was initially developed as a Microsoft Excel spreadsheet and later turned into a stand-alone application based on the Microsoft .NET framework.

The Problem Score is calculated by assigning a score of 0 for a "good" practice and a score of 1 for a "bad" practice. An exception relates to the proportion of animals slaughtered with short wool (< 5 cm), for which the score is based on the proportion of animals processed

with short fleece. The Problem Score is calculated by summing the individual problem question scores, and the higher the Problem Score, the larger the likely incoming problem.

For questions concerning the process, a score of 0 is given for each "good" practice and a score of 1 for each "bad" practice; some questions contain more than two options, in which cases additional possible scores of 2, 3, etc. can accrue. The Process Score is calculated by summing all the individual process question scores. Again, the higher the Process Score, the less likely the processing operations will be able to cope with a serious incoming problem.

Practices have not been weighted proportionally, since any constant of proportionality would likely depend on what other practices are also in use.

For each question, the possible answers and associated score are given, along with reasons for the choice. These questions have been organized for this manuscript in seven roughly related groups; the tool asks questions in an order that largely reflects the order of operations during slaughter and dressing. It should be emphasized that, while the questions and their order relate primarily to inverted dressing, which is the method by which the majority of sheep are processed in Australia, the tool can also be used to inform on conventional dressing by selecting the "not applicable" option where appropriate.

In order to develop appropriate questions, six sheep abattoirs were visited twice by the authors and observations made on unit operations which, while basically common to all plants, show substantial between-plant differences. The abattoirs were selected (non-randomly) because of their participation in the third national baseline (16), the differences in line speed and dressing technology and for sourcing stock from the same geographic region. The abattoirs produced between 2,000 and 8,000 animals per day. Quality Assurance and Production Managers were present during these visits and provided information about the process. An iterative process then followed, in which drafts of the spreadsheet were presented for comment to quality assurance staff of at least twenty sheep processing abattoirs. Based on their comments and suggestions, the tool was modified to its present form.

While the tool was being developed, the third national baseline study (16) was in progress, enabling up-to-date information on carcass microbiology to be gathered for each of the six plants selected for the study. The database from the baseline study was interrogated to generate prevalence and concentration of indicator organisms (aerobic plate count (APC) and *Escherichia coli*) from carcass sponges taken at each plant on at least two occasions.

## Problem Score incoming livestock questions

Since 1880, when sheep meat was first exported aboard the SS Strathleven from Australia to the United Kingdom (1), New Zealand and Australia have supplied virtually the entire sheep export market. This may explain the fact that most published work on microbiology of sheep slaughter and dressing emanates from these countries, beginning with Grau and Smith (10) and Nottingham (14), who described sources of carcass contamination. More recently, Biss and Hathaway (5) and Bell and Hathaway (3) have provided microbiological assessment of the two current dressing systems used by the industries of Australia and New Zealand: conventional and inverted. The publications of these authors form the basis for much of the scientific underpinning of the elements of the software tool described below.

The pelt is considered the primary source of microbial contamination transferred to the carcass during slaughter and dressing. Length of fleece, whether it is wet/dry, and its degree of contamination, particularly with feces/soil (termed "tag"), are major influences on carcass microbiology (3, 5). The foregoing forms the basis for four questions that estimate the Problem Score — contamination likely to enter the plant on livestock.

The first question is: *What percentage of sheep slaughtered have short (< 5 cm) wool?* Animals with long wool are harder to dress because of 'roll-back' of wool (where the fleece has the potential to flap onto the freshly exposed carcass surface) and a greater chance of contaminating knives and workers' hands, arms, aprons etc. (3). In the tool, the percentage, *p*, which is entered without decimals, is

scored as follows:  $\geq 90\%$  scores 0; 75–89% scores 1; 51–75% scores 2; 26–50% scores 3; and 0–25% scores 4.

The second question asked is: *Are animals crutched prior to slaughter?* Crutching (removing wool and tag from the perianal area) reduces the likelihood of contamination when opening cuts are made at the rump and hind legs (5). A “yes” scores 0, while a “no” scores 1.

The third question is: *Are stock housed under cover?* Housing animals under cover prior to slaughter allows the fleece to dry out. Dry fleeces are associated with lower fleece and carcass contamination levels (5). A “yes” scores 0, while a “no” scores 1.

The fourth and last question is: *Are the animals housed off the ground (elevated floor)?* Observation indicates that housing animals off the ground on slatted floors separates them from their feces, leading to cleaner stock entering the slaughter floor. A “yes” scores 0, while a “no” scores 1.

The Problem Score is calculated by summing the scores for all four questions; the higher the Problem Score, the greater the incoming problem is likely to be.

### Process Score processing questions

In Australia, sheep are processed by one of two methods: conventional or inverted dressing. It is thought, intuitively, that conventional dressing can result in higher levels of microbial contamination because the initial fleece incisions and removal are from the rear end, resulting in the opportunity for contamination with fecal organisms. However, Bell and Hathaway (3) found this premise to be confounded by other operational influences; for this reason, conventional *versus* inverted dressing *per se* is not included as a factor in the tool.

The first group of questions relates to the contamination from the fleece. After a sequence of incisions and clearing operations frees it from its underlying tissues, the fleece has the potential to flap onto the freshly exposed carcass surface, contaminating it. Called “roll-back”, such contamination can occur in both inverted and conventional systems and has been identified as a major cause of contact between fleece and carcass surface (15). Bensink (4) described how “leg-

ging paper”, which is inserted between the fleece and carcass immediately after clearing of the fleece, prevented the fleece from rolling back onto the freshly exposed brisket area.

Observation confirms that roll-back occurs more easily when the fleece is long, and its consequences are exacerbated when the fleece is dirty and wet (3), hence the focus on these factors as part of the Problem Score. However, roll-back can also be minimized at numerous stations on the slaughter and dressing floor.

On the inverted dressing slaughter floor, an important development has been the increased mechanization of fleece removal, first by use of punching arms to free the fleece and second by mechanical removal, either by a shoulder puller or by a rotary puller, which removes the fleece “inside-out” by pulling it upwards over the rump.

On each shoulder, a pocket between hide and flesh is freed, as a prelude to, traditionally, an operator “punching” downwards (manual punching) but, more recently, to inserting a mechanical arm into the pocket, which then punches downwards (mechanical punching). Observation of the process indicates that roll-back of the fleece onto the carcass is more likely when mechanical punching arms are used, so manual punching is considered superior. Experienced operators can also “tune” their punching as necessary, which is not possible with mechanical punching arms.

Observation of the process indicates that mechanical fleece removal can also cause roll-back in operation because the fleece margin frequently drags across the shoulders. Similarly, observing the actions of a rotary fleece remover shows that substantial pressure can be put on the carcass, causing feces to be squeezed from the anus. This is especially prevalent when stock are scouring, as is common during spring when pasture is plentiful. Consequently, the use of a rotary fleece remover is considered inferior to mechanical and to manual removal. Manual fleece removal (pull-back) can prevent the fleece margin from rolling back, and skilled operators can adapt their technique to the individual carcass characteristics.

An alternative approach does not use the removal of the brisket fleece, which allows the fleece on either side of the chest

to roll back once it has been cleared from the carcass. Instead, a superior operation is to clear the brisket fleece to form a pocket along the chest. The fleece can then be rolled down the carcass in a fashion similar to that in which a sock is pulled from one’s foot; the fleece is fully enclosed and inverted onto itself, eliminating contact with the carcass.

There is also observational evidence to support the contention of Gill (8) that incising and clearing of the fleece so that it falls away from the carcass can be arranged to prevent contamination from fleece. Processing lines can be engineered to lower or raise the inverted carcass so that the fleece falls away from the freshly-exposed carcass surface.

The scoring is then as follows.

- *Is legging paper routinely used?* A “yes” scores 0, while a “no” scores 1.
- *Are hind legs lowered to prevent roll-back?* A “yes” scores 0, while a “no” scores 1.
- *Is the brisket fleece removed, or is it cleared and a pocket formed?* A “cleared & pocket” scores 0, while the alternative “removed” scores 1.
- *How is the fleece pulled from the shoulders?* Answering “manual” scores 0, while “mechanical” scores 1.
- *What type of punching is used to clear the fleece?* A “manual” answer scores 0, “mechanical” scores 1.
- *How is the fleece removed?* A “manual” answer scores 0, “mechanical” scores 1, and “rotary” scores 2.

The second group of questions deals with contamination from operators’ hands, arms and knives. Operators’ hands are a potential source of contamination because the non-knife hand routinely grips the fleece during knifing. To prevent carcass-to-carcass contamination, hand wash stations with “warm” water at 35–44°C are located so that operators can rinse their hands between carcasses, or as necessary should they become soiled. Bell and Hathaway (3) found that operators’ hands carried a bacterial loading around 5 log CFU/cm<sup>2</sup> (similar to the APC of fleece) and that hand rinsing effected a 90% reduction.

Of particular importance is operator hygiene during manual punching, where one hand grips the fleece while the fist of the other is used to separate the fleece from the carcass by "punching" down each flank to above the operator's elbow. It is important that operators have sufficient time and hand-wash facilities to clean their hands and arms between carcasses.

Knife incisions through the fleece inevitably lead to microbial contamination. However, such incisions are relatively few and, once made, they can be extended without further contamination by cutting from the inside-out. To prevent cross-contamination by knives and other tools, it is traditional to rinse the knife between carcasses in warm water, then to dip it momentarily in a "sterilizer" unit containing water at a temperature of no less than 82°C. Bell and Hathaway (3) found that rinsing and dipping knives used in sheep dressing reduced the bacterial loading from 5 CFU/cm<sup>2</sup> of knife blade to 2.5 log CFU/cm<sup>2</sup>. Eustace et al. (7) evaluated the effectiveness of knife cleaning at an Australian sheep abattoir by estimating contamination of cleaned knives at each work station. Contamination varied, depending on whether knives were used for "dirty" operations such as fleece incisions or "clean" operations such as trimming. Overall, cleaned knives had an APC around 2 log CFU/cm<sup>2</sup> and *E. coli* was recovered on 18% of occasions, with a mean concentration on positive knives of 0.90 log CFU/cm<sup>2</sup>.

For some markets it is necessary for plants to use a 2-knife system, in which each operator is provided with two knives; at any one time one knife is in use on the carcass and the other is immersed in a sterilizer containing water no cooler than 82°C. The residence time in the sterilizer varies according to the range of tasks done by each operator, from 1–2 s to 30 s. Recently Dykes (6) studied the effect of temperature and time on inactivation of *E. coli* on knives, finding a 4 log CFU/cm<sup>2</sup> reduction in 82°C water for 5 s and a 2 log CFU/cm<sup>2</sup> reduction when knives were immersed in water at 60°C for 15 s.

Based on the above, a 2-knife system and adequate hand-wash facilities for manual punching were assessed as being superior elements.

The scoring is then as follows.

- *If manual punching is used, do operators have adequate time and facilities to wash hands and arms*

*between bodies?* A "yes" scores 0, while a "no" scores 1.

- *Do you use a 2-knife system?* A "yes" scores 0, while a "no" scores 1.

The third area assessed was the removal of contamination. While early research studies indicated that steam vacuuming produced significant reductions in microbial loads (see review by Bacon (2)), when on-line steam vacuuming was monitored in a Canadian plant, little reduction in generic *E. coli* was found (9). The researchers considered that the time for the process in a typical high-speed plant allowed effective treatment of an area only twice that of the steam nozzle. In the present context, steam vacuum was considered effective only if done at more than one work station and when it was concentrated on a small area based on cutting lines.

The scoring is then as follows.

- *Are cutting lines cleaned using steam vacuuming?* A "yes" scores 0, while a "no" scores 1.

The fourth group of questions concerned the contamination from viscera and organs. Preventing contamination from the viscera and head requires several unit operations in sheep dressing. Plugging the bung (anus) prevents leakage of feces. To reduce the risk of perforating the intestine, it is preferable to plug the bung immediately after bleeding and before the carcass is inverted, i.e., while the carcass is suspended only by the hind legs.

In 1994, Nesbakken et al. (13) demonstrated the efficacy of bagging and sealing the bung immediately after it has been separated from the tissues and this is considered an important operation.

While urine is normally sterile following passage through the kidneys, preventing urine contamination is considered an important aesthetic element in hygienic production.

The scoring is then as follows.

- *Is the bung plugged prior to carcass inversion?* A "yes" scores 0, while a "no" scores 1.
- *Is the bung bagged and tied or is the anal canal tied and removed?* Both methods prevent leakage of feces into the channel. A "yes" to either part of the question scores 0, while a "no" scores 1.

- *Is the pizzle (penis) heat sealed and clipped?* A "yes" scores 0, while a "no" scores 1.

The fifth area assessed was manning levels at key operations. Operations which prevent contamination of the neck with ingesta include rodding of the esophagus (weasand) to push ingesta back into the paunch, sealing the weasand by tying or clipping, and removing its free end. This series of operations is best carried out by more than one operator to ensure that sufficient time is allowed and that they can work with a cleaned implement.

Having two operators for key operations effectively halves the line speed, and when two operators are used at any of the following operations a "yes" scores 0, while a "no" scores 1.

- *Open Y-cut on forequarters*
- *Clear shoulders and foreleg*
- *Remove, clear, rod and clip the weasand*
- *Free the bung (anus)*
- *Open abdomen and strip out of the gastrointestinal tract*
- *Remove pluck (thoracic viscera)*

The sixth area related to line speed. Line speed determines whether operators have sufficient time to properly carry out the required tasks, including cleaning of hands, arms and knives between carcasses. In the tool, slower line speeds score better than higher line speeds; a line speed of less than 8 carcasses per minute scores 0; 8 to less than 10 carcasses per minute scores 1; 10 to less than 12 carcasses per minute scores 2; a line speed of >12 carcasses per minute scores 3.

Lastly, line management was assessed. Adjusting line speed and/or the number of operators at key work stations in response to the cleanliness of different lots throughout the day is an important management tool. A "yes" scores 0, while a "no" scores 1.

## RESULTS

The tool was used to assess operations at six plants and to calculate the Problem and Process Score (Table 1). In general, plants fell into three groups. Plants D and E had low total scores because of managed line speeds, 2-knife cleaning systems, vacuuming of cutting lines at several points and using two operators at many work stations. Three plants

**TABLE I. Problem and process scores at six abattoirs (plants A-F)**

	A	B	C	D	E	F
<b>Incoming livestock</b>						
What percentage of sheep have short (< 5 cm) wool?	2	2	2	2	0	2
Are animals generally crutched prior to slaughter?	1	1	1	0	0	1
Are fleeces generally dry due to undercover slaughter?	0	0	0	0	0	0
Are animals housed off the ground (elevated floor)?	0	0	0	0	0	0
<b>Problem Score<sup>a</sup></b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>3</b>
<b>Processing</b>						
Effectiveness of process						
Is the bung plugged immediately after bleeding (prior to carcass inversion)?	1	1	1	1	0	1
Do you use a 2-knife system?	1	1	1	0	0	1
Are two (or more) operators used at Y-cut for each carcass?	1	na	na	0	0	1
Is legging paper used routinely to prevent roll-back?	1	0	1	0	0	1
Are two (or more) operators used to clear the shoulders and foreleg for each carcass?	1	1	1	0	0	1
Are hind legs lowered to prevent roll-back?	1	na	na	1	0	1
Are two (or more) operators used to clear the brisket for each carcass?	1	1	1	0	0	1
Is the brisket fleece removed or cleared and a pocket formed?	1	1	1	1	0	1
How many separate work stations are used in weasand operations?	1	1	1	0	0	1
How is the fleece pulled back for the shoulders?	1	1	1	1	0	1
Are cutting lines cleaned using a steam vacuum?	0	1	1	0	0	1
What type of punching is used to clear the fleece?	1	1	1	1	0	1
If manual punching is used, do operators have adequate time and facilities to wash hands and arms between bodies?	na	na	na	na	0	na
Is the pizzle heat sealed and clipped?	1	1	1	0	0	1
How is the fleece pulled back?	1	1	1	1	0	1
Is a mechanical or rotary fleece remover used?	1	2	1	0	0	2
Are two (or more) operators used at bung removal?	0	1	1	0	0	1
Is the bung bagged and tied or is the anal canal tied and removed?	1	1	1	0	0	1
Are two (or more) operators used at abdominal opening and stripping out?	0	1	1	0	0	1
Are two (or more) operators used at pluck removal?	0	1	1	0	0	1
Is the line speed adjusted during the shift based on manning and carcass cleanliness?	0	1	1	0	0	1
What is the line speed (bodies per minute)?	<8	<8	<8	8-10	8-10	>12
<b>Process Score<sup>b</sup></b>	<b>15</b>	<b>20</b>	<b>18</b>	<b>9</b>	<b>2</b>	<b>25</b>
<b>Total Score<sup>c</sup></b>	<b>18</b>	<b>23</b>	<b>21</b>	<b>11</b>	<b>2</b>	<b>28</b>

a. Problem Score can vary from 0 to 7, with lower scores being preferred

b. Process Score can vary from 0 to 25, with lower scores being preferred

c. Total Score can vary from 0 to 32, with lower scores being preferred

**TABLE 2. Mean aerobic plate count (APC) and *E. coli* on sheep carcasses at Plants A–F**

Plant	n	Mean log APC/cm <sup>2</sup> (SD)	<i>E. coli</i>	
			Prevalence (%)	Concentration <sup>a</sup>
A	44	2.9 (0.5)	79.5	1.54
B	30	3.4 (0.9)	93.3	1.47
C	30	3.2 (0.3)	96.7	1.70
D	37	1.5 (1.0)	37.9	0.14
E	81	1.9 (0.8)	13.6	0.88
F	58	3.1 (0.5)	89.6	1.45

<sup>a</sup>Mean log count/cm<sup>2</sup> of positive samples

(B, C and F) had none of these features and two of them (Plants B and F) used a rotary fleece puller, resulting in higher total scores. Plant A, at which line speed was managed and two operators were used at some stations, had a score intermediate between the other two groups.

All six plants were sampled in the third national baseline study (16) and summary statistics of indicator organisms (APC and *E. coli*) isolated from their carcasses are presented in Table 2. In general, the ranking of the microbiological results of the carcass followed the ranking of the scores calculated using the software tool. Plants D and E had considerably (1–2 log) lower TVCs, *E. coli* prevalence and concentrations than did Plants B, C and F, with Plant A occupying an intermediate position between the two groups.

## DISCUSSION

The Australian sheep industry is spread over a large latitudinal range with intense seasonal changes involving rainfall and temperature effects on incoming livestock. In some cases, livestock are transported over vast distances to the abattoir.

Taken together, these factors account for a wide range of contamination on incoming livestock. The tool attempts to capture this variability in a Problem Score, which is establishment specific. The ability of each plant to cope with its unique incoming problem is then assessed by the Process Score for the plant. The tool removes the “one size fits all” approach to assessing slaughter and dressing, allowing each plant to be assessed on its

ability to control carcass contamination through its management and operational procedures.

It is emphasized that the score should be used as an indication only, not as a definitive assessment of the process. All plants already conform to the requirements of their Controlling Authorities, and no attempt should be made to “grade” plants.

Ideally, the tool will be used for process improvement because it gives the Quality Assurance (QA) Manager a check list that can be used to assess potential modifications to pre-slaughter and slaughter processes. For example, a management decision such as that taken by Plant E to accept only live-stock that have been crutched and have short fleeces (< 5 cm) will have clear implications on the degree of difficulty in keeping fecal contamination from meat surfaces.

Once on the slaughter and dressing floor, there are a large number of operational variables that can influence carcass contamination. In addition, line speed, and the ability to modify it by adjusting it and/or using additional operators at specific work stations, is an important influence on contamination (both visual and microbiological) of bodies.

The tool, while not a definitive guide, brings together various pieces of knowledge in a single place to assist QA and production staff to interrogate “what-if” scenarios that can assist in process improvement. The tool is available from the corresponding author.

## ACKNOWLEDGMENTS

We would like to thank the QA managers from various Australian sheep abattoirs who road tested the tool and provided valuable feedback on its usability. Jo Slade is also thanked for her help in the preparation of this manuscript, and two anonymous reviewers are thanked for the helpful comments and suggestions.

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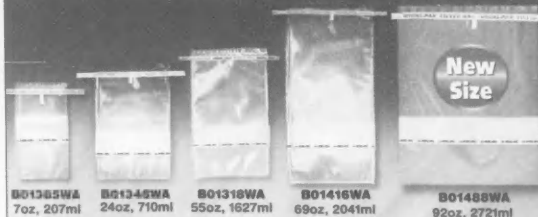
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# GENERAL INTEREST PAPER

## Control of *Salmonella* in Low-moisture Foods II: Hygiene Practices to Minimize *Salmonella* Contamination and Growth

Part two of a three-part series

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### ABSTRACT

Although low-moisture food products do not support *Salmonella* growth, the presence of low numbers of *Salmonella* can still cause illness. Therefore, the presence of the organism in low-moisture ready-to-eat foods must be prevented. To address the need for industry-wide guidance, the Grocery Manufacturers Association formed a *Salmonella* Control Task Force to develop guidance on the control of *Salmonella* when manufacturing low-moisture foods. Two of the control elements, preventing ingress or spread in a facility and controlling raw materials and incoming ingredients, were described in a previous paper. Here we focus on stringent hygiene practices in the Primary *Salmonella* Control Area, including control of movement of personnel and material; hygienic design principles, with particular attention given to ensuring that moisture can be excluded from the processing environment; and preventing growth in the facility by control of moisture, which is critically important in preventing *Salmonella* contamination of low-moisture products.

### INTRODUCTION

Over the past several decades, a number of outbreaks of salmonellosis have been associated with the consumption of low-moisture products such as chocolate, powdered infant formula, raw almonds, breakfast cereals, dry seasonings, paprika-seasoned potato chips, dried coconut, infant cereals and peanut butter. These outbreaks underscore the difficulty of eradicating *Salmonella* from the environment of dry product manufacturing facilities and highlight the need to reinforce industry preventive control measures through guidance based on the best available information. To address the need for industry-wide guidance, the Grocery Manufacturers Association (GMA) formed a *Salmonella* Control Task Force to develop guidance on the control of *Salmonella* when manufacturing low-moisture foods. Two of the control elements, preventing ingress or spread in a facility and controlling raw materials, were described in a previous paper (12). Here we focus on stringent hygiene practices, hygienic design principles and preventing growth in the facility.

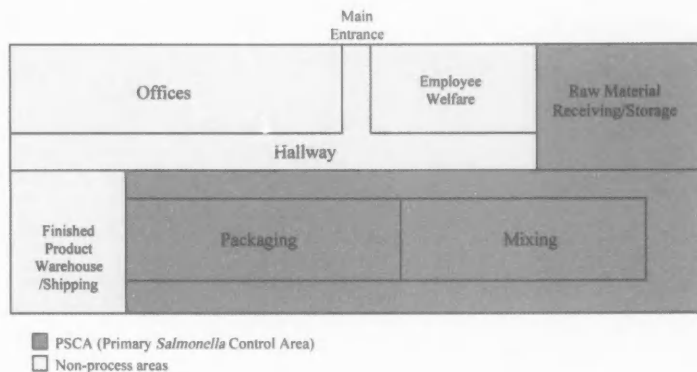
### SALMONELLA CONTROL ELEMENT 2: ENHANCE THE STRINGENCY OF HYGIENE PRACTICES AND CONTROLS IN THE PRIMARY SALMONELLA CONTROL AREA

The Primary *Salmonella* Control Area (PSCA) in a low-moisture product facility is the area where handling of ingredients

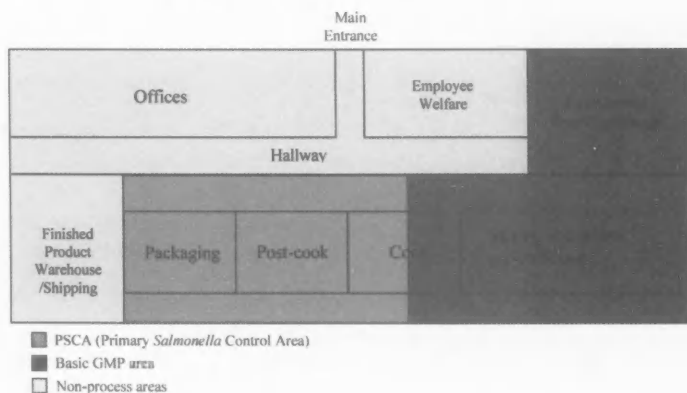
and product requires the highest level of hygiene control. In a facility where products receive a pathogen inactivation treatment, the PSCA is the area subsequent to the terminal lethality step. In a facility where no inactivation step is employed, e.g., a facility that produces a dry-blend mix, the entire process area may become the PSCA. Although there is a clear need to establish stringent hygiene control in the PSCA, practices in other areas of the facility should not be neglected, as they impact the hygiene conditions in the PSCA. In fact, maintaining stringent hygiene control in the PSCA depends on effective hygiene control in the rest of the processing area of the facility, which for comparison are designated the basic GMP area and, if one is established, the transitional area. The PSCA is sometimes referred to as the high hygiene zone or the high risk area (e.g., in Europe). The PSCA is also referred to as the ready-to-eat area, the critical side, or the dry side of the operation. The basic GMP area is also referred to as the basic hygiene area, the non-critical side or the wet side of the facility.

The separation of one manufacturing area in a facility from another is generally done to minimize contaminant transfer from one area to another, e.g., wet to dry areas, "dirty" (relatively speaking) to clean areas, raw material areas to finished product areas, or a basic hygiene area to a high hygiene area. Compartmentalization or segregation of the facility into specific areas is a common practice in food processing (7, 9). The separation of the low-moisture product manufacturing plant into areas of different hygiene levels

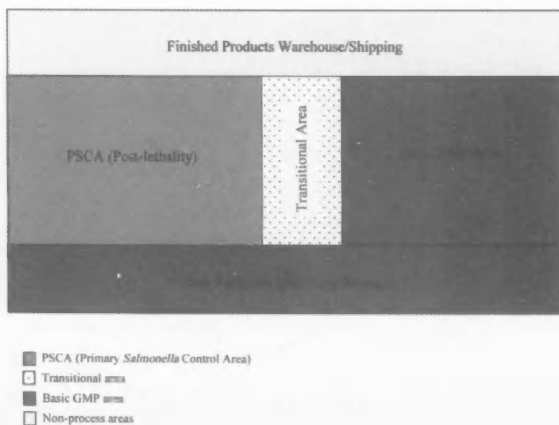
**FIGURE 1.** Example of a conceptual plant layout showing the entire process area as Primary *Salmonella* Control Area (PSCA) in red. The non-process area (e.g., warehouse and office) is in green. This layout may be applicable to products such as dry blends and snack bars.



**FIGURE 2.** Example of a conceptual plant layout showing two process areas with different hygiene control: a Primary *Salmonella* Control Area (PSCA) in red and a basic GMP area in blue. This layout may be applicable to products such as corn snack chips, cereals, and peanut butter.



**FIGURE 3.** Example of a conceptual plant layout showing three process areas with different hygiene control: a Primary *Salmonella* Control Area (PSCA) in red, a transitional area in a dotted pattern, and a basic GMP area in blue. The non-process area (e.g., warehouse, shipping) is in green (offices and employee welfare areas are not shown). This layout may be applicable to products such as infant formula.



with the establishment of a PSCA that is separated from the rest of the processing area is one of the first steps leading to effective *Salmonella* control (Fig. 1–3). Depending on the product and process and the intended consumer (e.g., general public, infants), the number of hygiene areas established in a facility in addition to the PSCA may vary. The objective is to minimize to the greatest possible extent the spread of *Salmonella* into the PSCA where preventing product contamination is the most critical.

Clearly defining the control measures necessary in the different areas is important to effectively control *Salmonella* in the processing environment, especially in the PSCA, and thus prevent contamination of finished products. As indicated previously, in the PSCA, processed products (and components of the products) not subjected to a further inactivation step are exposed to the environment and are vulnerable to contamination with *Salmonella* if the organism is present. As product contamination could have serious consequences for consumers, maintaining enhanced hygiene stringency in the PSCA area is extremely important. To ensure this high level of hygiene control in the PSCA, maintaining hygienic control of the basic GMP and the transitional areas must also be exercised. In comparison to the PSCA, the basic GMP area in the processing environment and the transitional area (if one is established, see below) are areas where *Salmonella* may occasionally be present. The occasional *Salmonella* contamination in these areas has a low likelihood of leading to finished product contamination, provided that the problem is detected and corrected in a timely manner. GMPs must be applied and adequate sanitation must be carried out (with wet or dry cleaning procedures as appropriate) in the basic and transitional areas to minimize potential *Salmonella* harborage sites that could become a source of contamination in the PSCA.

The degree of hygiene control in the facility may depend on the type of the operation and the analysis of the potential for *Salmonella* introduction. Generally, the stringency of hygiene control should increase from the basic GMP area to the transitional area to the PSCA. Particular emphasis should be placed on control measures for (physical) separation, passage of traffic (personnel, equipment, materials, etc.), air flow, cleaning processes and whether or not wet cleaning is permitted and how water is used (discussed further in Element 4), and verification (discussed further in Element 7) (3).

The degree of separation between the different hygiene areas within a facility may vary, depending on the product and

**TABLE 1. Example of desirable features for a buffer area at the entrance to the Primary *Salmonella* Control Area (PSCA)**

- Entry and exit doors of the buffer area to the PSCA are tightly fitted; internal cores are filled and if necessary equipped with self-closing devices.
- Insect light traps, if used, are installed outside the entry door to the buffer area (i.e., the door facing the non-critical side).
- Floor is properly sloped for drainage and sloped towards the non-critical side. Preferably no drains are installed in the area.
- A bench is provided for shoe change. Two sets of open shelves are provided: one for "dirty" shoes worn before entering the buffer zone, and the other for clean shoes worn in the PSCA. Air exhaust is used (if necessary such as when the buffer area is small) to remove shoe odors.
- Hands-free hand washing sink is provided and it is located on the non-critical side of the buffer area or just outside the buffer area on the non-critical side. Drying hands with paper towels is recommended. Hand washing is done on the non-critical side because wherever there is a handwashing station, the surrounding floor may become wet. Moisture on the floor should be minimized to the extent possible in this area, and care should be taken that this moisture not be transferred to the PSCA.
- After shoe-change and other changes, hands may be treated with a disinfectant spray.

process (9). Barriers are placed between the different hygiene areas to restrict traffic and prevent vectors (potential sources of *Salmonella*) from passing between the basic GMP area and the PSCA. Examples of vectors include dirt on shoes or clothing, pallets and packaging materials, pests, dust, and sometimes water. Examples of physical barriers are walls, doors, split conveyors, filters, etc. Examples of other barriers are pallet exchange, shoe-change, removal of outer bag packaging, marked limits on floors, etc. Whenever possible and necessary, there should be no direct connection between the PSCA and the basic GMP area. Access to the PSCA should ideally be through a buffer area (i.e., a vestibule or anteroom, hygiene juncture) where personnel take steps to minimize carrying contaminants into the PSCA. In addition, hygienic facility design and plant layout to direct the flow of personnel and traffic is an effective control measure to minimize the transfer of contaminants from one area to another (10). The air supply to the PSCA should be suitably filtered to prevent airborne contamination. Ideally, the PSCA should be maintained under positive air pressure to prevent the entry of contaminated air from the outside or from surrounding areas of the manufacturing facility (2, 7, 9).

The determination of whether a location in the facility belongs to the PSCA, the transitional area or the basic GMP area should be based on an evaluation of risk. An area can be evaluated based on the probability of *Salmonella* being present and the proximity of the area to the finished product. For example, a location that is "medium" or "high" on the probability axis, and "near" on the proximity axis would belong to the PSCA (Fig. 4), while a location that is far away on the proximity axis, or medium distance on the proximity axis and low on the probability axis would

fall into the basic GMP area. By using this approach, a facility may be divided into areas with different levels of hygiene control. An evaluation of risk and mitigation strategies can also be used to determine the appropriate control measures for the PSCA. For example, in a facility that uses raw materials known to be contaminated with *Salmonella* or in the event of the presence of persistent *Salmonella*, more stringent controls would be needed.

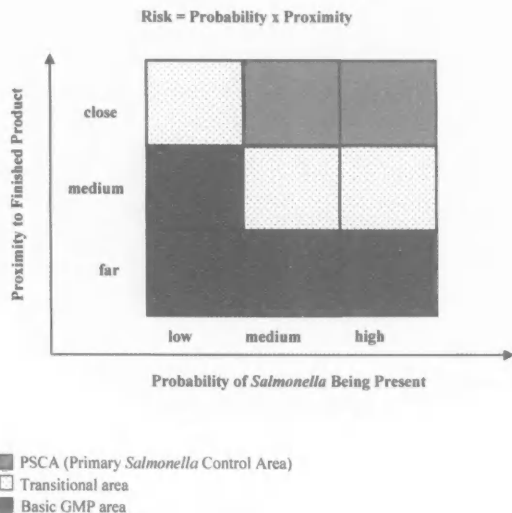
#### Common industry practices

- Establish designated areas in the facility with different levels of hygiene controls to minimize the spread of *Salmonella*.
  - Establish a Primary *Salmonella* Control Area (PSCA) within the process area of the facility.
  - Depending on the type of operation, a facility may generally be divided into one, two, or three processing areas (in addition to the non-processing areas). For example, an operation that does not employ an inactivation step may designate the entire processing area as the PSCA, e.g., a spice blending operation, a snack bar or nutrition bar operation, and other mix and pack operations (Fig. 1). An operation that employs an inactivation step may designate the processing area after the inactivation step as the PSCA and the rest of the processing area as the basic GMP area, e.g., a corn snack chip operation (Fig. 2). In addition to the basic GMP area and the PSCA, an operation

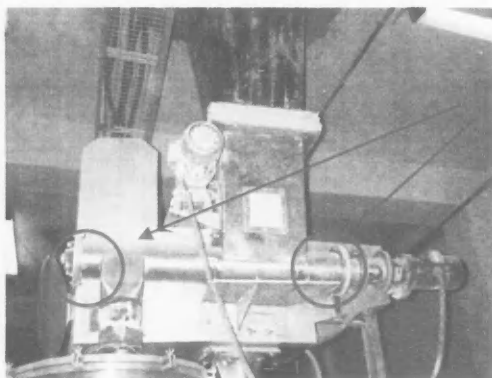
with an inactivation step may employ a transitional area to further enhance hygiene control in the PSCA, e.g., a powdered infant formula operation (Fig. 3). In general, the more sensitive the product or the consumer, the more important the separation of the facility into different hygiene areas to facilitate the implementation of enhanced controls in the PSCA.

- Depending on the type of operation and the hazard analysis, it may be desirable to establish a buffer area upon entrance into the facility and/or upon entrance into the PSCA. The buffer area is where traffic restriction can be implemented and different types of hygiene procedures can be applied. The buffer area, if established, should be designed to reduce the potential for introducing contamination into the PSCA, either through workers or through other items such as packaging materials, cleaning tools, and equipment. Examples of desirable features for buffer areas at entrances to the PSCA in an infant formula facility are listed in Table 1.
- Establish barriers for the PSCA. Barriers can be established at entrances and exits of the PSCA, or exits of the basic GMP and transitional areas. The barriers serve to completely or partially separate the PSCA from the rest of the facility. Physical separation of the PSCA from the rest of the processing area is par-

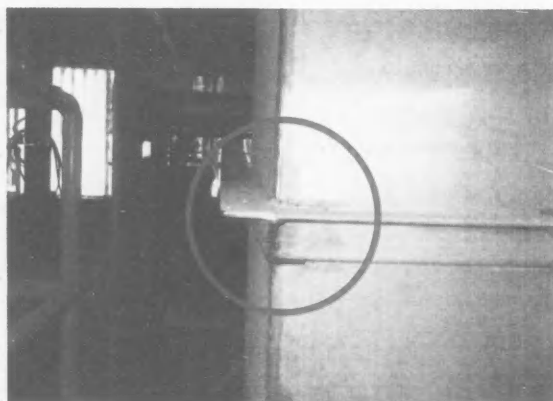
**FIGURE 4.** An example of using a risk evaluation approach for determining hygiene areas in a facility. In this approach, the risk of *Salmonella* contamination in finished product is proportional to the probability that *Salmonella* is present in the process area and the proximity of the area to the product before packaging.



**FIGURE 5.** Ends of a horizontal screw conveyor – always a potential area of stagnant product build-up.



**FIGURE 6.** A flat surface that can collect product (this should be eliminated or sloped).



ticularly important for operations that use raw ingredients in which *Salmonella* is unavoidable (e.g., raw cocoa beans, raw nuts and grains).

- Upon entrance to the facility, traffic may move between the basic GMP area and the transitional area without additional barriers. Movement of personnel and materials into the PSCA is controlled to various degrees depending on the type of operation. The riskier the product, the greater the need to have physical separation. For example, in powdered infant formula production, it is desirable to have a physical separation of the PSCA (walled off from the rest of the operation).
- Another example is peanut processing, where the raw side of the process is separated from the rest of the facility. The area in which raw peanuts are dumped into the roaster is physically separated from the roaster exit. A hygiene juncture is maintained at the entrance of the raw side of the process where gowning and boot changing, which may be color coded, occurs. The gowns and boots are removed when a worker exits the raw side, and a new set of attire is worn on the finished side. This is also the case for cocoa bean handling and processing.

- Control all traffic between the PSCA and the rest of the facility, including the movement of personnel and materials. Avoid activities that may lead to contamination of the PSCA. The following list of activities should be considered:
- Direct traffic between the raw side and the finished product side. Movement of personnel and materials (e.g., ingredients used in dry-mixing, packaging materials, pieces of equipment, carts, and cleaning tools) into the PSCA should be minimized and strictly controlled. Prior to entering the PSCA, personnel should follow established hygiene procedures in a buffer area or vestibule. These may include removing clothing/boots worn in the raw side of the process area and replacing them with clothing/shoes and other protective gar-

**TABLE 2. Example of steps for implementation of barriers and other controls to maintain enhanced stringency of hygiene in the Primary *Salmonella* Control Area (PSCA)**

Step 1	• Form a multidisciplinary team.
Step 2	• Define different areas within the facility in relation to hygienic requirements (e.g., PSCA, basic GMP area, transitional area). Establish required level of product protection using a hazard analysis or a risk assessment approach. The first priority is to prevent product contact surface contamination with <i>Salmonella</i> . • Map all circulation of people, incoming materials, waste, rework, etc. on a flow chart. Access to the PSCA should be limited to essential persons or activities only. • Establish barriers where appropriate and clearly define their purpose. Barriers should be acceptable and practical for all persons who enter the area regularly or for specific purposes (e.g., sampling, maintenance, etc.) • Take into consideration elements such as drainage and floor slopes; drainage and equipment positions; personnel and material routes; rework handling; storage of spare parts, maintenance tools and cleaning equipment; fire protection devices; conveyors; Clean-In-Place circuits; waste collection; air conditioning; air handling system; etc.
Step 3	• Define construction and equipment design standards to meet hygiene requirements. • Protect the PSCA during equipment installation to ensure that uncontrolled items/personnel and potential contaminants of concern cannot pass.
Step 4	• Establish routine procedures that describe what can and cannot pass the barriers and procedures for passing them. • Establish procedures to monitor and document barrier efficiency. • Establish procedures for maintenance, including routine and unscheduled maintenance.
Step 5	• Establish a master sanitation schedule to assure timely and effective sanitation of equipment and the processing environment.
Step 6	• Train all personnel who enter the PSCA and others concerned about the barriers and procedures, their purpose, use and maintenance. Retrain operators as often as necessary to maintain sanitary practices.

ments designated for use in the PSCA. Washing and drying hands prior to entering the PSCA is also important.

- Dedicated workers may be assigned to hygienic areas at the facility.
- Dedicated equipment, pallets, utensils and other tools should be used in the PSCA.
- Bringing products and ingredients into the PSCA without appropriate decontamination/treatment should be avoided. Additional controls are outlined in Element 5 for ingredients that are mixed into the finished product without a lethality step. Procedures for handling dry ingredients to be added to the finished product without a further inactivation step are elaborated in Element 5 (12).
- Prevent or minimize dust moving into the PSCA from the other areas by physical separations such as walls and by other means such as air filters and positive air pressure in the PSCA relative to the other areas of the facility.
  - Air filters should be installed and maintained in the ventilation system. The type of filters may vary from simple

dust filters to High Efficiency Particulate Air (HEPA) filters, depending on the product, process and the intended consumer.

- Where necessary and depending on the product and hazard analysis, further steps may be taken to filter air used in direct contact with product (e.g., for product cooling or powder transport) by using a HEPA filter applied at a point close to the line. When using HEPA filtered air in direct contact with product, it is more efficient to apply the filtration close to the point of use rather than filtering all air entering the PSCA with a HEPA filter.
- Establish a master sanitation schedule to assure timely and effective sanitation for the basic GMP and transitional areas (if one is established).
  - Use wet or dry cleaning procedures as appropriate.
  - Dry cleaning involves the use of tools such as vacuum cleaners, brooms, and brushes. Dry cleaning in the basic GMP and transitional areas may be followed by a wet cleaning as appropriate.

- To be effective, a wet cleaning should include complete cleaning and sanitizing cycles (for equipment, etc.). Partial wet cleaning without sanitizing should be avoided because a sanitizing step is critical to inactivate microorganisms after cleaning. Whenever water is introduced into the facility, thorough cleaning must be followed by sanitizing and drying as appropriate.

- Establish appropriate cleaning and hygiene procedures for the PSCA and the buffer/vestibule area at the entrance to the PSCA.
  - Use dry cleaning as the routine cleaning practices in the PSCA (discussed further in Element 4).
  - Use dry cleaning and controlled wet cleaning for the buffer/vestibule area leading to the PSCA (discussed further in Element 4). Keep the area as dry as possible.
  - Keep the PSCA dry, including floors, ceilings, equipment, products, and all other objects in the area. It is preferred that no drains are installed in this area; if there are drains, the floor surrounding them should

**TABLE 3. Sanitary design principles for equipment\***

1. **Cleanable.** Equipment should be constructed to facilitate effective cleaning that is verified by environmental monitoring.
2. **Made of Compatible Materials.** Construction materials used for equipment must be compatible with the product, environment, and dry cleaning and, when needed, wet cleaning and sanitizing.
3. **Accessible for Inspection, Maintenance, Cleaning and Sanitation.** When needed, equipment should be easily disassembled for sanitation without requiring special tools not normally used in food facilities.
4. **No Liquid Collection.** No stagnant product build-up or liquid collection areas. Equipment should be self-draining to assure that residues do not accumulate or pool on the equipment.
5. **Hollow Areas Eliminated or Sealed.** Hollow areas of equipment must be eliminated whenever possible or permanently sealed. Items such as bolts, studs, mounting plates, brackets, junction boxes, nameplates, end caps and sleeves should be continuously welded to the surface and not attached via drilled and tapped holes.
6. **No Niches** (e.g., no pits, cracks, corrosion, crevices, recesses, open seams, gaps, lap seams, protruding ledges, inside threads, bolt rivets, or dead ends). Welds should be ground and polished smooth.
7. **Sanitary Operational Performance.** During normal operations, the equipment must perform so that it does not contribute to unsanitary conditions or the harborage and growth of bacteria.
  - 7.1. **Hygienic Design of Maintenance Enclosures.** Human/machine interfaces such as push buttons, valve handles, switches and touch screens, must be designed to ensure product and other residues (including liquid) do not penetrate or accumulate in or on the enclosure or interface.
  - 7.2. **Hygiene Compatibility with Other Plant Systems.** Equipment design should ensure hygienic compatibility with other equipment and systems, such as electrical, hydraulic, steam, air and water systems.
8. **Validate Cleaning and Sanitizing Protocols.** Procedures for cleaning and sanitation must be clearly written, designed and proven effective and efficient. Chemicals recommended for cleaning and sanitation must be compatible with the equipment and the manufacturing environment.
9. **Separate Processes Wherever Possible.** Operations of different processes in food manufacturing plants should be properly separated to prevent cross contamination and/or adulteration.
10. **Meet Personnel Hygiene and Sanitation Requirements.** All plant personnel, contractors and visitors must be trained and required to follow plant hygienic and sanitation requirements – NO EXCEPTIONS

\*Adapted from an American Meat Institute document (1, 13) targeted to *Listeria* control in high-moisture products. In many cases, the general principles for sanitary design for high-moisture are appropriate to low-moisture products.

be properly sloped for drainage and kept dry under normal conditions.

- Maintain the PSCA to avoid cracked or damaged floors, hollow unsealed objects and poorly installed equipment.

- Keep the air used in the PSCA dry, including air entering the area and used to dry the product. If compressed air is used, steps should be taken to continuously dry the air, as moisture may be trapped in the compressed air.

- Product accumulation (i.e., on walls, ceilings, conveyor belts, lids and walls of batch tanks or mixing tanks, and the bottom of a bucket elevator) should be removed in a timely fashion through routine housekeeping. This is particularly important for products that are hygroscopic or in environments of high humidity leading to moisture absorption and localized condensation.
  - Poor equipment design may lead to residue accumulation and should be corrected to eliminate the problem where feasible (see more discussion in Element 3).

- An example of steps for implementing barriers and other controls in the PSCA is shown in Table 2. All or some of these steps may be used as appropriate, depending on the product and process.

### **SALMONELLA CONTROL ELEMENT 3: APPLY HYGIENIC DESIGN PRINCIPLES TO BUILDING AND EQUIPMENT DESIGN**

It is probable that a food manufacturing facility will be challenged with the introduction of *Salmonella* through numerous vectors, including contaminated ingredients, employee or equipment traffic, or infrastructure issues (breached roofs or drainage). The application of appropriate hygienic design standards to building design and layout, equipment, process and infrastructure is essential to ensure that if *Salmonella* is introduced it does not find a niche and become a resident/endemic strain but rather remains transient.

Optimal hygienic design of equipment and infrastructure is recognized as

critical to the business by manufacturers of microbiologically perishable foods. Optimal design and equipment maintenance for these processes is directly related to achieving desired product shelf-life, minimizing consumer complaints and enhancing company profitability. Conversely, manufacturers of low-moisture products too often have not had hygienic design and maintenance of equipment and infrastructure as a primary focus, given that product shelf-life is not dictated by microbial growth. The industry hygienic design mindset has been shaped by the belief that microbial issues are not a concern because of the stability of low water activity foods. Indeed, microbial growth will not occur in foods maintained at water activity below 0.60.

Highly visible recalls associated with these low water activity foods have convinced manufacturers of low-moisture products that their foods are susceptible to post-process contamination by infectious, pathogenic microorganisms. These pathogens will not grow in the food, yet they may survive for the duration of the product shelf-life and cause foodborne illness if consumed.

**TABLE 4. Types of cleaning in a low-moisture product manufacturing facility**

Dry cleaning	No water is used. Dry cleaning is the physical removal of residues (food particles, dust, etc.) by actions such as sweeping, brushing, scraping, or vacuuming the residues from equipment surfaces and the plant environment.
Wet cleaning	Water can be applied. However, certain practices should be avoided, e.g., excessive use of water (floor is flooded with water), high pressure hoses. Instead, water should be used on an as-needed basis and should be minimized and isolated to specific areas where possible. Complete drying after the wet cleaning is essential.
Controlled wet cleaning	A limited amount of water is used. Complete drying must follow immediately after the controlled wet cleaning. Specific pieces of equipment may be moved out of the Primary <i>Salmonella</i> Control Area, wet cleaned, sanitized, dried and then returned.

The manufacture of foods is accomplished by processes within areas of the manufacturing facility with differing requirements for water. The requirement for water during processing or sanitation typically defines the equipment and process hygienic design standards. These differing design standards do not reflect a lower hygienic expectation, but rather the appropriate approach to maintaining the equipment and process in a hygienic state, given the risk that water presents in terms of microbial growth. The equipment, surroundings and infrastructure that remain in a dry state (e.g., grain silos, dry blending, chocolate processing) generally will not be exposed to water and therefore have design standards that differ from the standards of equipment requiring water for food processing or sanitation.

Because limiting water is the primary means of controlling *Salmonella* in low-moisture food manufacturing, it is imperative that the relationship of each process point and installation to water sources be evaluated. Simply put, the type of cleaning necessary at each process point will determine water usage. Food allergens often complicate this evaluation, as installations may need to be designed to remove food allergens by using water that otherwise would not be required. The selection of the appropriate hygienic design standards begins with identification of the method of cleaning that will be employed at each process point. It is important that the key stakeholders define the hygienic needs (i.e., type of cleaning) of an installation and forecast the future usage of the manufacturing line and process. New manufacturing line installation is very expensive, and the desire for manufacturing flexibility is very high. The cost of retrofitting a manufacturing line and surrounding infrastructure designed to operate in a dry state to one that accommodates water is much higher than if the process had been designed originally to accommodate water.

A multidisciplinary food safety team should determine the current and, to the

extent possible, future plans for the manufacturing line and surrounding infrastructure. From these plans, the team should identify the new line's and infrastructure's relationship to water. The hygienic design standards will focus primarily on accessibility for dry cleaning and dust control if the equipment and process will remain in a dry state and receive only dry sanitation. Conversely, if the installation requires water, the focus on the installation and infrastructure will require a design that accommodates water, prevents microbial growth niches and receives microbiologically focused sanitation.

#### Common industry practices

- Building design and layout should be based on hygienic principles, using common practices such as those outlined in the literature (2, 4, 5, 6, 8).
- A common approach should be applied to sanitary design that keeps the equipment design as simple as possible and strives for a minimum number of parts, with all parts and assemblies accessible for inspection and cleaning. A program should be established for design review of equipment based on sanitary design principles, including some or all of the principles outlined in Table 3 as appropriate.
  - Review new equipment prior to purchase for sanitary design and layout. The proposed layout and placement in the facility should be evaluated to confirm that access necessary for proper cleaning is not compromised. The presence of the new equipment should not compromise the cleanability of existing machinery.
  - A similar review should be conducted for equipment that is relocated from one facility to another.
- Plans to modify existing equipment should be reviewed by the plant food safety team prior to beginning the alteration.
- Existing equipment should be periodically reviewed to verify that it still meets sanitary design principles and has not been altered in a manner that would compromise the sanitary design or cleanability of the equipment. Existing equipment should be modified when necessary to eliminate difficult-to-clean areas (such as unsealed hollow components, scratched surfaces, crevices, poor sanitary welds, etc.) and design features that may lead to residue build-up or stagnant products. Examples of poor design features are shown in Figures 5 and 6.
- If water will be used, the infrastructure and equipment must be designed to accommodate water. Development of microbial growth niches must be prevented. Water drainage from the process in the facility must ensure rapid drying. Additionally, the infrastructure must be designed to prevent entry of unwanted water from surrounding processes or from outside the facility.
- Particular attention should be given to sanitary design, layout and maintenance of equipment located in the Primary *Salmonella* Control Area (PSCA) to ensure that moisture can be excluded from the processing environment, including the utilization of dry cleaning procedures (see more details in Element 4). Conditions leading to the formation of condensate should be eliminated or minimized to the greatest extent possible.

**TABLE 5. Examples of common industry procedures for controlled wet cleaning**

- Remove as much residue as possible by dry cleaning.
- Avoid overuse or careless use of water. Procedures for collecting water should be in place to prevent water spreading on the floor or following product conveyance lines or other connections to non-wet cleaned areas of the facility.
- Commercial pre-moistened sanitizing wipes may be used to spot-clean specialized areas with minimal introduction of water.
- Never use high pressure water application, even for situations such as to get rid of dry build-ups, as the over-spray will spread to other areas and contaminants can be aerosolized.
- When drains are not used for wet cleaning they must be sealed.
- During cleaning, there should be no changes in procedures for entering the Primary *Salmonella* Control Area — all barriers still apply, e.g., entering through the buffer area and following required procedures.
- Always apply a sanitizing step following the controlled wet cleaning.
- Ensure prompt and complete drying of all areas and components involved (equipment, parts, floors, the environment, etc.) after controlled wet cleaning. All equipment parts and environmental sites must be visually inspected for any remaining wet spots before the sites are released for production. Consideration should be given to evaluating the microbiological quality of the first product through the equipment to verify the efficacy of the controlled wet cleaning process.

- Hygienic design standards and strict adherence to sanitation performance specifications must be applied to construction and major maintenance activities. These activities can dislodge microbial growth niches and lead to widespread contamination of the facility. The plant food safety team should evaluate this work and conduct an evaluation of the risk of introducing physical, biological or chemical hazards into the facility. Based on this evaluation they should define and implement the appropriate preventive measures, such as temporary isolation of the construction or maintenance sites, rerouting of employee and equipment traffic, proper handling of waste material egress, maintaining negative pressure in the work site, etc.
- Equipment maintenance should follow hygienic procedures such as those described in Element 1 (12) and Element 2 as appropriate. Unscheduled maintenance is particularly risky, and hygienic procedures should be strictly followed.
- A wide range of accessory tools such as supports and ladders may be located inside large equipment or inside the PSCA. Hygienic design is critical and these tools/structures should not have features such as hollow bodies, loose parts or uncleanable surfaces.
- Elevated infrastructure should be designed to minimize dust and dry material accumulation, especially when pipes, overhead structures and platforms are **directly** above exposed products or production lines.

#### **SALMONELLA CONTROL ELEMENT 4: PREVENT OR MINIMIZE GROWTH OF SALMONELLA WITHIN THE FACILITY**

Moisture control is critically important in preventing *Salmonella* contamination in low-moisture products (11). Water in the dry processing environment is one of the most significant risk factors (perhaps the single most important factor) for *Salmonella* contamination, as water allows for pathogen growth, significantly increasing the risk for product contamination. Industry experience indicates that the presence of water, even in very small amounts present for short, sporadic time periods, may allow *Salmonella* to grow in the environment. At times, moisture is obvious in the form of water droplets or puddles; at other times, it may be from sporadic sources such as roof leaks. However, many sources of moisture, such as high relative humidity or moisture accumulating inside of equipment, are not visually apparent.

*Salmonella* can, to varying degrees, be introduced into low-moisture product manufacturing facilities and become established in those environments. Harborage sites may develop and become a source of product contamination unless these sites are identified and eliminated (2). A harborage site, or niche, is a site in the environment or on equipment (junctions, cracks, holes, dead-end areas, etc.) that enables the accumulation of residues (food debris, dust, and water) and permits the growth of microorganisms such as *Salmonella*. These sites may be difficult to inspect or access and therefore can protect *Salmonella* during routine cleaning and sanitizing.

Growth of *Salmonella* is possible only in the presence of water. Since food par-

ticles and dust are normally expected to be present in processing areas, adequate nutrients are always available to microorganisms. Growth cannot occur, however, if the plant environment is sufficiently dry. The potential *Salmonella* harborage sites become more significant when water is present for a sufficient period of time.

The presence of water in the dry processing environment can result from improper use of water during cleaning, which has been linked to the occurrence and spread of *Salmonella* (2). Other events resulting in the presence of water in a dry area include condensate formation, leaking water or steam valves, infiltration of water following heavy rains (e.g., leaky roofs), the use of water showers in the case of fire emergencies, etc. (2). Efforts must be made to remove water immediately from the PSCA in such events in order to keep the plant environment as dry as possible. Dry conditions must be maintained at all time in the PSCA, except for the occasions when controlled wet cleaning is deemed essential. Potential problems arise when there is visible water present in the dry areas or when there are areas in which standing water has dried. *Salmonella* may be found not only in wet spots but also in spots where standing water has dried (14). The latter situation may present an additional risk of spread via the generation of airborne contaminated dust.

Dry cleaning is typically employed when conducting sanitation in the PSCA. The objective is to eliminate water from the area so that, despite the presence of food and other substrates, microorganisms (including *Salmonella*) will not grow. Without growth, *Salmonella*, if present, remains at very low levels, thus reducing the risk of product contamination. Dry cleaning has been successfully applied for many years in production of low-moisture



**TABLE 6. Examples of tools for dry cleaning and their uses**

Tools	Design features and usage
Brushes, scrapers	<ul style="list-style-type: none"> <li>- Choose tools with sanitary design that do not create hygienic problems. These tools should be cleanable, durable and without loose parts. The handles and supports should have no spaces where residues can accumulate. If the handle is hollow (e.g., to control weight for practical reasons), it should be sealed.</li> <li>- A tool that is used for cleaning product contact surfaces should not be used for cleaning floors, drains, and ceilings.</li> <li>- Provide a designated area to store cleaning tools not in use, e.g., hooks, hangers, storage cabinets, etc.</li> <li>- Check all brushes and scrapers regularly and replace them as needed. Do not use tools that are worn and could become potential sources of foreign materials and contamination.</li> <li>- Dry clean the tools. Wet cleaning is done only in designated areas and only if the tools can be dried promptly and completely; it must be done using controlled wet cleaning.</li> </ul>
Vacuum cleaners	<ul style="list-style-type: none"> <li>- Portable vacuum cleaners with appropriate design features are recommended for dry cleaning to avoid or limit the spread of dust. A vacuum cleaner has the advantage of collecting and retaining residues in a dust container. They can also reach difficult-to-reach places. For example, a vacuum cleaner is preferred to remove residues on overhead structures such as wiring supports and pipes (using a brush in this case would create and spread dust).</li> <li>- Desirable design features for vacuum cleaners are described in Table 7.</li> <li>- A vacuum cleaner used in the Primary <i>Salmonella</i> Control Area (PSCA) should not be used outside the area. A vacuum cleaner that is used for cleaning inside equipment should not be used for cleaning the floor. Dedicated accessories should be used accordingly. The dust bag should be removed in an area isolated and as far away as possible from the process line (but still in the PSCA). The vacuum cleaner dedicated to the PSCA should not be taken outside the PSCA for emptying because it could transport contaminants on its return.</li> <li>- A vacuum cleaner will be an efficient tool only if it is well maintained in such a way that it does not become a carrier of contamination, e.g., protected against water and moisture, making sure attachments are well fitted. If a vacuum cleaner used in the PSCA needs cleaning or maintenance, it can be done in a dedicated/isolated area in the PSCA or it can be protected by a plastic cover and transported on a pallet to a dedicated area outside the PSCA. After maintenance, the vacuum cleaner should be dry-cleaned. On rare occasions when necessary (e.g., when contamination is detected), the exterior of the vacuum cleaner can be subjected to controlled wet cleaning, sanitizing, and drying prior to use again.</li> <li>- Filter(s) should be properly maintained on a regular basis and replaced when necessary.</li> <li>- Central vacuum cleaners, if they are used, should be used with caution because these tend to have lengthy pipes that are difficult to clean and maintain. They can also harbor insects.</li> </ul>

foods such as dried milk and infant cereals to prevent product recontamination with *Salmonella*.

Dry cleaning is especially important in older facilities or in older areas of facilities that were not originally designed on the basis of current sanitary design principles. In such facilities, in spite of regular maintenance, there may be cracks or other harborage sites that may be difficult to eliminate. Even if dust or food residues may enter such a site, potential problems can be minimized if the residues and the sites are dry. Once water enters the harborage site, microbial growth can occur and the potential risk of contamination to the environment and eventually to the product is increased. Many years of industry experience shows that, even though the environment may appear a little dusty after dry cleaning, this is a far more hygienic condition (on a microbial level) than a wet-cleaned environment without visual

dust. Serious *Salmonella* problems may develop when wet cleaning introduces moisture under equipment supports, into floor cracks and other difficult-to-clean or "hidden" spots where complete drying is not achieved.

Product accumulation should be removed as soon as possible (11). Occasionally there are special circumstances, such as finding environmental sites positive for *Salmonella*, which requires that equipment not designed for wet cleaning be wet cleaned. Extreme care must be taken to understand the risks and to formulate a plan that will successfully eliminate the contamination without spreading and enhancing the problem. Dry and controlled wet cleaning may be required, including clean-out-of-place with disassembly, cleaning and sanitizing, drying and reassembly. It is recommended that a multidisciplinary team be formed that has the appropriate expertise to plan and oversee this type of high-risk operation.

### Common industry practices

- ❑ Minimize the use of water in the entire plant environment.
- ❑ Specify the type of cleaning practices to be used in different hygiene areas, i.e., the basic area, transitional area, and PSCA. There are three types of cleaning (Table 4): dry, controlled wet and wet cleaning. Dry, wet and controlled wet cleaning in the different hygiene areas should be used at appropriate frequencies, which may be modified based on the specific product and process.
- ❑ Choose dry cleaning as the routine cleaning practice in the PSCA. Use controlled wet cleaning infrequently in a prudent manner and on an as-needed basis. Do not use wet cleaning or use it only in very rare cases in

**TABLE 7. Desirable design features for vacuum cleaners based on the location of use**

For use outside the Primary *Salmonella* Control Area (PSCA):

- Practical easy-to-empty vacuum cleaners equipped with a normal dust trap filter (for both large and small particles, but not necessarily a microbiological filter) and a removable and replaceable bag. To prevent dust from re-circulating to the air with the exhaust, a filter is installed on the outlet of the vacuum cleaner and maintained properly.

For use inside the PSCA:

- Should be made of stainless steel except certain accessories, contain a multiple-stage filtration system with replaceable bag for dust collection, and have practical and easy-to-clean or easy-to-replace accessories.
- Should have a detachable stainless steel trolley, straight stainless steel wands, flexible plastic hose, round brush, crevice cone or floor nozzle to be used as appropriate for the purpose.
- Exhaust fan and motor of the vacuum cleaner should be located above the dust collector;
- Accessories and spare parts can be easily obtained when replacement is needed;
- Accessories fit tightly when attached;
- Exterior is cleanable;
- Absence of fittings (wheels, etc.) that can accumulate dust.
- The vacuum cleaner should have a multiple-stage filtration system, which may include features such as a large main filter to ensure even airflow; a microfilter to protect the motor and acts as a barrier to small size particles; a HEPA (High Efficiency Particulate Air) filter with 99.97% efficiency in removing particles and bacteria down to 0.3 microns; and/or a ULPA (Ultra Low Penetration Air) filter that retains 99.999% at 0.12 microns. A HEPA filter should be used for at least some part of many operations (e.g., for a unit used to clean product contact surfaces). Whether a ULPA filter is needed would depend on the nature of the product and the point/area of use (e.g., equipment vs. floor in PSCA, inner surface vs. outer surface of equipment).

the PSCA, e.g., in response to a product contamination incident.

- When controlled wet cleaning is necessary, care must be exercised such that only the minimum amount of water is used. Table 5 lists common procedures for controlled wet cleaning. It is recommended that the environment of the wet-cleaned area be tested for *Salmonella* to verify sanitation effectiveness – see Element 7 (3). Areas/situations where controlled wet cleaning may be necessary include the following:
  - In the case of an unusual event, such as a roof leak or a faulty sprinkler that may lead to potential product contact surface contamination in the PSCA, production should be stopped. The leak should be fixed, and the area cleaned, sanitized, and dried before production resumes.
  - Wherever possible, remove parts of equipment and conduct controlled wet cleaning on them in a room dedicated to cleaning.
  - When controlled wet cleaning is done in a certain area of the PSCA, the area should be segregated and care must be taken so that the cleaning activities do not adversely impact the adjacent areas.
  - Other examples of situations in which controlled wet cleaning is needed include when

the buffer area upon entry to the PSCA becomes dirty and requires cleaning, when there is a need to remove sticky build-ups and to remove allergens, etc.

- Eliminate water in the PSCA. Water distribution systems (piping, etc.) should also be limited to the greatest extent possible.
  - In order to maintain the PSCA as dry as possible, the use of "dry drains" (i.e., drains that are physically capped with an impermeable barrier when not being used to collect water) is recommended.
  - In production where hygroscopic products are made, procedures should be in place to remove as soon as possible accumulated product to avoid moisture build-up and localized condensation.
- Establish appropriate dry cleaning procedures for the PSCA.
  - The goal of dry cleaning is to collect, remove and dispose of residues without redistributing them or cross contaminating the environment. Examples of dry cleaning tools and their uses are described in Table 6. Personnel responsible for maintenance, cleaning and checking the tools should be designated and properly trained.

- In addition to tools such as brushes and scrapers, vacuum cleaners are useful for dry cleaning. When vacuum cleaners are used, it is desirable to dedicate individual vacuum cleaners to specific areas, so that vacuumed material can be tested as part of the environmental monitoring program – see Element 7 (3). If the material tests positive for *Salmonella*, there is a limited area to search for the source of the contamination. In addition, the contaminated vacuum has not been used in other areas around the plant and the contamination is confined. Desirable design features for vacuum cleaners are described in Table 7.
- The objective of dry cleaning is to remove residues without the use of water by using tools or cleaning aids that do not entail the application of water or other aqueous solutions. Where appropriate, "blasting" with dry CO<sub>2</sub> pellets or other dry abrasives can be an effective method for removing stubborn residues on equipment or facility surfaces without introducing water. Hot oil may also be used to flush the interior of equipment used to handle low-moisture products such as peanut butter or chocolate.

- Sanitizers that will rapidly evaporate after contact, such as alcohol-based sanitizers, provide a means to spot-sanitize equipment with a very minimal introduction of water. For example, critical or sensitive spots (such as electrical equipment control panels) can be dry-cleaned and then sanitized with an alcohol-based sanitizer. However, it is not possible to sanitize a dirty surface, such as an area with dry soils that cannot be removed effectively. These sanitizers are flammable; caution should be taken to prevent explosion or fire during application.
- Compressed air should generally not be used for dry cleaning except in special situations (e.g., to dislodge dust from inaccessible points). Moreover, if and when compressed air is used, it should be dried and filtered to exclude microorganisms and moisture prior to use. Water traps in compressed air systems can be included as part of the environmental monitoring program and be tested for indicator organisms (e.g., Enterobacteriaceae), as well as *Salmonella*.
- Dry cleaning should be monitored and verified by visual observations and environmental monitoring.
- Separation of cleaning tools used in different hygiene areas is important and can be accomplished using color coding or other suitable means.

## CONCLUSIONS

The Primary *Salmonella* Control Area (PSCA) in a low-moisture product facility is the area where handling of ingredients and product requires the highest level of hygiene control. All traffic between the PSCA and the rest of the facility, including the movement of personnel and materials, must be controlled. Building design and layout should be based on hygienic principles. Particular attention should be given to sanitary design, layout and maintenance of equipment located in the PSCA to ensure that moisture can be excluded from the processing environment, including the utilization of dry cleaning procedures. Moisture control is critically important in preventing *Salmonella* contamination in low-moisture products. Dry conditions must be maintained at all times

in the PSCA, except for the occasions when controlled wet cleaning is deemed essential, e.g., in response to a product contamination incident.

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# IAFP Rapid Response Symposium – Salmonella in Peanut Products – Understanding the Risk and Controlling the Process

March 26, 2009

by Dr. Mickey E. Parish

University of Maryland  
College Park, Maryland



Snackfood US and the IAFP Foundation, and presented a variety of viewpoints from industry, government and academia on issues related to the recent peanut product salmonellosis outbreak and subsequent recall by the Peanut Corporation of America (PCA). IAFP Executive Director David Tharp and President Stan Bailey began the symposium with a welcome and introductory comments, respectively.



Patrick Archer, President of the American Peanut Council, (APC) began the formal talks with a "View from the Peanut Industry." This presentation discussed the overall industry response including plans for future steps to revise GMPs and GAPs, comprehensive training and industry outreach. Mr. Archer addressed the industry's shock at the allegation that

PCA had knowingly released contaminated product for shipment, and the APC member commitment to food safety and industry certification based on global standards. He indicated that a kill step study has been completed with the data presented to APC members and the FDA. The study will be submitted for peer review.



The next speaker, Dr. Darlene Cowart, is President of JLA USA and former QA manager for Cargill Peanut Products where she assisted in addressing food safety concerns. Dr. Cowart gave an overview of safety programs utilized in peanut production from grower to sheller. Good Agricultural Practices with the greatest impact on food safety include: Land selection/crop rotation, soil fertility, crop protection, irrigation and harvest. Next steps for grower groups involve a review and updating of GAPs and GMPs with incorporation of a thorough hazard analysis and characterization to include issues

On March 26, 2009, IAFP held a day-long Rapid Response Symposium titled, "Salmonella in Peanut Products – Understanding the Risk and Controlling the Process" in Arlington, Virginia. The symposium was co-sponsored by the American Peanut Council, bioMérieux, Cargill, ConAgra Foods, General Mills, Mars

related to *Salmonella*. This would be followed by education and outreach programs to the grower community with information on the application of food safety through continuous improvement programs. Dr. Cowart continued her talk with a discussion of the role that shellers and contract warehouses play in the safety of peanuts. Since no kill step is provided in this process, and since aflatoxin is a known concern, shellers and warehouses use a well-integrated system of supplier controls, aflatoxin specifications and management, grading and regrading, packaging specifications, dry cleaning/sanitation, pest control, GMPs/HACCP, and mock recalls to ensure product quality and safety from aflatoxin. During audience questions and comments, it was noted that there are numerous issues related to pathogen prevalence, traceability, peanut tempering, integration of pathogen and aflatoxin reduction activities, and certification that may require industry attention.



Dr. Casey Barton Behravesh, Lt. Commander in the US Public Health Service is assigned to the National Center for Zoonotic, Vector-borne and Enteric Diseases at CDC. She provided an epidemiological timeline of the outbreak in a talk titled, "Outbreak of *Salmonella* Serotype Typhimurium Infections Associated with Peanut Butter and Peanut

Butter-containing Products – United States, 2008-2009." This presentation emphasized the front-line role of local and state health departments in identifying and tracking disease outbreaks in coordination with federal agencies such as CDC, FDA and USDA. After providing an overview of salmonellosis outbreaks in the US, Dr. Behravesh discussed the cycle of disease control and prevention involving surveillance, epidemiological investigations, applied research and implementation of prevention measures. This was followed by a detailed timeline and activities related to the outbreak beginning with November 10, 2008 when the first multistate cluster was identified by PulseNet. Issues of interest during this timeframe include the merger of two separate clusters into one investigation in early December, identification of King Nut brand peanut butter as the food of interest from epidemiological and laboratory evaluations by the Minnesota Department of Health, the January 10 recall issued by PCA, January 16 isolation of *Salmonella* from unopened container of peanut butter by the Connecticut Department of Health, isolation of *Salmonella* from a tanker truck that carried peanut paste, and the ultimate large number of recalled products that totaled 3,858 as of March 24, 2009. Dr. Behravesh concluded her presentation with statements highlighting the complexities of ingredient-driven outbreaks, and the need for enhancements of capacities at the local, state and federal levels to yield a more rapid response and limit the number of illnesses associated with an outbreak. She further stated that illnesses from the PCA outbreak could continue to occur as people eat peanut butter-containing products that have slipped past the recalls.



Dr. Donald Zink, Senior Science Advisor for FDA's Center for Food Safety and Applied Nutrition, offered a talk titled, "Salmonella in Peanut Products: Understanding the Risk and Controlling the Process - The FDA Perspective." Dr. Zink provided an overview of FDA activities related to outbreaks in general and the

PCA salmonellosis outbreak specifically. In spite of the difficulties encountered due to the "ingredient nature" of peanut butter, the investigation was organized and orderly due to the use of an effective incident command system at FDA. Ultimately, thousands of products from hundreds of companies have been recalled. He noted that many companies deemed recalls easier than attempting to validate their processes to maintain product on the market. Validation obstacles are due to the significant heat resistance of salmonellae at low water activity and existence of limited data on this topic. One issue of interest from the investigation was the difficulty in notifying vending companies of recalls. Dr. Zink noted that some wholesale club stores are capable and willing to provide recall information to customers, such as vending companies, who purchase recalled products.

Dr. Zink mentioned that *Salmonella* testing can be product and strain specific thereby creating difficulties in detecting the organism in foods. Salmonellosis outbreaks and illnesses from foods, other than eggs, have not declined in recent years. Observations from investigations of outbreaks include notable items such as:

- Failure to appreciate the importance of *Salmonella* control in certain high risk foods
- Too much reliance on finished product testing
- Poor implementation of GMPs
- Ineffective implementation of appropriate system monitoring
- Inadequate qualification of critical ingredient suppliers
- Inadequate cleaning, sanitation and pest control
- Inadequate response to *Salmonella* findings in finished products and the environment

Peanut product manufacturers need to learn more about control of *Salmonella* including process validation, limitations of testing, and environmental monitoring. Dr. Zink noted that salmonellae in the manufacturing environment will eventually find its way into the product. Exceptional GMPs and SSOPs are necessary to reduce likelihood of pathogen contamination. A recent FDA analysis of a food processing facility found seven serotypes of salmonellae whereas the company's own monitoring program had found nothing. This illustrates that training on testing methodology and knowing where to look for *Salmonella* is needed. Dr. Zink concluded his remarks by stating that companies need to plan on how to respond if *Salmonella* is found in the product or immediate environment. Production should be terminated, the pathogen harborage found and eliminated, and status of lots produced since last cleanup determined.

In a presentation titled, "Impact of Processing Environments on Control of *Salmonella* in Low Moisture Food Plants," manager of the ConAgra peanut plant in Sylvester, GA, Mr. Earl Ehret, provided an account on measures needed to renovate and reopen the facility after the 2006-2007 salmonellosis outbreak from peanut butter. He provided a brief timeline of events beginning with the voluntary recall announced in February 2007, through

April when the likely causes of the contamination were announced and August when the facility was reopened and shipped product. It is likely that contamination events occurred due to the presence of *Salmonella* in the processing environment, possibly from raw peanuts and peanut dust, combined with moisture from roof leaks. ConAgra invested \$33 million in facility renovations including new roof, walls and sealed floors. Physical separation of raw peanuts and finished product was built into the new facility with new walls and coded door locks. Separate clean-out-of-place areas for raw and finished processes were built along with a new HVAC system to create appropriate positive or negative air pressures and manage peanut dust. Equipment and personnel traffic control with color coding was implemented to prevent cross-contamination. Although water is used in the processing portion of the plant, Mr. Ehret indicated that all other areas are cleaned manually using sanitizer and hand wiping. Other changes include training employees in SQF, surprise corporate audits, at least 50 routine environmental tests per week to monitor critical areas, extensive contractor training in food safety, and increased frequency of finished product testing with a five day hold-and-release. His final advice is that food safety must be thoroughly integrated into all aspects of your business rather than a separate part of the business.



Dr. Larry Beuchat, Distinguished Research Professor from the University of Georgia provided an overview titled, "Behavior of *Salmonella* in Foods with Low Water Activity." General characteristics of the organism, the disease state, survival in low water activity products, heat tolerance and other microbiological concerns were discussed. Dr. Beuchat

mentioned outbreaks from other products with low water activity and from other peanut products. These include paprika on potato chips, breakfast cereals, soft cheeses, infant formula, ice cream, pastry, cooked ham, peanut flavored snacks, peanut butter, peanut sauce and inshell peanuts. Salmonellae are very hardy and can grow at temperatures as low as 2°C, water activity as low as 0.93, and pH between 3.9 and 9.5. This pathogen can adapt to extreme environmental conditions such as desiccation, pH and temperature stress. Survival is enhanced at refrigeration and freezing temperatures as well as at low water activity. Studies have shown survival of salmonellae in milk chocolate for >9 months, in almonds for >550 days, and in peanut butter and spreads for more than 24 weeks. Factors affecting heat tolerance include prior growth conditions, composition of foods, stationary vs. log phase cells, and growth in an environment with limited nutrients. Tolerance of certain salmonellae increases if cells are grown at elevated temperatures prior to application of heat stress. Studies indicate that log reductions between 1.8 and 3.0 occur after various *Salmonella* serotypes are exposed to 20 minutes at 70, 80 and 90°C in peanut butter. In addition to *Salmonella*, other pathogens have been shown to survive in peanut products. *Clostridium botulinum* can grow in peanut spread at high water activities. *Listeria monocytogenes* survives in peanut butter and chocolate peanut spread for 16 to 24 weeks at 20°C. In summary, Dr. Beuchat indicated that *Salmonella* remains viable in peanut products for extended time periods and survival is enhanced in high fat and low water activity foods.



Dr. Linda Harris, Associate Director of the Western Institute for Food Safety and Security, and Extension Specialist in Microbial Food Safety at the University of California, Davis presented a talk titled, "Process Validation for Peanut Butter and Other Low Moisture Foods." Dr. Harris discussed process validations developed for almonds and possible applications to

peanut products. Detailed procedures for in-plant validation of processes to achieve desired lethality from blanching, oil roasting, use of PPO and other processes are available. Dr. Harris further indicated significant challenges exist to validate the dry roasting process. She noted that verification procedures include a review of records, calibration of instruments and routine microbiological analyses. After defining D, F and z values, Dr. Harris noted several challenges to conducting validation tests including the choice of test strain, need to use marked strains (such as antibiotic resistance), inoculation methods, recovery methods and choice of surrogate organism for in-plant testing. She mentioned that the surrogate organism used for studies on almonds, *Enterococcus faecium* NRRL B2354, may be reasonable for peanut studies but should be validated for this purpose. Dr. Harris concluded her talk with remarks that thermal resistance of *Salmonella* is greatly increased in low water activity foods, survivor curves can be non-linear with significant tailing, and experts with experience in low water activity foods should be consulted for process validation.



Dr. Donald Schaffner, Professor of Food Science and Director of the Center for Advanced Food Technology at Rutgers University presented a talk on "Using Modeling and Risk Assessment in Managing *Salmonella* Risk in Peanut Butter." He began by discussing the concept of risk analysis in terms of risk perception, risk assessment and

risk management. Steps in risk assessments include hazard identification, exposure analysis, dose-response analysis, and risk characterization. When considering modeling and risk assessments of peanut products, essential components that must be addressed include items such as formulation details (how much peanut butter is in a food), effects of testing, *Salmonella* concentrations and the probability of human illness. For this presentation, Dr. Schaffner modeled a theoretical scenario as an example. Assuming a product with 1.5 cells/g peanut butter, a serving size of 3.6 g, a log reduction of 0.9 to 1.5 log CFU, and 1.5 million servings manufactured, illnesses on the order of 6 to 18 people could occur. Without the 0.9 to 1.5 log reduction, 135 illnesses could be expected. Dr. Schaffner ended his talk by making the points that there is no zero risk, negative test results from food products can be useful to estimate risk, data on prevalence and concentrations of pathogens in foods are needed for modeling, and even a slight reduction in pathogen population can have a positive effect. He emphasized that a large number of servings, contaminated sporadically at very low levels, can produce an outbreak.



Dr. Paul Hall, President and CEO of AIV Microbiology and Food Safety Consultants LLC was the next presenter with a talk titled, "The Value of Third Party Independent Audits in Assuring Food Safety: Are They Truly Independent?" The presentation began with an overview of the growth in food manufacturing and global trade and the increasing need

for thorough audits to ensure that products meet US safety and

security standards. Certification involves certification bodies that conduct audits and certify compliance to designated standards, and accreditation bodies that accredit certification bodies. Currently, a wide array of audits and standards exist that are driven by customer requirements. This is difficult to manage at the food manufacturing facilities which may have literally hundreds of customers demanding various types of audits. In January 2009, FDA published "Guidance for Industry: Voluntary Third-Party Certification Programs for Foods and Feeds" (<http://www.fda.gov/oc/guidance/thirdpartycert.html>) which describes attributes that a certification program needs to verify product safety. Dr. Hall provided an overview of this document and pointed out important concepts necessary for a third-party auditing system to work effectively. While accredited certification bodies can offer impartial, qualified, licensed assessments, recent food safety issues from facilities with third party audits have provoked an outcry from the media that there is a conflict of interest when an auditor essentially works for the company it evaluates. Dr. Hall mentioned that studies on the reliability of third party audits indicate that differences among results of various auditors are not non-trivial and can be quite significant. He further discussed the needs for auditor calibration procedures, auditor controls to address conflicts of interest, and checks and balances in the third party audit systems. In terms of recent outbreaks from companies that utilized third party audits, concerns exist related to the auditor experience levels, lack of time to do an appropriate audit, reliance on checklists rather than dynamic risk-based systems, too much paper review vs. time on the plant floor, lack of follow up, lack of audit depth, and complacency of companies who pass audits. Dr. Hall concludes that value exists from third party audits but they are not infallible. Government inspectors must share some culpability in outbreaks, but need additional resources to produce appropriate oversight. In the future, companies should move toward multidisciplinary team audits of 2 to 5 days and must aggressively address findings no matter how small.



#### Panel Discussion

The symposium concluded with a panel discussion involving Don Zink, Larry Beuchat, Paul Hall, Jenny Scott and Sarah Klein. Two panelists who had not spoken earlier in the day were given five minutes for remarks. Jenny Scott, of the Grocery Manufacturers Association provided an overview of a GMA document related to control of *Salmonella* in low moisture foods. The document addresses seven control elements: 1. Prevent ingress or spread of *Salmonella* in the processing facility, 2. Enhance the stringency of hygiene practices and controls in the primary *Salmonella* control area, 3. Apply hygienic design principles to building and equipment design, 4. Prevent or minimize growth of *Salmonella* within the facility, 5. Establish a raw materials/ingredients control program, 6. Validate control

measures to inactivate *Salmonella*, and 7. Establish procedures for verification of *Salmonella* controls and corrective actions.



Sarah Klein of the Center for Science in the Public Interest indicated that the peanut outbreak represented a "perfect storm" involving a very popular food, especially for children, a food with a long shelf life, and a company that allegedly shipped products known to contain *Salmonella*. She indicated that a recent study on the PCA outbreak

conducted by the Harvard School of Public Health indicated that 60% of consumers have taken steps to minimize risk, 25% mistakenly believe that jarred, brand-name peanut butter is involved, and only 14% of consumers have consulted the FDA recall product list. She further indicated consumer concerns that one company refused to recall products forcing FDA to issue a warning for consumers to avoid that company's products. Further, she suggested that FDA's use of the term "voluntary" suggests to the consumer that the recall is of lesser concern.

After the panel discussion, President Stan Bailey thanked the speakers and attendees for supporting the symposium.

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## ***Sponsors of the IAFP Rapid Response Symposium – Salmonella in Peanut Products – Understanding the Risk and Controlling the Process***





# NEW MEMBERS

## AUSTRIA

**Patrick Mester**

University of Veterinary Medicine  
Vienna  
Vienna

**Peter Rossmanith**

University of Veterinary Medicine  
Vienna  
Vienna

**Dagmar Schoder**

University of Veterinary Medicine  
Vienna  
Vienna

## CANADA

**Genevieve Arsenault**

Yum!  
Vaughan, Ontario

**Tarek F. El-Arabi**

University of Guelph  
Guelph, Ontario

**Hussein El-Masri**

ALMAAS Food Safety Plus  
Woodbridge, Ontario

**Simmon Hofstetter**

University of Alberta  
Edmonton, Alberta

**Tim Little**

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Maple Ridge, British Columbia

**David White**

Lambton Health Unit  
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## COLOMBIA

**Jairo Romero**

Colombian Association of Food  
Science and Technology  
Bogota

## THE NETHERLANDS

**Jarret D. Stopforth**

Institute for Environmental Health  
Gorinchem

## SOUTH KOREA

**Ji Hoe Kim**

Aquaculture Environment Institute,  
NFRDI  
Tongyeong, Gyeongsangnam-Do

**Min Hwa Lee**

Chung-Ang University  
Ansung

**Won-Bo Shim**

Gyeongsang National University  
Jinju, Gyeongnam

## THAILAND

**Suthep Ruangwises**

Chulalongkorn University  
Bangkok

## TURKEY

**Aysegul Eyigor**

Uludag University  
Bursa

## UNITED KINGDOM

**Rebecca Brown**

University of Wales Institute, Cardiff  
Cardiff, South Glamorgan

**Niteen V. Sawant**

Unilever  
Bedfordshire

## UNITED STATES

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Auburn

### ARKANSAS

**Jacquelyn Adams**

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Springdale

**Suzanne Finstad**

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Springdale

**Makuba A. Lihono**

University of Arkansas at Pine Bluff  
Pine Bluff

## CALIFORNIA

**Martha Maier**

Vista Analytical Laboratory  
El Dorado Hills

## DELAWARE

**Lihong Wu**

DuPont Qualicon  
Wilmington

## FLORIDA

**Shaji George**

Walt Disney World Co.  
Lake Buena Vista

**Michelle L. Upshaw**

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Tampa

**Jennifer Walker**

Walt Disney World Co.  
Lake Buena Vista

## GEORGIA

**Shawn M. Lyons**

University of Georgia  
Athens

## HAWAII

**Shawn Gunn**

VETCOM  
Laie

## ILLINOIS

**Arlette G. Shazer**

FDA  
Batavia

## KANSAS

**Tim Parish**

PepsiCo  
Manhattan





## NEW MEMBERS

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Danisco U.S.A.  
New Century

### MARYLAND

**Joyce M. Njoroge**  
FDA  
Laurel

**Gary R. Pasternack**  
Intralix, Inc.  
Baltimore

**Daniel R. Shelton**  
USDA  
Beltsville

### MASSACHUSETTS

**David G. Nyachuba**  
University of Vermont  
Amherst

### NEW JERSEY

**Wenchao Li**  
Rutgers University  
New Brunswick

### NEW YORK

**Jeff Adams**  
The Carriage House Companies, Inc.  
Fredonia

**Teresa Kloch**  
Perry's Ice Cream Co.  
Akron

**Marcus Lovelace**  
Perry's Ice Cream Co.  
Akron

**Joseph J. Woloszyn**  
The Carriage House Companies, Inc.  
Fredonia

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HEB Grocery Co.  
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**Melissa Davidson**  
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Bryan

**Ashley Haneklaus**  
Texas A&M University  
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**Palmy R. Jesudhasan**  
Texas A&M University  
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**Tiffany Muras**  
Texas A&M University  
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**Julie L. Prouse**  
Texas A&M University  
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**Victoria Sophia Rios**  
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**Mark R. Russell**  
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**Shannon E. Schmidt**  
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**Dawna Winkler**  
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**Michael V. Wood**  
Del Monte Fresh Produce  
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**Michelle Wollenzien**  
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**Traci Hayes**  
Idaho Technology Inc.  
Salt Lake City

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**Aisha P. Salazar**  
Kansas State University  
Fairfax

### WASHINGTON

**Achyut Adhikari**  
Washington State University  
Pullman

### WEST VIRGINIA

**Reza Tahergorabi**  
West Virginia University  
Morgantown

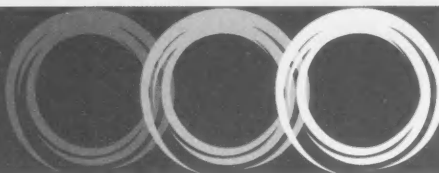
### WISCONSIN

**Jane E. Mattias**  
Johnsonville Sausage, LLC  
Sheboygan

## NEW SILVER SUSTAINING MEMBER

**AEGIS Food Testing Laboratories**  
Phyllis A. Antonacci  
North Sioux City, South Dakota

# WHAT'S HAPPENING IN FOOD SAFETY



## **Columbus Public Health Selected as 2009 Crumbine Award Winner**

**C**olumbus (Ohio) Public Health has been selected as the recipient of the 2009 Samuel J. Crumbine Consumer Protection Award for Excellence in Food Protection.

For 54 years, the Crumbine Award, named for one of the most renowned public health sanitarians in the United States, has been presented to a local public health unit by a jury of leading environmental health officials and public health sanitarians and is the most prestigious recognition that a public health unit can receive. Crumbine winners serve as models for other public health and safety programs across the nation.

2009 Crumbine Award Jury Chair Lila Wickham of the Multnomah County (Oregon) Environmental Health Services (the 2006 Crumbine Award winner) said, "Columbus Public Health described a visionary, innovative, collaborative and practical food safety system with multiple partnerships and strengths. The program has already received international, national and local recognition and is deserving of the prestigious Crumbine Award."

"We were thrilled in Columbus to learn the Crumbine Award Jury had selected our program as the 2009 recipient," said Keith Krinn, Columbus's environmental health administrator. "The credit for the recognition goes out to our field staff, the backbone of our Food Protection Program, where the interface with our customers takes place. Also, the success of our food protection effort would not be realized without our partnerships with our community, the foodservice industry and especially our own Columbus Board

of Health. We are truly honored and humbled by the recognition associated with the Crumbine Award."

Columbus Public Health received the Crumbine Award at the Annual Educational Conference of the National Environmental Health Association, June 21–24 in Atlanta. Award presentations will also be made at the Annual Meeting of the International Association for Food Protection, July 12–15 in Grapevine, TX and National Association of County and City Health Officials, July 29–31 in Orlando, FL.

The Crumbine Award is supported by the Conference for Food Protection, in cooperation with the American Academy of Sanitarians, American Public Health Association, Association of Food & Drug Officials, Foodservice Packaging Institute, International Association for Food Protection, National Association of County and City Health Officials, National Environmental Health Association, National Restaurant Association Solutions, National Sanitation Foundation International and Underwriters Laboratories Inc.

## **DuPont Qualicon Hosts 8th Annual Food Quality Award Presentation**

**T**he 8th Annual Food Quality Award presentation and reception was recently hosted by DuPont Qualicon during the Food Safety Summit in Washington, D.C. The event honored Fieldale Farms Further Processing division in Baldwin, GA, as the 2008 winner of the Food Quality award. The evening also provided over 300 people with an opportunity to network and hear insightful commentary on food safety from the Costco perspective.

Sponsored by DuPont Qualicon and presented by Food Quality

Magazine, the annual Food Quality Award recognizes a North American Quality Assurance/Quality Control department or program that has made significant improvements in food safety and quality with a positive impact on business results. Fieldale Farms Further Processing Division was selected this year for its ongoing commitment and investment in infrastructure, equipment, technology and personnel. This winner joins an elite group of past honorees, including West Liberty Foods LLC, Hormel Foods, Beef Products Inc. (BPI), Tyson Food Safety and Lab Services, SYSCO Corporation, Franklin Foods, Hygaard Fine Foods Ltd. and East Balt Commissary, Inc. of Chicago.

"We're honored to recognize superb achievements in the food industry because we believe in our responsibility to promote a culture of food safety and quality around the world," said Luiz Fischmann, global marketing manager, DuPont Qualicon.

Accepting the award on behalf of Fieldale Farms Further Processing was Dan White, manager of food safety and quality assurance, and Mark Wright, national accounts sales manager. Headquartered in Baldwin, GA, Fieldale Farms is a private label manufacturer and food service supplier of poultry products.

A keynote address was given by Craig Wilson, assistant vice president and general merchandising manager of food safety and quality assurance for Costco Wholesale Corporation. Mr. Wilson shared insights on how Costco and other large companies can maintain focus on food safety despite the challenges of the current economic climate.

Rick Biros, founding publisher of *Food Quality Magazine* and Marcos Cantharino, global sales and market-



ing director, DuPont Qualicon, co-presented the award. Beckyjo Smith, North American business manager, DuPont Qualicon, served as the evening's emcee.

### ADPI Praises Activation of Dairy Export Incentive Program by the USDA

The American Dairy Products Institute (ADPI) commended Secretary of Agriculture Tom Vilsack for announcing the activation of the Dairy Export Incentive Program (DEIP) for the period ending June 30, 2009.

"Frankly, DEIP is one of the most effective things that federal government can do at this time to support the American Dairy Industry," said Dale Kleber, the Chief Executive Officer of ADPI.

"DEIP will permit US dairy manufacturers to be price competitive in international markets where other countries, including the E.U., are subsidizing the exports of their dairy industries. DEIP helps level the global playing field and is fully consistent with US treaty commitments to the World Trade Organization," Mr. Kleber continued.

"This timely decision by the Obama Administration can provide the US dairy sector with greatly needed relief and will go a long way in stabilizing market pricing for certain dairy commodities, especially nonfat dry milk," Mr. Kleber continued. "But the department will need to follow through on the announcement by issuing the Invitations for Offers as soon as possible, otherwise the potential benefits of DEIP may not be realized."

Today's DEIP allocation for NDM equals 68,201 metric tons or 150 million pounds. (By comparison since October, 2008, the Commodity Credit Corporation has acquired 238 million pounds of NDM.)

Over the past several months ADPI and several other dairy

associations have urged USDA and other federal agencies comprising the Trade Policy and Review Group to activate DEIP.

### NSF Food Safety Leadership Awards Presented at the 2009 Food Safety Summit

NSF International recently announced the 2009 recipients of its Food Safety Leadership Awards at the Food Safety Summit in Washington, D.C. NSF's Food Safety Leadership Awards program, now in its sixth year, recognizes the extraordinary efforts of individuals and organizations that have demonstrated outstanding dedication and achievement in food safety.

Dr. Phillip Minerich of Hormel Foods Corporation was awarded the Lifetime Achievement Award in Packaging Distribution. For over 32 years, he has worked within food production, committed to improving the safety of our food supply. Because of Dr. Minerich's contributions, public health and food regulation agencies have more effective methods for contamination detection.

Carletta Oton accepted the award for Systems Improvement (Water) on behalf of The Coca-Cola Company. To ensure a higher standard of water, the company has moved beyond end-of-pipe treatment to modern risk management frameworks. The company is also striving to improve source water management practices across its expansive bottling system.

Eileen Staples accepted the award for Systems Improvement (Community) on behalf of Greenville County Schools Food and Nutrition Services in South Carolina. Greenville County School Food and Nutrition Services implemented a HACCP program in 86 schools and 12 satellite locations in the face of budget constraints, limited time and the challenge of training 650 employees across various locations.

Dr. Carl Winter, Dept. of Food Science and Technology at the University of California, accepted the Education Training award. Over the past decade, Dr. Winter has developed a unique musical approach to spread food safety messages through the project, "Improving Food Safety Education through the Use of Music-based Curricula."

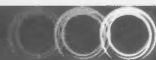
Steve Robinson of Dole Fresh Vegetables accepted the Systems Improvement award. Steve Robinson is responsible for creating a groundbreaking food safety application that tracks food from its origins to shelf, which was found to reduce the amount of time it takes to trace a specific lot to its origin.

Mr. Joseph Reardon of the North Carolina Dept. of Agriculture and Consumer Services received the Systems Improvement award. Mr. Reardon successfully directed the Castleberry Recall, the first public health recall in over 30 years where *Clostridium botulinum* was identified as a causative agent between canned product and foodborne illness.

### 3-A SSI Announces 2009 Volunteer Awards and Progress Report

3-A Sanitary Standards, Inc. (3-A SSI) announced the recipients of its 2009 Volunteer Service Awards and the release of a special progress report, The Symbol of Assurance, at the 3-A SSI Annual Meeting in Milwaukee, WI.

Introduced in 2008, the new 3-A SSI Volunteer Service Awards recognize the extraordinary dedication and commitment of individuals who contribute to the development of voluntary standards and the mission of 3-A SSI. Nominations for the awards are made by fellow volunteers among the three stakeholder groups in 3-A SSI – regulatory sanitarians, fabricators, and processors – and others.



Winners of the 3-A SSI Volunteer Service Awards for 2009 announced at the meeting included:

- Mr. Donald Wilding (Dairy Equipment Specialist, Illinois Dept. of Public Health, Div. of Food, Drugs and Dairies) received the Leadership Service Award for outstanding service to 3-A SSI voluntary standards development and significant contributions to the mission of 3-A SSI.
- Mr. J. Mel Jolly (Consultant) received the Advancement Award for outstanding accomplishments on behalf of 3-A SSI.
- Mr. Stuart Salvador (Paul Mueller Co.) received the Next Generation Award, made to an individual who has been engaged in 3-A SSI standards development activities for less than five years and has demonstrated leadership, dedication and significant contributions to the development of 3-A Sanitary Standards or 3-A Accepted Practices.

Highlights of 3-A SSI progress in the latest year are now available in the 2009 Annual Report, The Symbol of Assurance. The report is available at the 3-A SSI web site under News & Events at <http://www.3-a.org/news/2009annualreport.pdf> or upon request from 3-A SSI.

### Lee E. Blakely Receives 2009 American Dairy Products Institute Award of Merit

The American Dairy Products Institute (ADPI) is pleased to announce Lee E. Blakely as the 2009 Recipient of the Award of Merit. The Award of Merit was established in 1991 to recognize individuals who have made a significant difference in the processed dairy products industry.

Mr. Blakely has enjoyed a long, multi-faceted dairy career which has spanned an unusually broad range of responsibilities in fields of teaching, manufacturing, quality assurance and marketing. Over the course of his career, Mr. Blakely has contributed in many ways and roles to the advancement of the American Dairy Industry.

Mr. Blakely's successful career in the dairy industry was built on an impressive foundation of academic achievement. He received his Bachelor of Science degree in Food Technology from the University of Georgia in 1962 and subsequently earned Master of Science and Doctoral degrees in Food Science from Michigan State University.

After receiving his doctorate, Blakely began teaching future dairy industry managers as an assistant professor at the University of Wisconsin-River Falls and later moved to the well-regarded dairy science program at TexasTech University in Lubbock, TX.

After several years of teaching, Mr. Blakely's expertise was sought by the dairy industry, and he joined Dairyman's Cooperative Creamery Association (DCCA) in 1973 as senior vice president of manufacturing.

In 1999, DCCA merged with Land O'Lakes where Mr. Blakely assumed the role of vice president of quality assurance. In 2002, Mr. Blakely was named chief technical officer for Cheese and Protein International LLC, which was acquired by Saputo and reorganized as Saputo Cheese and Protein. Mr. Blakely, who retired last fall, still remains active in the dairy business taking on various consulting assignments from Land O'Lakes and other industry clients.

During his long and distinguished dairy career, Mr. Blakely had a very active relationship with the American Dairy Products Institute. Since 1973, he has served on ADPI's

Technical Committee, Board of Directors and Executive Committee as well as eight years as an officer including president of ADPI from 1999-2001.

Mr. Blakely has also served on numerous dairy industry scientific and research advisory committees. He is currently serving on the 3-A Sanitary Standards Board of Directors where he will play a key role in developing dairy and food equipments standards that underly the strong safety record of the dairy industry. He will also serve as the Chairman of the Organizing Committee for the 2011 International Whey Conference, which will be held in Chicago in 2011.

### US Foodservice SVP of Food Safety and Quality Assurance Named to Global Gap Board

Jorge Hernandez, senior vice president of food safety and quality assurance for US Foodservice has been elected to the board of Global Gap, an organization in Cologne, Germany that works on the development of Good Agricultural Practices (GAP) that include Integrated Crop Management and a responsible approach to worker welfare. Mr. Hernandez joins Richard Yudin, technical manager for Fyffe as the only two Americans to sit on the board. His responsibilities include helping set a strategic direction that includes best scientific views that will benefit all stakeholders and consumers.

Mr. Hernandez brings a diverse and in-depth food safety experience to the organization. He has worked both in the public and private sector. As SVP for food safety and quality assurance for US Foodservice, Hernandez is responsible for ensuring compliance with all food safety regulatory standards.

Prior to his position at US Foodservice, Mr. Hernandez was the



vice president for food safety and risk management for the National Restaurant Association and before that he worked for the food safety program at the Illinois Department of Public Health. Mr. Hernandez is a registered sanitarian, a past FDA standardization officer, a member of the Center for Diseases Control-Environmental Health Committee, the Global Food Safety Initiative-Technical Committee, the American National Standards Institute-Accreditation Committee, the Conference for Food Protection, the National Restaurant Association Quality Assurance Executives Study Group and serves as a board member of the Produce Marketing Association.

Mr. Hernandez was elected to the board following the retirement of Stephen Ridge from ASDA and the Global Gap board.

### ASQ Announces 2009-2010 Officers

ASQ (American Society for Quality) announced the following slate of officers for the 2009-2010 term:

- President – Peter L. Andres, Boeing Company, Integrated Defense Systems, Huntington Beach, CA.
- Chairman – Roberto M. Saco, Aporia Advisors, Inc., Coral Gables, FL.
- President-elect – E. David Spong, Boeing Company (retired), Rancho Palos Verdes, CA.
- Treasurer – Jim Rooney, ABSG Consulting, Knoxville, TN.
- Newly Elected Board Member – Lloyd Barker, Alcoa, Inc., New York, NY.

- Re-elected Board Member – Kay A. Kendall, Westford, MA.

The results were announced at ASQ's Annual Business Meeting, held in conjunction with the World Conference on Quality and Improvement, May 18-20, in Minneapolis, MN. Current ASQ president Roberto M. Saco will assume the chairman's duties July 1, 2009, and Peter L. Andres, who is currently president-elect, will move into the president position.

Mr. Andres has more than 25 years of experience in quality management, primarily in the aerospace industry. His areas of expertise include application of quality management systems, acquisition quality strategies, and process improvement methods. He is currently a quality engineer with Integrated Defense Systems at the Boeing Company in Huntington Beach, CA. He began working for Boeing Company in 1996.

### Mettler-Toledo Hi-Speed Appoints Bob Urban as Operations Manager

Mettler-Toledo Hi-Speed appoints Bob Urban as operations manager. Mr. Urban is a seasoned operations management professional and will oversee operations engineering, materials, and production functions at Mettler-Toledo Hi-Speed.

Throughout his career in manufacturing leadership, Bob has focused on quality, lean manufacturing, and continuous improvement initiatives, most recently as president and plant manager of National Refrigeration Company in Honea Path, SC.

Bob holds a Master of Business Administration and a Bachelors of Science in Business Management.

He is also certified as an ASQ quality engineer.

### FMI Announces Elections of 2009 Board Members

Food Marketing Institute (FMI) announced the election of four new members of the FMI Board of Directors. FMI also announced the election of the board chairman and four board vice chairmen.

Elected to the FMI Board of Directors are Mark Batenic, chairman, president and CEO, IGA Inc., Chicago, IL; Rudy Dory, owner, Rudy's Markets, Inc., Bend, OR; Jerry Garland, president and CEO, Associated Wholesale Grocers Inc., Kansas City, KS; and Dean Peterson, president and CEO, Harmon City, Inc., West Valley City, UT.

Richard "Ric" N. Jurgens, chairman, CEO and president of Hy-Vee, Inc., West Des Moines, IA was elected chairman of the FMI Board; and Steven C. Smith, president and CEO of K-VA-T Food Stores, Inc., d/b/a Food City, Abingdon, VA, is the immediate past chairman of the FMI board.

Elected as FMI vice chairmen to the board are Gregory Calhoun, president and CEO of Calhoun Food Markets, Inc., Montgomery, AL, and will serve as chairman of the public affairs committee; William Coyne, president and CEO of Raley's Family of Fine Stores, Sacramento, CA, and will serve as chairman of the finance committee; Ed Crenshaw, chief executive officer of Publix Super Markets, Inc., Lakeland, FL, and will serve as chairman of industry relations committee; and Dave Skogen, owner and chairman of the board of Festival Foods, Onalaska, WI, and will serve as chairman of the member services committee.

# INDUSTRY PRODUCTS



Torrey Pines Scientific, Inc.

## New Compact Digital Hot Plates and Stirrers from Torrey Pines Scientific

**T**orrey Pines Scientific announces its new compact EchoTherm™ Digital Hot Plates and Digital Stirring Hot Plates that use minimum bench space.

These new units are ideal in chemical, pharmaceutical, environmental, biochemical, electronic and other laboratories where temperature accuracy, ease of use, and reproducible sample preparations are a must.

The EchoTherm™ Models HP50 and HS50 Digital Hot Plates and Digital Stirring Hot Plates are compact, rugged and designed for samples of 2 liters or less.

The units feature a membrane keyboard and full function liquid crystal display where target and actual sample or plate temperature, stirring speed and timer are continuously visible. These units can store two of the user's favorite settings

in memory for instant recall and use at any time

Heater tops are 6" x 6" square and feature energy efficient 400 watt heaters. The solid ceramic plate is white, chemically resistant, and designed for use with solutions in a vessel.

The milled-flat cast aluminum top is recommended for working with solids directly on the heater plate surface. Temperatures can be set to 450°C on the ceramic topped units and to 400°C on cast aluminum tops. The units are readable and settable to 1°C. Accuracy is 1% over the entire temperature range.

Temperature control is by PID software and is controlled to ±1°C or °F. Stirrer speeds can be set from 100 to 1500 rpm. The built-in timer can be set to 99 hours and is readable to 1 second. It has an audible alarm with user-settable Auto-Off for turning off the heater and stirrer when the timer counts down to zero. The units are supplied with an immersion probe for controlling solution temperatures directly.

All units are available in 100, 115, and 230 VAC, 50/60 Hz models.

**Torrey Pines Scientific, Inc.**

San Marcos, CA

866.573.9104

[www.torreypinsscscientific.com](http://www.torreypinsscscientific.com)

## Remel Announces 8 Hour Stability for Quanti-Cult® Plus

**R**emel, a manufacturer of high quality microbiology products has announced new data demonstrating consistent CFU counts over an 8 hour time period for reconsti-

tuted Quanti-Cult® Plus quality control organisms (when refrigerated).

Pharmaceutical and biotech companies can perform daily quality control testing using the same vial of reconstituted microorganisms, saving valuable time and money. When refrigerated after reconstitution, Quanti-Cult® Plus organisms maintain consistent CFU counts (<100 CFUs), in agreement with testing guidelines cited in the United States Pharmacopoeia (USP). Consistent CFU counts were confirmed over an 8-hour time period for the bacteria, yeast, and fungi species which are recommended for Microbial Limits Testing and Sterility Testing in the United States Pharmacopoeia (USP) Chapters 61, 62, and 71.

Pharmaceutical companies monitor their manufacturing environments for contaminating microorganisms to ensure they are meeting regulatory guidelines for cleanliness and/or sterility. In order to perform these tests, USP guidelines recommend the use of ATCC® strains of control microorganisms for microbiological testing. These microorganisms must deliver <100 CFUs per inoculum and meet stringent testing requirements. Remel Quanti-Cult® and Quanti-Cult® Plus products meet these guidelines are manufactured in an ISO 9001:2000 certified facility and meet stringent guidelines for consistent results. By verifying CFU consistency over 8 hours, Remel has maximized the benefit Quanti-Cult® Plus products offer pharmaceutical customers needing microbiology testing products, help-

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# INDUSTRY PRODUCTS

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800.255.6730  
Lenexa, KS  
www.remel.com

## **Chemir Analytical Services: Delivering Emergency Services to the Food Industry**

**C**hemir Analytical Services is proud to announce the expansion of their emergency services department supporting food and beverage manufacturers and processors. When quality problems occur within a food and beverage processing, manufacturing or distribution center, Chemir Analytical Service's scientists are available around the clock to solve the problem.

Chemir Analytical Services offers custom investigations that help companies confront crises such as contamination, packaging failure, product recalls and more. Analytical chemists utilize state-of-the-art instrumentation to solve difficult problems such as unknown materials or contaminants, off-colors, off flavors or off-odors and packaging leaching.

"When faced with a production shut-down or recall, food processors need quick and reliable answers to get things up and running again as quickly as possible," said Eric W. Uffman, Ph.D. and director of technical services for Chemir Analytical Services. "By having our services available on nights and weekends, our clients are ensured efficient and accurate answers."

In addition, Chemir Analytical Services partners with board-certified

toxicologists when situations involve alleged harmful or toxic chemical contaminants. This understanding of chemical toxicity, along with Chemir's analytical investigations results in a full toxicity risk assessment report.

The laboratory facilities at Chemir Analytical Services are FDA registered, ISO 9001:2000 certified and cGMP/GLP compliant. Chemir scientists are also available to provide expert witness and litigation support services.

**Chemir Analytical Services**  
800.659.7659  
Maryland Heights, MO  
www.chemir.com

## **The Original Patented Opti-load® Feature from Biohit!**

**O**pti-load® – Biohit's Original Patented Tip loading mechanism for easy, safe and consistent loading and ejection of tips from single and multichannel pipettes.

With the Biohit "Systems" approach, we optimize fit between tip and pipette tip cone, maximizing accuracy and precision in delivery of liquid sample.

The Systems approach, in tandem with the Opti-load feature makes the entire pipetting experience easier, safer, more reliable and efficient.

Tips seal securely, won't fall off, and don't require excessive force to load onto or eject from tip cones. Opti-load on multichannel pipettes saves time and ensures high throughput.

Biohit has taken a role in the development of technically advanced product features that provide better

ergonomics, enhanced safety and reliable performance for laboratories all over the world for over 20 years.

The Opti-load feature can be found in all of Biohit pipettes including mLINE, eLINE and most Proline Plus models. Opti-load is one of Biohit's innovative, patented features making Biohit a smarter choice for demanding researchers.

The unique Opti-load feature with spring loaded tip cones allows for effortless tip loading, ejection, and optimal tip sealing.

**Biohit Inc.**  
732.922.4900  
Neptune, NJ  
www.us.biohit.com

## **Integrated Environmental Technologies, Ltd. Announces NSF Registration of EcaFlo® Anolyte (Excelyte®)**

**I**ntegrated Environmental Technologies, Ltd. has announced the registration of EcaFlo® Anolyte (trademark Excelyte®) with the National Science Foundation as a "D2" antimicrobial – an "antimicrobial agent not requiring rinse(ing)". EcaFlo® Excelyte® has quickly gained momentum in recent months as the disinfectant of choice for hospitals, universities, public school systems, medical and veterinary schools, cleaning services, food processing, athletic departments, veterinary clinics, medical research labs and professional sports teams as well as state, county, city and federal governments.

The announcement allows for EcaFlo® Excelyte® to be marketed not only as a hard surface disinfectant, but also as a solution used to rinse fruits, vegetables and other food products prior to processing.

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

# INDUSTRY PRODUCTS

Because Excelyte® has been proven effective against such pathogens as *E. coli* and *Salmonella*, the product has potential wide-reaching implications for the agriculture industry as a first line of defense against contamination.

William E. Prince, president and CEO of IET said, "This latest registration, along with all the other recent announcements, proves that EcaFlo® Anolyte is one of the most effective antimicrobial solutions available on the market. That's no longer just our opinion, it's been validated by the federal agencies responsible for regulating such products. We have already received multiple inquiries from grocery chains and others involved in food processing asking about how to obtain Excelyte® – we believe it will only continue to grow as more federal and regulatory recognition is gained."

IET is actively pursuing FDA 510(k) approval for the product for use as a topical disinfectant for use in critical and semi-critical patient treatment areas and patient care devices, and will continue to seek governmental and federal approvals wherever applicable.

**Integrated Environmental  
Technologies, Ltd.**  
843.390.2500  
Little River, SC  
www.ietltd.net

## Gainco Introduces Accusizer™ Portion Classifiers for High-speed Sizing and Distribution

Accusizer™ portion classifiers from Gainco are expressly designed for in-motion sizing and



Gainco

distribution of a wide variety of poultry items, including fresh or quick-frozen products. Gainco's new 9-inch classifier model is designed for handling items such as breast filets and butterflies, wings, tenders, drums, thighs, whole legs and other smaller food portions weighing less than two pounds and shorter than 10 inches in length.

Completely designed and built in the USA, Accusizer™ classifiers are engineered for cost-effective operation and user-friendly interface. They incorporate key productivity-boosting features such as an IP69K-rated touchscreen interface with graphical displays and multi-language communications that make the software user-friendly and extremely easy to use. Moreover, the classifier's all-new tubeless frame design is engineered to reduce vibration and facilitate enhanced bacteria control and sanitation – along with reducing washdown cleaning time.

In addition, new quick-release hopper and chute designs have been incorporated into the Accusizer™ classifier to improve access to serviceable components.

The Accusizer™ classifier system's extremely durable weigh

deck plus the ability to deliver information that's easier to see and to share are among the other productivity-enhancing features of the new Accusizer™ 9-inch classifier model. Using the equipment, operators can size up to 180 portions per minute, with a tolerance of  $\pm 1.0$  grams at one standard deviation for even the smallest pieces. Moreover, interchangeable in-feed systems make it very easy to adapt to the size and type of product being processed.

Other notable design features of the classifier include a pull-off arm that reduces the incidence of product damage during discharge. Incorporating industry-leading Habasit® plastic conveyor belting provides durability at the weigh deck while also improving sanitation.

All Accusizer™ classifiers feature a large touchscreen display monitor that allows the viewing of all drops at one time. The system is designed for local or remote PC interface. Encased in a heavy-duty stainless steel housing specially designed to withstand the harsh rigors of poultry processing operations, the digital load cell provides both RF and EMI resistance, thus eliminating any weighing inconsistencies that might arise from plant electrical noise.

All relevant data is filtered, scaled and digitized directly into the control system at measurement rates up to ten times faster than analog systems. This rapid weighing response helps prevent production bottlenecks and improves productivity.

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



# INDUSTRY PRODUCTS

Another key operating feature of AccuSizer™ classifiers is the DataMan® Data Collection System, a combined software/hardware solution that allows for the integration of all remote units on the production floor. Operators can set parameters, monitor yields and throughput, and create customized reports – all from a single location. Raw data can be made available throughout the plant network as well as across the corporate network. The data can also be moved to popular databases such as Oracle, SQL Server, and DB2.

**Gainco Inc.**  
800.467.2828  
Gainesville, GA  
www.gainco.com

## Newly Patented Liquid Hypochlorite Injection System from FMI

**F**luid Metering, Inc. introduces their new patented Chloritrol™ valveless metering system for accurate, maintenance-free injection of liquid sodium and calcium hypochlorite for treatment of municipal drinking water.

Accurately metering of liquid sodium hypochlorite presents a unique challenge because of the fluid's tendency to out-gas.

The Chloritrol™ System is a unique valveless duplex pump design. The primary pump injects liquid hypochlorite directly into the water main. The secondary pump removes out-gas bubbles from the system preventing loss of prime. The Chloritrol™ will self prime against pressures up to 125 psi. Internal components are made of sapphire-hard ceramics which provide long term drift-free accuracy.

Flow rate is controlled by FMI's Model V300 Variable Flow Controller, which accepts 4-20 mA, 0-5 VDC, and 0-10 VDC, signals from process sensors and instrumentation. Flow rate can be manually controlled as well using convenient from panel membrane switches and LED readout.

The Chloritrol™ has been field tested in very demanding applications, and demonstrated that it exceeds performance expectations. It is also noted that the size of the system, as well as energy consumption, is a fraction of that of conventional injection pumps.

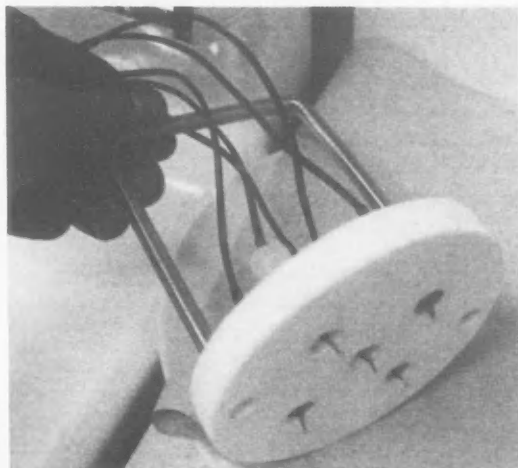
In addition to sanitizing of drinking water, the Chloritrol is an excellent choice for accurate sodium hypochlorite addition for municipal swimming pools, water parks, resorts, food processing plants, and waste treatment applications.

**Fluid Metering, Inc.**  
800.223.3388  
Syosset, NY  
www.fmipump.com

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

**EDITOR'S NOTE:** In the June 2009 issue of *Food Protection Trends* 29:(6):335-341 on page 336 the incorrect figure was printed. The correct figure is printed below.

**FIGURE 1.** Teflon disk with thermocouples for measuring patty temperature.





# WORLD'S FOOD PROCESSING + PACKAGING MARKETPLACE



In a market like this, you need to operate at peak performance. Food processors need every advantage they can get. Today, your biggest opportunity lies in innovation. At the Worldwide Food Expo, you'll see how new technologies can address today's hot topics – from trends and ingredients to food safety, sustainability and how to “green” your operations and packaging. Co-located with the AMI Meat, Poultry & Seafood Expo, the Worldwide Food Expo is also an ideal venue for exploring “crossover” ideas between industries.

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[www.chinafoodsafety.com](http://www.chinafoodsafety.com)



China International Food Safety & Quality Conference + Expo 2009

# 2009

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For more information about attending, speaking or sponsorship/exhibiting opportunities, please contact: [info@infoexws.com](mailto:info@infoexws.com)



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Tel: 852-2865 1118 Fax: 852-2865 1129 [www.chinafoodsafety.com](http://www.chinafoodsafety.com)

# COMING EVENTS

## AUGUST

- **3-7, 2nd Annual Molecular Methods in Food Microbiology Symposium and Workshop**, Colorado State University, Fort Collins, CO. Sponsored by Colorado State University, Cornell University and the Silliker Food Center. For more information, go to [www.ansci.colostate.edu/content/view/734/107/](http://www.ansci.colostate.edu/content/view/734/107/).
- **4-6, Food Marketing Institute Auditing SQF Systems Training**, Marriott Chicago Midway, Chicago, IL. For more information, go to [www.fmi.org/forms/Meeting-Calendar/](http://www.fmi.org/forms/Meeting-Calendar/).
- **9-13, Dietary Managers Association 49th Annual Meeting**, Hyatt Regency Atlanta On Peachtree Street, Atlanta, GA. For more information, call 800.323.1908 or go to [www.dmaonline.org](http://www.dmaonline.org).
- **11-13, Statistical Process Control (SPC) for the Food Industry**, University of Georgia, Athens, GA. For more information, go to [www.foodscience.caes.uga.edu/](http://www.foodscience.caes.uga.edu/).

## SEPTEMBER

- **8-12, 6th International Conference on Predictive Modeling in Foods**, Renaissance Washington, D.C. Hotel, Washington, D.C. For more information, contact Debbie Donze at [ddonze@helmsbriscoe.com](mailto:ddonze@helmsbriscoe.com) or go to [www.6icpmf.org](http://www.6icpmf.org).
- **13-16, 123rd AOAC Annual Meeting**, Philadelphia, PA. For more information, go to [www.aoac.org](http://www.aoac.org).
- **13-16, American Association of Cereal Chemists International Annual Meeting**, Baltimore Convention Center, Baltimore, MD. For more information, call 651.454.7250 go to [www.aacnet.org](http://www.aacnet.org).
- **15-16, Developing and Implementing HACCP for the Meat and Poultry Industry**, University of Georgia, Athens, GA. For more

information, go to [www.foodscience.caes.uga.edu/](http://www.foodscience.caes.uga.edu/).

- **15-16, Food Labeling: Complying with Regulatory Requirements for the Labeling of Packaged Foods Workshop**, GMA Headquarters, Washington, D.C. For more information, go to [www.gma-online.org/events/index.cfm](http://www.gma-online.org/events/index.cfm).
- **15-16, Upper Midwest Dairy Industry Association**, Centennial Meeting, Holiday Inn, St. Cloud, MN. For more information, contact Gene Watnaas at 218.769.4334 or [saantaw@prtcl.com](mailto:saantaw@prtcl.com).
- **20-24, IDF World Dairy Summit-United Dairy World 2009**, Maritim Hotel Berlin, Berlin, Germany. For more information, go to [www.wds2009.com](http://www.wds2009.com).
- **21-24, Dairy Technology Workshop**, Randolph Associates, Inc., Birmingham, AL. For more information, call 205.595.6455; E-mail: [kristy.clark@raiconsult.com](mailto:kristy.clark@raiconsult.com).
- **22-24, New York State Association for Food Protection's 86th Annual Conference**, Doubletree Hotel, East Syracuse, NY. For more information, contact Janene Lucia at 607.255.2892; E-mail: [jgg@cornell.edu](mailto:jgg@cornell.edu).
- **22-24, Wisconsin Association for Food Protection 2009 Joint Education Conference**, Wilderness Resort, Wisconsin Dells, WI. For more information, contact Neil Vassau at 608.833.6181 or go to [www.wafp-wi.org](http://www.wafp-wi.org).
- **23-24, China International Food Safety and Quality Conference and Expo**, Landmark Hotel and Towers, Beijing, China. For more information, go to [www.chinafood-safety.com/index.htm](http://www.chinafood-safety.com/index.htm).
- **23-25, Washington Association for Food Protection Annual Conference**, Campbell's Resort, Lake Chelan, WA. For more information, contact Stephanie Olmsted at 206.660.4594 or go to [www.waffp.org](http://www.waffp.org).

## OCTOBER

- **1-2, Advanced Listeria monocytogenes Control Measures in RTE Meats and Poultry**, Toronto, Canada. For more information, contact Blaise Ouattara, Canadian Meat Council at 613.729.3911 ext. 23; or go to [www.cmc-cvc.com](http://www.cmc-cvc.com).
- **5-7, Process Expo 2009**, Las Vegas Convention Center, Las Vegas, NV. For more information, go to [www.fpsa.org/processExpo/](http://www.fpsa.org/processExpo/).
- **6-7, Advancing Your HACCP Program**, University of Georgia, Athens, GA. For more information, call 706.542.2574; E-mail: [EFS@uga.edu](mailto:EFS@uga.edu).
- **6-7, Iowa Association for Food Protection Annual Conference**, Quality Inn & Suites, Ames, IA. For more information, contact Lynn Melchert at [lynn.melchert@swissvalley.com](mailto:lynn.melchert@swissvalley.com).
- **7-8, Associated Illinois Milk, Food and Environmental Sanitarians Fall Conference**, Stoney Creek Inn, East Peoria, IL. For more information, contact Steve DiVincenzo at [Steve.DiVincenzo@illinois.gov](mailto:Steve.DiVincenzo@illinois.gov).
- **7-9, IAFP European Symposium on Food Safety**, Berlin, Germany. For more information, call 515.276.3344 or go to [www.foodprotection.org/events/european-symposia/](http://www.foodprotection.org/events/european-symposia/).
- **13-16, 2009 ASTHO Annual Meeting**, Vienna (Tysons Corner), VA. For more information, go to [www.astho.org](http://www.astho.org).
- **18-21, Food Microbiology Symposium - Current Concepts in Foodborne Pathogens and Rapid and Automated Methods in Food Microbiology**, University of Wisconsin-River Falls, River Falls, WI. For more information, go to [www.uwrf.edu/afs-all/institutes/foodmicro/](http://www.uwrf.edu/afs-all/institutes/foodmicro/).
- **21-22, British Columbia Food Protection Association 10th Anniversary Fall Technical Session and Conference**, Delta

# COMING EVENTS

Vancouver Airport Hotel, Richmond, BC. For more information, contact Terry Peters at 604.666.1080; E-mail: [terry\\_peters@telus.net](mailto:terry_peters@telus.net).

- **26-29, North Dakota Environmental Health Association Annual Conference**, Doublewood Inn, Fargo, ND. For more information, go to [www.ndeha.org](http://www.ndeha.org).
- **28-31, Worldwide Food Expo**, McCormick Place, Chicago, IL. For more information, go to [www.worldwidefood.com](http://www.worldwidefood.com).

## NOVEMBER

- **2-4, Sweets Middle East**, Dubai International Convention and Exhibition Centre, Dubai, U.A.E. For more information, phone 971.4.308.6748; E-mail: [sweetsmiddleeast@dwtc.com](mailto:sweetsmiddleeast@dwtc.com).

- **5-7, Mexico Association for Food Protection Annual Meeting**, NH Krystal Hotel, Puerto Vallarta, Mexico. For more information, E-mail Alex Castillo at [a-Castillo@tamu.edu](mailto:a-Castillo@tamu.edu) or go to [inocuidad.cucei.udg.mx](http://inocuidad.cucei.udg.mx).
- **7-11, 137th APHA Annual Meeting and Exposition**, Philadelphia, PA. For more information, go to [www.apha.org/meetings](http://www.apha.org/meetings).
- **9-10, Advanced HACCP Training Course**, Ecolab Inc., Eagan, MN. For more contact [foodsafety@ecolab.com](mailto:foodsafety@ecolab.com).
- **9-11, 3rd Halal Expo**, Dubai, U.A.E. For more information, go to [www.worldhalalexpos.com](http://www.worldhalalexpos.com).

- **10-12, Sanitation Workshop**, Randolph Associates, Inc., Birmingham, AL. For more information, call 205.595.6455; E-mail: [kristy.clark@raiconsult.com](mailto:kristy.clark@raiconsult.com).
- **11-12, Implementing SQF 2000 Systems Training Course**, Ecolab Inc., Eagan, MN. For more information, contact [foodsafety@ecolab.com](mailto:foodsafety@ecolab.com).
- **11-13, IAFP Asia Pacific Symposium on Food Safety**, Seoul KyoYuk MunHwa HoeKwan Hotel, Seoul, South Korea. For more information, go to [www.iafpkorea.co.kr/main.asp](http://www.iafpkorea.co.kr/main.asp).
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followed up with PCR, which is being condensed into field tests costing \$50 (3).

### Framework for bioterrorism surveillance

Because of its nearly instantaneous data-collection and microbiological analysis capabilities, the system I'm proposing will even be capable of detecting a bioterrorism attack, most obviously by strengthening existing surveillance systems. An existing emergency detection system in California (9) collects weather alerts, natural disaster information, and other official warnings, potentially even 911 calls, into a common database, then makes them available to subscribers. My system could generate an automatic warning when a threshold number of Web users report similar symptoms, such as those associated with the prodromal period for smallpox, at the same time in a given locale. Cases would be able to see the number and location of other cases.

This proposed surveillance system is intended to supplement, not replace, existing systems such as Food Net and the official reporting systems. But I believe this proposal is the future of foodborne and environmental disease surveillance.

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- F2430 Smart Sanitation: Principles and Practices for Effectively Cleaning Your Food Plant
- F2440 Cleaning and Sanitizing in Vegetable Processing Plants: Do It Well, Do It Safely!
- F2450 A Guide to Making Safe Smoked Fish
- F2451 A HACCP-based Plan Ensuring Food Safety in Retail Establishments
- F2460 Safer Processing of Sprouts
- F2460 FastTrack Restaurant Video Kit
- F2500 Tape 1 - Food Safety Essentials
- F2501 Tape 2 - Receiving and Storage
- F2502 Tape 3 - Service
- F2503 Tape 4 - Food Production
- F2504 Tape 5 - Warewashing
- F2505 Worker Health and Hygiene Program for the Produce Industry Manager Guide to Worker Health and Hygiene Your Company's Success May Depend on It!
- F2506 Worker Health and Hygiene: Your Job Depends on It!
- F2600 Food Industry Security Awareness: The First Line of Defense

## OTHER

- M4030 Ice: The Forgotten Food
- M4050 Personal Hygiene and Sanitation for Food Processing Employees
- M4060 Psychiatric Aspects of Product Tampering
- M4070 Tampering: The Issue Examined

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QUANTITY	DESCRIPTION	MEMBER OR GOV'T PRICE	NON-MEMBER PRICE	TOTAL
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<b>SHIPPING AND HANDLING</b> – \$3.00 (US) \$5.00 (Outside US)		Each additional	Shipping/Handling	
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# THOUGHTS ON TODAY'S FOOD SAFETY...



## **A Call for a New Surveillance System for Sporadic Foodborne Illness Using a Weight-loss Web Site**

Jim Hartman, R.S., M.S.  
Healthy Homes/Lead Program  
Columbus Public Health  
Columbus, Ohio

### **Introduction**

I wish to describe a new approach to conducting surveillance for sporadic foodborne illness and other environmental hazards and organizing the inspection programs that control them (4, 5). The system I am suggesting would show the actual risk of specific foods and processing errors. It also applies to other environmental exposures.

According to the CDC (8) there are 81 million cases of foodborne disease every year in the United States. Only a small fraction of these (approximately 0.032%) are investigated as outbreaks (7). We should investigate more of these sporadic cases partly because they may have different causes than outbreaks do. More important, we need to find out how much of a deviation from control is necessary to cause illness. For example: we know the percentage of outbreaks caused by improper cooling, but we do not know the percentage of improperly cooled foods that cause illness. What is the probability that bean soup cooled in a huge pot for eight hours will cause illness? To answer this question we would have to investigate meals eaten by people who did and did not get sick.

### **Why people would participate**

This would require a group of people who were motivated to record everything they ate for a period of time. People are not likely to devote the effort necessary to record everything they eat unless they need to control their weight or have a diet-related chronic disease. It is no secret that we have an obesity epidemic going on, although, whether it is a health crisis is being debated – see, for example, the article by Goetz (2). Still, we seem to think telling people to eat less and exercise more will

solve the problem. It seems to me we need a way to help people keep track, like one keeps track of money when on a budget. Most other weight-loss Web sites merely provide advice and sample meal plans. This proposed Web site could be promoted as a way to lower health insurance premiums to participants.

### **Web pages for diet and physical activity**

My proposal begins with a set of user-friendly interactive Web pages for monitoring diet and physical activity to control health problems. This Web site would collect actual diet and physical activity records. It also would provide the opportunity to report illness symptoms.

The unlucky few users who were using the Web pages to control other diet-related diseases, but who experienced symptoms of foodborne illness, would be referred to their local health department, which would receive their complete food and illness history, including sources of foods.

### **Enteric disease epidemiology program**

The system I am proposing would require a team of health department sanitarians who could investigate foods reported by cases, and controls matched to cases, using the same techniques used in outbreak investigations. Many (or most) inspections in a jurisdiction would be targeted to investigate restaurants or other sources of foods identified by the Web site. A data-processing system to tabulate and compare food processes used by restaurants involved with cases and those involved with controls would be necessary (6).

Amazingly, according to the CDC (8), foodborne illness is so common that if 50 people keep a 7-day diet record, one of them will get sick from something in his or her record. CDC's estimate for the incidence was 1.4 episodes per person per year. Knowing a person's symptoms and incubation period and what might go wrong with the preparation process would tend to implicate specific meals and foods.

The near real-time essence of this approach would require rapid microbiological methods like ATP-bioluminescence surface hygiene meters during inspections and immunomagnetic separation (1)

Continued on page 465



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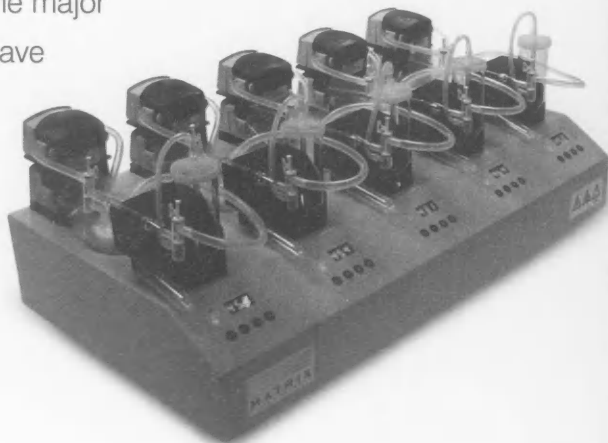
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