

August 2009

Vol. 29, No. 8

ISSN:1541-9576

Periodicals

6200 Aurora Avenue • Suite 200W
Des Moines, Iowa 50322-2864, USA

Food Protection Trends

Science and News from the International Association for Food Protection



**Contamination Prevention and Response
Related to Fresh and Fresh-cut Produce**

**Control of *Salmonella* in Low-moisture Foods
III: Process Validation and Environmental
Monitoring—Part three of a three-part series**

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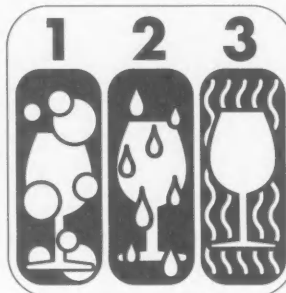
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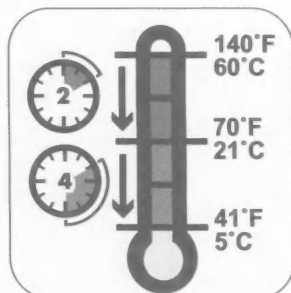
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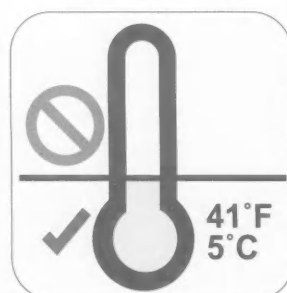
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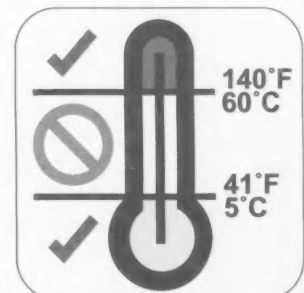
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VOLUME 29, NO. 8

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Food Protection Trends (ISSN-1541-9576) is published monthly beginning with the January number by the International Association for Food Protection, 6200 Aurora Avenue, Suite 200W, Des Moines, Iowa 50322-2864, USA. Each volume comprises 12 numbers. Printed by Heuss Printing, Inc., 911 N. Second Street, Ames, Iowa 50010, USA. Periodical Postage paid at Des Moines, Iowa 50318 and additional entry offices.

Manuscripts: Correspondence regarding manuscripts should be addressed to Donna A. Bahun, Production Editor, International Association for Food Protection.

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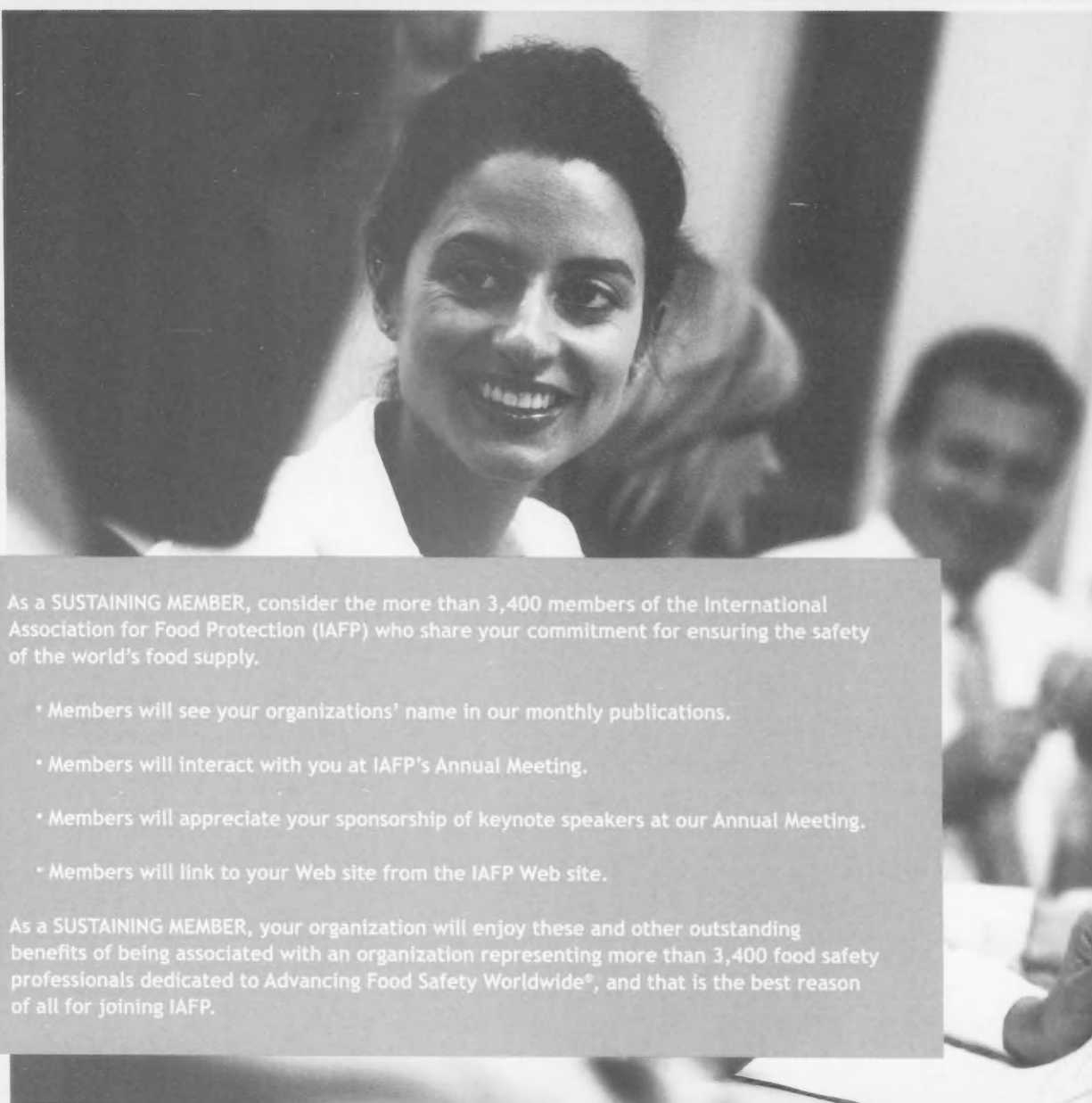


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"VICKIE'S VIEW" FROM YOUR PRESIDENT

Well, I've had three years to think about this moment: penning my inaugural President's column for *Food Protection Trends*. Each member on the International Association for Food Protection (IAFP) Executive Board, past and present, will tell you that writing this monthly column might be the most difficult part of the appointment. You would think that in three years, I could come up with some good stuff to write about. In fact, I've thought about what I would write, and even came up with some really good ideas, In My Opinion (IMO)! However, now that the time is upon me, I can't seem to find any of those little dinner napkins on which I jotted all those insightful topics! Even so, the world has changed significantly during the past three years, and I ask myself, are any of those ideas and thoughts still relevant in any case?

The shifting economy is driving many of the changes we are experiencing in the food industry: decreased funding, decreased labor, decreased resources, and so on. What hasn't changed—and what will always be—quintessentially relevant is food protection and the goal of global food safety. IAFP is the organization created to foster that vigilance—the organization created for protecting the global food supply. As it turned out, I didn't need my dinner napkin notes to know what I wanted to convey in this first column. It came from another seemingly unrelated source. For the past three years I have participated in the Avon Walk for Breast Cancer. I debated doing it this year. Who would have extra money to donate to this cause in this depressed economy? Then a friend of mine was diagnosed with breast cancer and I realized that cancer doesn't take a break; it doesn't stop afflicting people just because there is an economic downturn. Food protection is analogous to this in that



By **VICKIE LEWANDOWSKI**
PRESIDENT

***"This is not
the time to put
food protection
on hold!"***

we have and will continue to have food protection issues and foodborne illness outbreaks regardless of the state of the economy.

My message became very clear: This is not the time to put food protection on hold! In fact, as consumers find themselves with less discretionary money during difficult economic times, they are forced to make choices: preventative/routine health checkups or mortgage payments, groceries or gas for the car. Similarly, choices will be made with respect to food: more consumers will opt

to eat at home rather than dine out, purchase less expensive food at the grocery store, etc. And it's not just consumers tightening their belts. We have witnessed industry, government and academia forced to do the same. However, regardless of the economy, as food safety professionals we must always remain vigilant in protecting the global food supply. I urge each of you to be cognizant of cost-saving efforts that impact your job and to always push back on any initiatives that will potentially compromise the safety of our food supply.

IAFP's mission statement is "to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply." It is this mission statement that will facilitate achieving global food safety. It is a good practice for all types of organizations to keep their mission statement front and center and to review it on a regular basis and to question, "Are we doing what we say we are doing?" Is IAFP doing what they say they are doing? Having been a proud member of this Association for more than 10 years and a member of the Executive Board for three, I can answer this with a resounding "Yes!" IAFP is internationally recognized as the premier food safety organization worldwide. Recognition like this can only be achieved through the works of exemplary membership, executive leadership and a dedicated staff. All three of these elements have come together synergistically for the success of IAFP. I feel incredibly humble and honored to be in the presence of so many prominent food safety professionals; the worldwide recognition and expertise of our members is what is reflected back on IAFP. Our Executive Board currently has and has had members on it that are "legends" in Food Safety, and I

have been fortunate to have served on the Board with many of them, including Kathy Glass, Jeff Farber, Frank Yiannas, Gary Acuff, Stan Bailey, Lee-Ann Jaykus, Isabel Walls, Terry Peters, Maria Teresa Destro, Carl Custer, Roger Cook and Dan Erickson. Each of these members has given so much time and effort to the organization, helping to nurture and actualize the mission of IAFP. The third element—

and hands-down the most crucial one to the success of IAFP—is our Executive Director David Tharp, Assistant Director Lisa Hovey and the IAFP staff. I start my year as president with confidence, knowing that I have this incredibly effective and dedicated staff supporting me and the Association.

My hope is that my President's column throughout the next year will be relevant to my fellow IAFP

members. In order for that to happen I sincerely encourage your feedback and topic suggestions. This is your organization; please feel free to contact me at any time at VLewandowski@kraft.com. (I also accept suggestions via dinner napkins!)

"We should all be concerned about the future because we will have to spend the rest of our lives there."—**Charles F. Kettering, inventor, philosopher**

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, or call Leilani McDonald, Affiliate Council Liaison, at +1 515.276.3344 or +1 800.369.6337



“COMMENTARY” FROM THE EXECUTIVE DIRECTOR

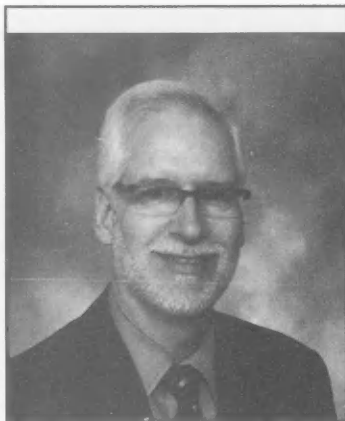
This is always an odd time to write a column for *Food Protection Trends*. By the time you read this, IAFP 2009 will be completed but I am writing this column just days before IAFP 2009 begins. So, from the reader's perspective, I feel compelled to tell you about the outcome of the Annual Meeting, but since it did not yet begin, that is very hard to do!

I can tell you that our expectations for a very successful meeting are met with registration numbers, hotel reservations, exhibitor sign up and sponsorship dollars all tracking extremely well against prior year's statistics. This is especially encouraging for the current economic conditions for the world. With the comparisons we follow, it is sure to be a well-attended conference.

The projected attendance at IAFP 2009 is just another indicator of how important face-to-face meetings continue to be. We expect more than 10% of our attendance will come to the meeting from outside of North America. Even with Internet forums, Listserv news, blogs, podcasts, wikis, instant messaging and so many other ways to communicate important information; the IAFP Annual Meeting continues to be a force in bringing food safety leaders together, face-to-face.

Not only does IAFP bring food safety leaders together at its Annual Meeting, but now we have two additional meetings each year outside of the North American continent. For 2009, this includes our European Symposium on Food Safety and the Asia Pacific Symposium on Food Safety. Program detail for both symposia are available on the IAFP Web site. Dates and locations for these meetings are as follows:

- European Symposium on Food Safety will be held from 7–9 October in Berlin, Germany



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

**“Now we have
two additional
meetings each year
outside of the
North American
continent”**

- Asia Pacific Symposium on Food Safety will be held from 11–13 November in Seoul, Korea

Our hope is for IAFP Members and other food safety professionals who are unable to journey to the IAFP Annual Meeting, that they might be able to come to a meeting organized by IAFP in a region closer to their home. The European Symposium has seen nice growth over the years and

offers an even stronger program in 2009. The Asia Pacific Symposium is considered our International meeting and moves from continent to continent or region to region. Last year's symposium was held in Brazil.

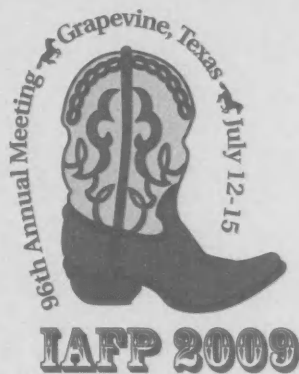
There are two other opportunities for IAFP Members to participate in meetings outside of North America. They are the China International Food Safety and Quality Conference and Expo (CIFSQ) and the Dubai International Food Safety Conference (DIFSC). IAFP has aligned with the organizers of both of these conferences to assist with speaker invitations, program content and encouraging company sponsorships and exhibiting. We have found both to be well organized and very well received by those in attendance. Upcoming dates for these conferences are as follows:

- CIFSQ will be held September 23–24, 2009 in Beijing, China
- DIFSC will be held February 22–24, 2010 in Dubai, United Arab Emirates

If you have the opportunity, we encourage your attendance at either of these exceptional conferences.

So as you can easily see, IAFP continues to expand by providing opportunities for IAFP Members and food safety professionals to come together, face-to-face, to discuss important topics to keep the world's food supply as safe as can be. When it is possible, come to one of our meetings. We look forward to welcoming you, wherever it is around this world of ours!

You might ask, “how did IAFP 2009 turn out?” We can't tell you results right now, but if you check your August *IAFP Report* or the Web site, you will find details there. Otherwise, we will fill you in next month in this column. One thing is for sure, it was a HOT TIME in Texas in July!



*A Special
Thank You
to Our Sponsors,
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IAFP 2009
A Success!*

Watch for Annual Meeting Highlights
in the October issue of *Food Protection Trends*.

Contamination Prevention and Response Related to Fresh and Fresh-cut Produce: An Expert Perspective on the Farmer Decision Making Process

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SUMMARY

Despite a recent concerted effort to reduce the incidence of foodborne diseases associated with fruits and vegetables, infections traced to these foods continue to occur. This has resulted in great interest in identifying and promoting adoption of practices that will result in a safer food supply and a more robust agricultural economy. The research findings reported here are the first of five stages intended to improve the effectiveness of on-farm decision making related to microbial contamination prevention and response. An expert-based conceptual model was developed with input from diverse stakeholders in academics, government and industry. The resulting qualitative influence diagram depicts the major influences on farmers' perception, understanding, and internalization of contamination threats and ultimately their decision making regarding prevention of and response to contamination. This model provides a clear view of state-of-the art scientific knowledge of food safety as it relates to fresh and fresh-cut produce. This knowledge is being used as a benchmark for assessing potential gaps in knowledge or misperceptions among growers, processors and others in the chain of custody. More focused scientific research and risk communication efforts will then be developed from this research to reduce contamination by increasing preventive action and improving response.

A peer-reviewed article

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INTRODUCTION

Current practices associated with production, harvesting, processing, packaging, transportation and preparation of vegetables provide many opportunities for transfer of pathogens to humans. Despite a recent concerted effort by industry, academia, and government to reduce the incidence of foodborne diseases associated with fruits and vegetables, infections continue to occur. This has resulted in great interest in identifying and promoting adoption of practices that will result in a safer food supply and a more robust US agricultural economy. Specifically, individuals involved in various stages of production along the farm-to-table continuum need to be the target of risk communications that enhance their ability to make optimum decisions regarding food safety practices.

The research findings reported here are the first of five stages that are collectively intended to improve the effectiveness of on-farm decision making related to microbial contamination prevention and response. Enhancing such decision making requires assessing the degree to which farmers' knowledge and perceptions correspond with those of experts. The goal of this assessment is to identify potential gaps and misconceptions that need to be addressed through future research, education, and extension efforts and to discover overlooked and emerging concepts not identified by experts.

To identify farmers' knowledge and perceptions, this project employs a mental models approach. The concept of mental models is a well-established theory in psychology and decision science (7-9). Mental models can be thought of as a complex web of deeply held beliefs that operate below an individual's conscious level. They affect how an individual defines a problem, reacts to an issue, gathers and processes information, assesses risks and benefits, and makes decisions about topics and issues that are communicated to them. Because mental models define an individual's thoughts and actions with regard to a particular cultural domain, they can also limit an individual to a range of familiar patterns of reasoning and behavior. Effective analyses of these models can provide insight into broadening the boundaries of a particular audience with more specific risk communications (9).

The methodology of using mental models, to inform risk communication

by identifying what people already know and what they need to know, has been the focus of extensive policy and management applications. A short list of these applications, which represents the relevance of this approach across multiple social scales, includes global climate change (2), wildfire management (13), antibiotic use in livestock (3), radon in homes (1), and agricultural weed management (12). In general, these studies have highlighted the underlying motivational and cognitive processes that are reflected in the target audiences' beliefs, attitudes, and perceptions. It is these processes that provide important insights into patterns of decision behavior and the underlying gaps in knowledge and perceptions that must be addressed through future risk communications.

MATERIALS AND METHODS

Research approach and design

As a research method, the mental models methodology is based on five steps: developing an expert conceptual model of the problem and associated decision process, conducting interviews to develop the target audience mental models, conducting a confirmatory (survey-based) assessment of the identified gaps, developing the risk communication message, and evaluating the effectiveness of the message (9). The research reported here integrates expert knowledge on microbial hazards to fresh and fresh-cut produce into what is known as the "expert" or comprehensive, technical model. This first step in the mental models methodology provides the theoretical baseline for all future research. As a result, the expert model is not limited to concepts on which the expert participants agree, but rather attempts to capture the full state of knowledge on the topic. An expert model targeting foodservice operators, regulatory agencies and consumers with regard to improving microbial safety of fresh produce was recently published (10), but no such previous effort has been made focusing on contamination on-the-farm.

The expert model for prevention of and response to contamination related to fresh and fresh-cut produce was initially developed based on informal conversations with the principal investigators on the project and a directed review of exist-

ing literature (4, 5, 6, 11). An expert model workshop was then conducted in April 2007, with broad representation of approximately 20 key experts in the fields of food safety, plant pathology, microbiology, animal health, horticulture and crop sciences, consumer sciences, and decision science, from universities that include The Ohio State University, Kansas State University's International Food Safety Network (iFSN), University of Georgia, and the University of California at Davis. Representation at the workshop also included experts from federal government agencies (e.g., CDC, USDA), and the food industry (e.g., vegetable growers/farmers, retail grocers). The expert model workshop began by presenting participants with the draft simple expert model that had been developed previously. Participants were then asked to discuss: potential hazards that exist at each step in the food production system; risk communication and management related to food risks; the roles and responsibilities of key players along the food system "chain of custody" and the degree of coordination among them; and influences that impact on-farm risk mitigation activities (e.g., regulations, economic forces, industry pressures, etc.). After this exercise, participants developed hypotheses of key influences on producer understanding of the potential for contamination, their level of preparedness, and readiness to act in response to a contamination event. Finally, participants were asked to discuss the influence of government and university risk communication and management on farmer preparedness and response.

Participant feedback was recorded and incorporated into the model by consensus of the research team. The revised model was then returned to the panel of experts for review and comments. Following a period of review, another meeting was held in August 2007, in which the original participants and those who were unable to attend the first workshop (e.g., FDA) either attended in person or called in to provide comments and feedback, as well as final approval of the model.

RESULTS AND DISCUSSION

The expert participants confirmed many of the concepts included in the draft model but also identified additional concepts related to the food system ("chain

FIGURE 1. Comprehensive expert model depicting expected influences on farmers' decision making regarding safety of fresh and fresh-cut produce. The size of the node does not indicate the importance of that factor in the model, as the nodes have not been weighted

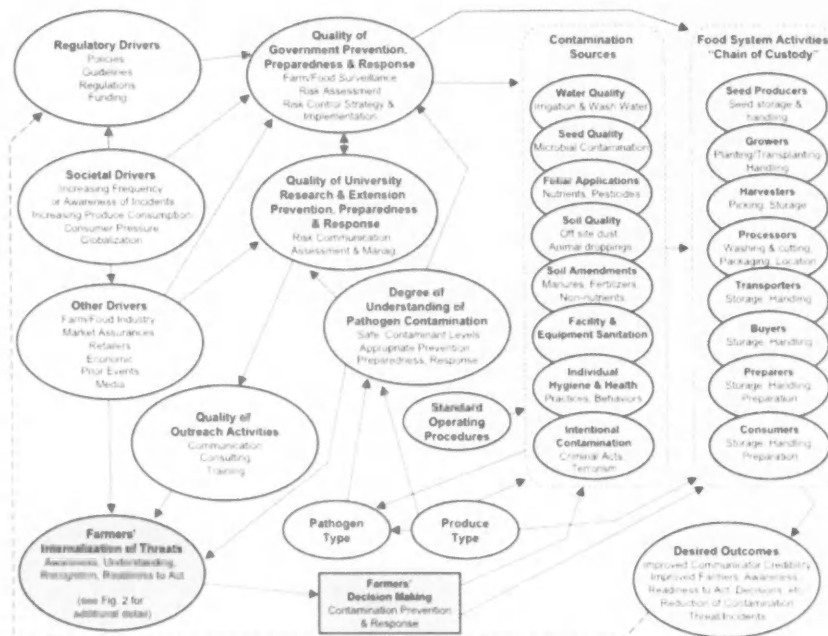
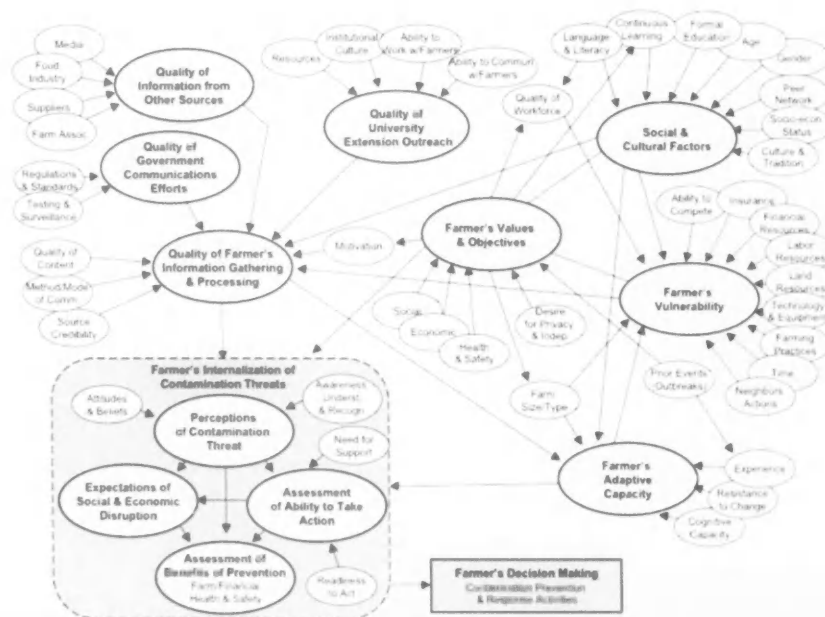


FIGURE 2. Detailed farmer sub-model depicting expected influences on farmers' internalization of contamination threats and decision-making regarding safety of fresh and fresh-cut produce. The larger nodes depict organizing factors while the smaller nodes depict more detailed factors related to the larger organizing nodes



of custody”), microbial contamination sources, contamination prevention, preparation and response best practices, and influences on farmers’ decisions related to prevention of and response to contamination. This information was summarized and represented in a final expert model using the form of a qualitative influence diagram (Fig. 1), as well as a more detailed expert conception of the specific influences on farmers’ internalization of contamination threats (Fig. 2). In both models, each node represents a variable that will be both qualitatively and quantitatively assessed with the target decision makers (i.e., farmers) in the mental models and survey phases of the project.

The simple expert model

The simple expert model identifies the expected major influences on farmers’ perception, understanding, and internalization of contamination threats and ultimately their decision making regarding contamination prevention and response (Fig. 1). The main influences affecting behavior are referred to as ‘drivers’. The model is best read starting from the upper left corner, where the drivers of the system are located. The model reveals the main drivers as being regulatory (e.g., policy, guidelines, regulations, funding), societal (e.g., increasing frequency and awareness of incidents, increasing consumption) and a combination of other drivers (e.g., farm/food industry, retailers, economics), and ends in the lower right hand corner, where the expert panel members’ desired outcomes are detailed. The central food system activities shown on the right hand side of the model depict the “chain of custody” of food from production to consumption. At any point in this chain of custody, food is influenced by contamination sources (e.g., water quality, soil quality, soil amendments, facility and equipment sanitation and individual health and hygiene).

Contamination sources are influenced in turn by the quality of government food contamination prevention, preparedness and response, standard operating procedures of the farm operators, and farmers’ decision making. Farmers’ decision making also directly influences food system activities in the chain of custody. The type of produce being grown

influences food system activities and contamination sources. Farmers’ decision making, such as their actions regarding contamination prevention and response, are influenced by their internalization of contamination threats, including their awareness, understanding, recognition and readiness to act.

The internalization node is shaded to link it to the additional nodes represented in the detailed farmer’s sub model (Fig. 2). In general, farmers’ internalization of the threat is influenced most directly by other drivers such as the farm/food industry, and farm economics and prior contamination events. Farmers’ internalization is also influenced by the quality of outreach activities (primarily of University extension) and also by the degree of understanding of pathogen contamination (within the scientific and agricultural community, not of the individual farmer specifically). This degree of understanding influences the quality of university research and extension activities, which in turn influences and is influenced by the quality of government food activities, representing an interactive, two-way relationship between government and industry on these issues.

The detailed farmers’ sub model

This sub model (Fig. 2) is intended to expand upon the farmers’ internalization of contamination threats node in the simple model (Fig. 1). The farmers’ internalization of threats is composed of four main factors: perception of contamination threat, assessment of benefits of prevention, expectation of social and economic disruption, and assessment of ability to take action. These perceptions, assessments, and expectations are impacted by three major influences: the quality of information gathering and processing, individual values and objectives, and adaptive capacity (e.g., farmers’ experiences, cognitive capacity and resistance to change).

The quality of farmers’ information gathering and processing represents a cultural lens through which the individual absorbs relevant information, represented by the quality of information and communications available from government and other sources and the quality of University extension outreach. The quality

of information gathering is also influenced by social and cultural factors (e.g., age, gender, education, peer network), and the individual farmer’s values and objectives, which may or may not create individual motivation to seek information. Finally, farmers’ information gathering and processing is also influenced by their actual and perceived vulnerability (e.g., their level and access to technology and equipment, their reliance on particular labor resources, their financial resources, etc.).

Farmers’ values and objectives indirectly affect the quality of information gathered and processed, but they also directly affect the farmers’ internalization of the threat. These values and objectives may be influenced by social and cultural factors; a farmer’s perceived vulnerability based on available resources and assessment of the particular situation; and perceptions of and attitudes toward prior events (e.g., the 2006 spinach-related *E. coli* outbreak). Finally, an individual farmer’s adaptive capacity may directly influence internalization of the threat. Adaptive capacity is influenced by the size and type of farm, social and cultural factors, experience, quality of information gathering and processing, resistance to change, and individual cognitive capacity.

CONCLUSIONS

As previously mentioned, the expert model presented here is the first step in a larger mental models project aimed at reducing the risk and incidence of contamination for fresh and fresh-cut produce. The goal during this stage was to devise a relational model, using current literature and a panel of diverse experts to, first, benchmark the scientific understanding of influences on farmer decision-making and ultimately contamination at various points in the chain of custody; second, determine how these influences interact with each other and lead to the desired food safety outcomes; and third, identify opportunities for improving risk communication and management through additional or improved programming.

A comprehensive understanding of these influences now allows us to probe farmer understandings of these relationships in order to identify potential gaps in knowledge or misconceptions for which specific risk messages and outreach

programs can be developed. The goal of this on-going analysis is to compare practitioner beliefs with research findings and identify alignments and gaps in both expert and farmer thinking about microbial prevention of and response to contamination (e.g., the authors have conducted and are currently analyzing interviews with farmers, using the expert model presented here as the theoretical framework for understanding their perceptions, attitudes, and behaviors regarding prevention and response to microbial contamination threats in fresh and fresh-cut produce).

Further, the development of a relational model provides the basis for future investigations of fresh and fresh-cut produce food safety by providing a framework of relationships and influences while allowing room for identification of additional influences not included in the current model. Food safety research in this area can reference this state-of-the-art scientific model and amend it with future findings, allowing for greater adaptive capacity among experts. Additionally, such a model provides specific areas of understanding and places boundaries and relationships among concepts that will enable researchers and extension professionals to achieve increased accuracy in reaching desired audiences with more focused risk communication efforts. In turn, this will reduce contamination incidents by increasing preventive action among food producers and others in the chain of custody as well as improving contamination response.

ACKNOWLEDGMENTS

The authors thank the expert panel that participated in the development of the initial expert model. This research was supported by a United States

Department of Agriculture (USDA) Cooperative State Research, Education, and Extension's (CREES) National Integrated Food Safety (NIFSI) competitive grant (USDA/CREES NIFSI grant 2006-51110-03686).

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GENERAL INTEREST PAPER

Control of *Salmonella* in Low-moisture Foods III: Process Validation and Environmental Monitoring

Part three 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. Five of the control elements were covered in previous papers: preventing ingress or spread in a facility, controlling raw materials and ingredients, adhering to stringent hygiene practices in the Primary *Salmonella* Control Area, following hygienic design principles, and preventing growth in the facility by control of moisture. Here we address validation of control measures to inactivate *Salmonella* and verification of control through environmental monitoring.

SALMONELLA CONTROL ELEMENT 6: VALIDATE CONTROL MEASURES TO INACTIVATE SALMONELLA

When a lethality step is needed to inactivate *Salmonella* in a low-moisture product or ingredient, the processing parameters used should be adequate to inactivate the level of the organism likely to be present. According to the National Advisory Committee on Microbiological Criteria for Foods (NACMCF), validation encompasses collecting and evaluating scientific data and technical information to demonstrate that the control measures and associated critical limits at the lethality step, when followed, will result in a safe product (43). In addition, it is necessary to demonstrate that the chosen control measure and critical limits can be applied in production at a critical control point. Validation of lethality steps for low-moisture foods involves determining an appropriate log reduction for *Salmonella*, determining the critical limits in the process required to achieve the reduction, and confirming that the process equipment consistently delivers the critical limit parameters in the operation (43, 52).

In general, NACMCF's definition for pasteurization (44) can be used to guide the determination of an appropriate level of log reduction. With respect to a low-moisture product, NACMCF's definition translates into applying any process, treatment, or combination thereof to reduce the most resistant *Salmonella* serotype "to a level that is not likely to present a public health risk under normal conditions of

distribution and storage." NACMCF also indicated that a control measure aimed at inactivating the target pathogen does not protect the consumer if the product is subsequently recontaminated during manufacturing. The effective approach to prevent recontamination is through good hygiene practices verified by environmental monitoring (see Element 7) to ensure that recontamination is not likely to occur.

The level of reduction required will depend on the potential levels of *Salmonella*, if present, in the raw ingredients. Efforts have been made to set an appropriate level of log reduction for a specific low-moisture product based on a risk assessment. For example, a risk assessment (16) conducted to assess the risk of salmonellosis from almond consumption was used to determine that a 4-log reduction of *Salmonella* in raw almonds is adequate to ensure safety of the finished product (6). In some instances, historical knowledge is used as the basis for validation (49). For example, pasteurization at 72°C for 15 s is considered adequate to inactivate expected levels of vegetative pathogens of concern in raw milk. These parameters may be used as the critical limits or as the basis to establish other process parameters as critical limits at the lethality step to inactivate *Salmonella* in the fluid milk ingredient for a dried milk product; preventing recontamination after pasteurization during drying and subsequent handling would be essential to protect the finished dried product from recontamination. Both industry guidelines (22) and FSIS regulations in 9 CFR 590.575 (12) set parameters for the pasteurization

TABLE 1. Heat resistance of *Salmonella* in food matrices as influenced by a_w

Study	<i>Salmonella</i> serotype	Heating medium	Water activity (a_w)	Temperature (°C)	D-value (min)	z-value (°C)	
Barrile and Cone, 1970 (8)	Anatum	Milk chocolate	Not reported	90	11	24.2	
Harris, 2008 (28)	Enteritidis PT 30	Almonds (oil-roasted)	Not reported	121	0.85	27	
		Almonds (blanched)	Not reported	70	1.0	29	
Goepfert and Biggie, 1968 (26)	Typhimurium	Milk chocolate	Not reported ^a	70	816	19.0	
				80	222		
				90	75		
	Senftenberg 775W	Milk chocolate	Not reported ^a	70	440	18.0	
				80	116		
				90	36		
Archer et al., 1998 (7)	Weltevreden	Wheat flour	0.50-0.60 ^b	69-71	80	30.3	
				72-74	45		
				75-77	40-45		
				0.46-0.50 ^b	69-71	55	53.9
					72-74	55	
					75-77	40-45	
			0.41-0.45 ^b	69-71	55	19.6	
				0.36-0.40 ^b	72-74	75	15.2
			75-77		80		
			0.31-0.35 ^b	69-71	345	29.2	
				75-77	85		
			0.25-0.30 ^b	69-71	165	34.7	
72-74	240						
75-77	150						

TABLE I. Continued

VanCauwenberge et al., 1981 (56)	Newington	Corn flour (15% moisture)	Not reported	49	18	Not reported
	Typhimurium				48	
	Kentucky				66	
	Anatum				48	
	Senftenberg				300	
	Cubana				150	
	Thompson				264	
	Tennessee				594	
	Senftenberg				Corn flour (10% moisture)	
	Anatum	156				
Liu et al., 1969 (36)	Senftenberg 775W	Animal feed ^c (15% moisture)	Not reported	71.1	10.0	10.4
		Animal feed ^c (10% moisture)	Not reported	71.1	115.2	11.0
Sumner et al., 1991 (53)	Typhimurium	Chocolate syrup	0.75	65.6	2.7	8.3
			0.83 (product A)	65.6	1.2	6.2
			0.83 (product B)	65.6	3.2	7.7
			0.84	65.6	2.7	8.3

^a Moisture level probably less than 2.5%.

^b Value of a_w measured after drying the inoculated wheat flour.

^c Simulated-naturally contaminated meat and bone meal stabilized at the indicated moisture level was used in the study.

of dried egg white, which include heating the product in a closed container to at least 130°F (54.4°C) for 7 days or longer until *Salmonella* is no longer detected (as a practical matter, the egg industry routinely uses a more severe heat treatment in order to eliminate the avian influenza virus as well as *Salmonella*).

Both thermal and non-thermal control measures can be used for *Salmonella* inactivation to achieve the target log reduction. Various processing steps (e.g., cooking, frying, roasting, baking, heat extruding, fumigation) may be used to inactivate *Salmonella* in a low-moisture product. Thermal processing is the most commonly used control measure to inactivate *Salmonella*. For example, the Almond Board of California's Technical Expert Review Panel (ABC TERP) determined that oil roasting at or above 260°F (126.7°C) for 2 min will result in a 5-log reduction of *Salmonella* on the surface of whole almonds (1). The ABC TERP also provided minimum time and temperature combinations required for blanching processes to deliver a 4 or 5-log reduction of *Salmonella* on almonds (1). These parameters were determined on the basis of heat resistance data for *Salmonella* Enteritidis PT 30 as the target organism.

It is useful to review available scientific data for the processing method of interest, including high temperature short time or low temperature long time, when desirable for maintaining product quality. In order to assure appropriate validation, it is also necessary to evaluate scientific and processing equipment data and information specific to the processing technology under consideration. A process authority should be consulted where necessary. For example, the ABC TERP, which consists of experienced microbiologists and processing experts, evaluates the adequacy of various treatments to inactivate *Salmonella* in raw almonds and develops guidelines for validating individual processes, including propylene oxide (PPO) treatment for raw almond kernels, PPO treatment for in-shell almonds, blanching, oil roasting, dry roasting and other processes that may be proprietary (1).

Heat resistance of *Salmonella* is affected by factors during heating, as well as the *Salmonella* strains used (28). Heat resistance observed in an aqueous system may not be applicable to a low-moisture product. For example, a study by Ng and colleagues (46) found that *S. Senftenberg* 775W was the most heat

resistant among 300 strains evaluated in an aqueous solution, while this strain was found to be less heat resistant than *S. Typhimurium* in chocolate (26). *S. Enteritidis* PT 30, the target organism for raw almonds, was implicated in a foodborne illness outbreak and was found to be more resistant to dry heat than many of the strains evaluated on almonds (1, 58).

A number of studies have been published on heat resistance of *Salmonella* in various low-moisture products. Available D- and z-values for heat resistance of various *Salmonella* strains in low-moisture matrices are shown in Table 1 for food matrices and in Table 2 for model systems. These data indicate that heat resistance is much greater in a product with low a_w than in a high-moisture product. For example, while reaching an internal product temperature of 160°F (71.1°C) without a hold time would eliminate *Salmonella* in raw poultry (23), the same temperature would result in little inactivation of *Salmonella* in milk chocolate, in which the D-value for *S. Typhimurium* has been reported as 816 min at 71°C (26).

Table 1 shows D-values for *Salmonella* in wheat flour (7), milk chocolate (8, 26), almonds (28), corn flour (56), and dry animal feeds (36). In addition, recent research (18) found that, based on the non-linear Weibull model, 42 ± 8 min at 90°C achieved a 5-log reduction of a mixture of three outbreak-associated *S. Tennessee* strains in peanut butter (49 ± 12 min were needed to inactivate a composite of other *Salmonella* isolates). Liu et al. (36), who determined the heat resistance of *S. Senftenberg* 775W in meat and bone meal and chicken starter at moisture levels from 5% to 30%, found that the method used to prepare the inoculum (growing the cells in a laboratory medium vs. in meat and bone meal suspension) affected the heat resistance. Akinleye (3) reported that D- and z-values were affected by water activity of a salt solution model system. D- and z-values relevant to low-moisture heat conditions from this study are shown in Table 2, along with data from another study using sucrose as a model system (53). It should be noted that comparison of inactivation kinetics data from different studies can be difficult, and it is crucial to review the raw data and experimental procedures, as well as the D- and z-values reported, so as to apply the data appropriately.

Heat-inactivation of *Salmonella* in low water activity matrices was found

be non-linear in many cases, such as in peanut butter (37), oil-roasted almonds (2), flour (7), and laboratory media (39). The *Salmonella* inactivation curve in low water activity foods can be complex, often showing a concave upwards curvature, and significant tailing has been observed (28, 38, 39). Thus, the rate of inactivation may not be constant throughout the heating process, and caution must be used when interpreting and using heat resistance data to support the adequacy of the process parameters.

In a study by Archer et al. (7) of the heat resistance of *Salmonella* Weltevreden in wheat flour, the investigators observed that death kinetics were non-linear, with approximately a 1-log reduction in the first 5–10 minutes of heating, followed by a slower, linear decrease in survivors. To be conservative, the investigators calculated the D-value based on the second, slower phase of the inactivation curve. Sumner et al. (53) reported that the D-value of *Salmonella* Typhimurium ATCC 13311 increased by more than 100-fold as the a_w was reduced from 0.98 to 0.83 in sucrose solutions; this trend was observed in the treatment temperature range of 65 to 77°C (149–170.6°F); the study did not investigate temperatures below 65°C for *Salmonella* inactivation. In laboratory media with a_w adjusted with glucose and fructose, Mattick et al. (39) reported that *Salmonella* Typhimurium DT104 inactivation was non-linear in the range of 55 to 80°C (131–176°F). At temperatures ≥ 70°C (158°F), heat resistance increased as the a_w decreased from 0.90 to 0.65; however, this trend was not observed for heat treatment at 65°C (149°F) or below, at which range decreasing a_w from 0.90 to 0.65 either had little effect or slightly decreased the heat resistance of *Salmonella*.

Some studies have also been published on the inactivation of *Salmonella* by non-thermal processing. For example, the efficacy of low-energy X-ray irradiation was examined for inactivating *S. Enteritidis* PT 30 on almonds at different water activities (34). The organism was found to be more resistant at a_w 0.65 (D₁₀-value ~ 0.34 kGy) compared to a_w 0.23 (D₁₀-value ~ 0.26 kGy). Irradiation, for products where its use has been approved, can also be an effective control measure. Irradiation with a dose up to 30 kGy (21 CFR 179.26) has been approved for use in inactivating microorganisms in dry aromatic vegetable substances such as herbs, spices and vegetable seasonings

TABLE 2. Heat resistance of *Salmonella* in model systems as influenced by a_w

Study	<i>Salmonella</i> serotype	Heating medium	Water activity (a_w)	Temperature (°C)	D-value (min)	z-value (°C)
Akinleye, 1994 (3)	Typhimurium	Salt solution	0.42	90	32.3	30.3
				100	12.5	
				110	18.2	
				120	8.9	
			0.31	90	20	40
				100	12.7	
				110	16.7	
				120	10.6	
Sumner et al., 1991 (53)	Typhimurium	Sucrose solution	0.83	65.5	40.2	7.6
			0.85	65.5	19.2	6.5
			0.89	65.5	4.8	6.9
			0.94	65.5	1.4	7.7
			0.98	65.5	0.29	7.6

(13). Danyluk et al. (17) reported a greater than 5-log reduction of *S. Enteritidis* PT 30 on almonds after the product had been treated with PPO (0.5 kg/m³) for 4 hours, followed by storage for 5 days. Ethylene oxide is effective for treating spices and herbs to eliminate *Salmonella* (47, 57). While its application as a control measure is being phased out in some cases (such as for basil), it remains an effective measure to eliminate *Salmonella* in spices and herbs where approved, especially for treating high-risk ingredients that otherwise would not receive a lethality treatment for *Salmonella*.

Validation testing can be carried out using *Salmonella* (appropriate strains), or a surrogate organism that has been validated for the product and process under consideration, or a non-microbial method such as using an enzyme as a surrogate that has been validated for use in such applications. When the time and temperature profiles of a process can be mimicked in the laboratory (e.g., oil roasting), a challenge study with appropriate *Salmonella* strains can be conducted in the laboratory to validate the process (35). This approach has been used to validate a dry-air roasting process for peanuts, where a lab-scale roaster was used to

mimic the actual processing times and temperatures, and the process was found adequate to deliver a 4-log reduction of several *Salmonella* strains (55).

When it is difficult to mimic the processing conditions in the laboratory with sufficient accuracy, a surrogate organism or a non-microbial substance may be used for validation. When a surrogate organism or substance is used, a relationship between the target *Salmonella* strain and the surrogate needs to be established, and the surrogate should behave in a way that a correlation can be made in a conservative manner (35). In practice, a surrogate that has heat resistance comparable to or greater than the target *Salmonella* strain (to build in a margin of safety) is usually selected. For example, studies in several laboratories were conducted to select a surrogate organism for *S. Enteritidis* PT 30, the pertinent pathogen for almonds (58). Correlation between *S. Enteritidis* PT 30 and a surrogate organism, *Enterococcus faecium* NRRL B-2354 (also known as *Pediococcus* spp. NRRL B-2354), has been established for dry heat in the 250 – 310°F (121.1 – 154.4°C) range for almonds. *E. faecium* NRRL B-2354 was found to have inactivation characteristics comparable to *S. Enteritidis* PT 30 under

dry heat conditions (11, 58). In fact, the D-values for the surrogate were slightly higher than those for the pathogen in the 250 – 310°F (121.1 – 154.4°C) range for almonds subjected to dry heating.

Alternatively, particles containing enzymes can be passed through a plant processing step and tested for residual enzyme activity, thus providing an indication of process lethality. The use of enzymes for process validation has been described for various thermal processes (10, 54). Testing for phosphatase has been used to verify that the pasteurization of milk has occurred.

Common industry practices

- Determine the target level of *Salmonella* reduction in the product and process under consideration.
 - The determination can be based on the rationale outlined by NACMCF (44). The target level of *Salmonella* reduction should be such that the treated product presents a reasonable certainty of no harm to the consumer.
 - A targeted 2- to 5-log reduction is commonly selected on

the basis of a hazard analysis that includes historical association of ingredients with *Salmonella*, prevalence and extent of contamination (i.e., the incoming load of *Salmonella*), and the intended use of the final product. The selected log reduction should include a margin of safety, e.g., an additional 2-log reduction beyond the extent or levels of contamination expected to occur in the ingredients (21, 25, 41, 42).

- Where regulatory or industry standards for log reduction have been established, these should be applied. For example, based on a comprehensive risk assessment a 4-log reduction of *Salmonella* in raw almonds has been established in the US to ensure safety of the finished product.
- Determine the adequacy of the selected control measure and associated critical limits for processing.
 - Critical limits should be developed on the basis of thermal parameters (e.g., D- and z-values, thermal death times) or non-thermal parameters of the most resistant and pertinent *Salmonella* serotype, based on occurrence in the product ingredients, processing environment, and/or association with an outbreak involving the product or similar products.
 - In many cases, processing conditions are initially driven by quality attributes, and it is essential to determine whether these conditions can deliver the target log reduction (several quick trials in the lab can be done for a feasibility assessment; literature data can also be used). Working with process engineers to optimize the process to deliver the target log reduction while still maintaining product quality is a common approach used in the industry.
 - In practice, several approaches can be used for validating the adequacy of process parameters. As noted previously, if the process can be mimicked reasonably well in a

laboratory (e.g., for oil roasting), then *Salmonella* can be used in process validation in a laboratory setting to confirm that the critical limits, when achieved, consistently result in the target *Salmonella* log reduction. If the process is too complex to mimic in a lab setting (e.g., heat extrusion), other approaches for validation may be used, such as determining lethality based on the processing conditions (e.g., integrated lethality based on time and temperature profiles) or using a suitable surrogate for validation on the processing line. In addition to process parameters, other critical factors such as the initial temperature and initial moisture level of the ingredient(s) should also be considered in lethality validation studies.

- A non-pathogenic microbial surrogate or a non-microbial surrogate such as an enzyme can be used after appropriate validation. For example, *E. faecium* NRRL B-2354 has been determined to be an appropriate surrogate for *Salmonella* in the validation of processing methods for almonds (1).
- Use published data to guide the determination of whether a challenge study is needed for control measure validation.
 - The utility of literature data depends on the food or model matrix and the design used in the study to generate the data. According to the rationale outlined by NACMCF (44), the value of a particular set of literature data will be enhanced if the matrix and conditions used to generate the data are similar to the product and process to which the data are being applied.
 - Available heat resistance data may be used to estimate log reduction by thermal processing in a low-moisture product. The ideal approach is to use available heat resistance data collected in the same food matrix, such as using D- and z-values obtained in wheat flour to calculate log reduction in wheat flour during

heat processing. Care should be taken when using D- and z-values, as inactivation may not be linear. In some cases a non-linear heat resistance model may have been developed for a product (e.g., peanut butter, almonds) and this can also be used. When D- and z-values are not available for the food at the water activity under consideration, data obtained with a product of similar composition may be used, e.g., data obtained in wheat flour or corn flour for cereal products. When data for a food matrix are not available, data obtained in a model system (e.g., sucrose solution) with similar a_w may be used to estimate lethality. When using this approach, it is important to keep in mind uncertainties inherent in applying available data and assumptions made.

- In most cases, literature data are used to guide efforts in identifying parameters specific to a product of interest, whether a challenge study is needed, and how a challenge study may be designed. Whether published data are sufficient to support the adequacy of the lethality of a chosen control measure and associated critical limits depends on several factors. According to the rationale developed from industry experience (49), if an evaluation based on literature data shows that survival of *Salmonella* is not likely to occur, with a reasonable margin of safety, challenge studies would not be needed. For example, analysis of the time and temperature profiles for a heat extrusion process may indicate that, based on the a_w of the ingredients and the product, the process is expected to deliver *Salmonella* inactivation that would greatly exceed 5 log. On the other hand, if there is less confidence in using published data, then limited challenge studies may be needed to verify estimated log reduction based on literature data. If the evaluation shows that there is limited lethality for the product/process based

on available heat resistance data, then additional studies or process re-design would be warranted.

- Available scientific guidance, such as the NACMCF guidance on parameters for performing an inoculated pack/challenge study (45), should be used for validation of control measures through microbiological challenge testing.
 - Microbiological expertise is necessary to determine the relevance and validity of applying published data to a specific product and process. An experienced microbiologist or process authority should assist in the use and interpretation of published data.
- Consider both thermal and non-thermal control measures, with validation, to eliminate *Salmonella*.
- Thermal processing can be used under dry or moist conditions. Moist heat treatment is followed by a drying step in the manufacturing of many low-moisture products. Where appropriate (e.g., for some spices and seeds) a combination of steam treatment (pressurized or non-pressurized) and drying may be used to inactivate *Salmonella*. In such cases, validation should focus on determining the lethality of the steam process alone as a conservative scenario or, if heating after the steam process is included in lethality calculations, the combined effects of the multiple processing steps should be validated.
 - Validation should focus on the CCP used to deliver the target log reduction, when one of multiple steps effecting lethality is chosen as the CCP. Cumulative effect from multiple inactivation steps may be used to achieve the target log reduction, even though individual steps alone are not sufficient to achieve the target lethality, as long as the individual processing steps and the combined lethality are validated. Be aware that not all heating steps in a process will provide *Salmonella*

inactivation. For example, spray drying is an evaporative cooling process that usually does not result in appreciable inactivation. Another example of minimal to no *Salmonella* inactivation may be a finishing dryer following the heat extrusion process.

- For a low-moisture product (e.g., spray-dried milk) that starts with high-moisture ingredients (e.g., milk), the heat treatment process prior to drying should be readily verifiable, and efforts should be concentrated on preventing post-lethality contamination during drying and the subsequent steps through finished product packaging.
 - Examples of non-thermal control measures are treatment with an approved chemical for fumigation, such as propylene oxide or ethylene oxide, and treatment with irradiation.
- Once the lethality of the process is validated by scientific data, it should be ensured that the operation can deliver the critical limits and that the parameters are consistently met, through in-plant validation, which is an integral part of the validation process. Subsequently, verification of process control may include activities such as records review, calibration of instruments, and periodic finished product testing or other type of independent checks.
- It should also be ensured that raw material/ingredient suppliers validate their processes and the control measures.

SALMONELLA CONTROL ELEMENT 7: ESTABLISH PROCEDURES FOR VERIFICATION OF SALMONELLA CONTROLS AND CORRECTIVE ACTIONS

The adequacy of the *Salmonella* control program should be verified on an ongoing basis to assure effectiveness and to drive continuous improvement. Verification should focus on implementing a robust environmental monitoring program that has been designed to identify transient and/or resident *Salmonella* in the processing areas. Appropriate corrective action procedures must be developed to address positive *Salmonella* findings with

the intent of containing the contamination, identifying the potential source, and eliminating the problem. This section focuses on environmental monitoring and corrective actions to be taken when *Salmonella* is found in the environment, since this is one of the most important verification activities in low-moisture product manufacturing. Other verification activities, such as those for critical control points in a HACCP system, are well covered elsewhere (9, 33, 43, 51).

Environmental monitoring is an essential component for *Salmonella* control, as it provides a microbiological assessment of a plant's environment and an assessment of the effectiveness of sanitation and the overall *Salmonella* control program (27, 40, 59). Environmental monitoring is not, in itself, a control measure. Rather, it is a tool to verify the effectiveness of the overall *Salmonella* control program. Monitoring results provide critical information to improve *Salmonella* control in the plant environment; this information should be used to correct problem areas before they pose a risk to finished product. With this understanding, it is critical that the program be designed and implemented so as to maximize detection of *Salmonella*. A robust environmental monitoring program is one of many prerequisite programs that together provide a firm foundation for effective food safety management.

The target organism for environmental monitoring for low-moisture foods should be *Salmonella*. Scientific literature suggests that the pathogen is more persistent in the environment than other organisms such as coliforms and Enterobacteriaceae. A suitable indicator for *Salmonella* has not been identified (19). Testing with enumeration of Enterobacteriaceae, however, may help assess moisture control in areas in the processing environment intended to remain dry (30). Enterobacteriaceae is a useful indicator of process hygiene and may be monitored in parallel as a hygiene indicator for verification of general sanitation effectiveness. However, it cannot be a substitute for the direct monitoring of *Salmonella* because, while high levels of Enterobacteriaceae suggest an increased risk for the presence of *Salmonella*, low levels of Enterobacteriaceae do not guarantee absence of the pathogen (15, 19).

Environmental monitoring for *Salmonella* is generally conducted on non-product contact surfaces (non-PCSSs). Non-PCSSs in the Primary *Salmonella* Control Area (PSCA) should be the main focus of routine monitoring for *Salmonella*. However, environmental monitoring for *Salmonella* should also be conducted in other areas of the facility (e.g., wet processing or handling of raw materials).

TABLE 3. Example of an environmental monitoring program for production of low-moisture foods

Sampling Zone	Definition	Examples of Sample Sites*	Test for	Frequency	Number of Samples**
Zone 1	Product contact surfaces (PCS) in the Primary <i>Salmonella</i> Control Area	Conveyors, filler hoppers, scrapers/utensils, packaging equipment, etc.	Indicator organisms (e.g. Aerobic Plate Count; Enterobacteriaceae); <i>Salmonella</i> only when special circumstances dictate	Post-Sanitation or as needed for investigational, validation, or verification purposes	Line Dependent
Zone 2	Non-PCS within close proximity to PCS in Zone 1. - Areas that, if contaminated, could reasonably lead to PCS contamination (i.e., under normal operational practices)	Exterior of equipment, legs/frameworks, motor housings, catwalks, control panels, scrap carts, floor drains, HVAC vents, vacuum cleaners if used near PCSs, air filters, weight scales, floor mats at packaging, etc.	<i>Salmonella</i>	Weekly, Biweekly, or Monthly	5-10
Zone 3	Non-PCS within process area but more removed from PCS. - Areas that, if contaminated, could not reasonably lead to PCS contamination without mechanical or human intervention (i.e., employee using compressed air to clean floors or a piece of equipment being moved)	Cleaning tools (brooms, squeegees), floor scrubbers, forklifts, floor drains, traffic pathways into process area, ceiling drain pipes, wall/floor junctures, wash stations, ingredient storage areas, etc.	<i>Salmonella</i>	Weekly or Monthly	3-6
Zone 4	Non-PCS outside processing areas. - Areas that, if contaminated, could spread to the processing area via foot or equipment traffic (i.e. waste carts picking up contamination in compactor room)	Compactor areas, employee entrances, locker rooms, storage rooms, labs, etc.	<i>Salmonella</i>	Monthly or Quarterly	2-4

* It is recommended that a facility assessment be done to identify sampling sites, in order to include potentially problematic areas. Weekly monitoring may be considered as a starting point to establish a solid baseline and the frequency may be revised based on results over time.

** In general, a greater number of samples are taken in Zone 2 than Zone 3 and in Zone 3 than Zone 4 – a ratio of 5:3:2, 6:3:1, 7:2:1, 8:1:1 have been used depending on the product and process, although other approaches may be effective. A larger facility with multiple process lines may take a greater number of samples than those indicated for the zones.

Monitoring in these areas can provide insight into the potential for *Salmonella* to be present and potentially spread into the PSCA. Within the PSCA, non-PCS areas adjacent to PCSs should be monitored with relatively high frequency. If these areas are not maintained in sanitary condition, they may pose a risk of product contamination. Non-PCSs within the PSCA that are more distant from PCSs should be sampled with medium to high frequency, and non-PCSs outside the PSCA should be sampled with low to medium frequency (Table 3). Each facility should determine the frequency adequate for its product and process. In general, high, medium and low frequency would correspond to daily/weekly, monthly, and quarterly testing, respectively.

Testing of a PCS and finished product may be done under some circumstances as part of the overall verification of *Salmonella* control. PCS testing may play an important role in hygienic qualification for equipment prior to use or for investigation of positive *Salmonella* findings. Periodic product testing can be useful in verifying that the food safety system for *Salmonella* control is working. Sampling plans used by the industry for product testing include those described in the FDA BAM (4, 5) and those described

by ICMSF (29). However, because it has well-known limitations in finding low levels of contamination, product testing alone is not a reliable means for assuring the absence of *Salmonella* (29).

An adequate number of samples should be taken at appropriate frequencies for the environmental monitoring program to be effective. The number of samples and the frequency of sampling depend on the operation and facility. The sampling frequency can, in part, be based on current industry practices.

The first step in developing the frequency of testing and the test sites in an environmental monitoring program is to establish a solid baseline. Weekly monitoring may be considered as a starting point and the frequency revised based on the results over time. For example, in a facility that has historical testing data that show consistent *Salmonella* negatives in the environment based on a rigorous sampling program, the monitoring frequency can be reduced. On the other hand, a facility should be prepared to increase monitoring when changes in the operation warrant more monitoring, e.g., ingredient changes, leaky roof, drain back up, construction events, equipment installation, or detection of *Salmonella* during routine environmental monitoring.

An official or validated method, such as the FDA BAM *Salmonella* method (5) or ISO 6579 (32), should be used for testing. For some products, methodology may need to be modified and validated, as some food components (e.g., high fat levels) can complicate the sample preparation and pre-enrichment step and other aspects of the analysis. Both methods include a section on the testing of environmental samples. An alternative method may be used after it is validated as equivalent in sensitivity and specificity to a standard reference method for environmental samples or for the product being tested. Choosing a validated method is important, because a method validated for one purpose may not be suitable for another purpose; similarly, a method validated for individual sample units may not be suitable for testing sample composites (40).

Common industry practices

- Develop a written program for routine environmental monitoring.
 - The program should include elements such as identification of sampling sites, frequency of sampling, number of samples, sampling procedure, and test

method. Examples of these elements are described in Table 3. Corrective actions to be taken when a positive is found should also be outlined (see examples in Table 4).

- Sampling devices noted in the program should be appropriate for the types of samples collected and validated as necessary. For example, if sponges are used, they must not contain preservatives, and validation of *Salmonella* recovery is recommended.
- Sampling sites should be delineated into zones to facilitate program development, provide focus to critical sampling areas, and help direct appropriate corrective actions. For example, four zones may be established:
 - Zone 1 for PCSs in the Primary *Salmonella* Control Area;
 - Zone 2 for non-PCSs adjacent to or within close proximity to PCSs in the Primary *Salmonella* Control Area;
 - Zone 3 for non-PCSs more distant from PCSs in the Primary *Salmonella* Control Area and process areas outside the Primary *Salmonella* Control Area; and
 - Zone 4 for areas outside the process area (e.g., employee entrance, locker room, warehouse, loading dock).
- Routine environmental monitoring should target testing non-PCSs under normal operating conditions. Samples taken post-sanitation provide sanitation verification only and would not meet the true intent of environmental sampling. A "seek and destroy" philosophy should be adopted in environmental monitoring. This means that the monitoring program is designed to aggressively search for *Salmonella*, particularly in environmental sites where *Salmonella* might be expected to be present, might concentrate, or might grow and spread. Table 5 provides examples of potential *Salmonella*-positive sites, based on food industry experience; the

listing is by no means inclusive of all potential sites.

- Using only preset sample sites is not recommended, since it significantly limits the scope of sampling and will likely miss emerging areas of concern. However, some sites may be sampled on a continuing basis to assess trends. Sampling data should be reviewed on a routine basis. The sampling program should be dynamic and responsive to the data generated.
- A rotation schedule should be developed to allow all areas of the plant to be sampled on a periodic basis, e.g., weekly monitoring with rotation of sites between different areas of the plant, with all sites sampled within a specified time period (e.g., monthly or quarterly). However, this should not be set up in a manner that excludes the sampling of an area of concern identified in a "non-scheduled" area. The sampling plan should be flexible and allow for additional samples to be collected where appropriate.
 - Increase environmental monitoring (frequency and/or number of samples), as well as other control measures, in response to plant events such as during and after construction, and after equipment installation and major repairs are completed. An example of intensified control and monitoring is shown in Table 6.
 - Develop a policy on whether and when to test PCSs and/or finished product and a program for this testing.
 - Testing of PCS, if included in the program, should be done only after a policy has been established with regard to the impact of a PCS-positive on finished product and the actions to be taken. Routine testing of PCSs is not particularly meaningful in verification because, given an effective *Salmonella* control program, contamination, if any, is likely to be sporadic, and sampling is unlikely to find positives on PCS.
 - PCS testing may be done as part of corrective actions for an environmental

positive, e.g., in sampling for investigational purposes following positive *Salmonella* findings in areas that may pose a risk for PCS contamination on the line (see Table 4). PCS testing may also be valuable under other circumstances, such as hygienic qualification of a piece of equipment prior to use in production, e.g., for new equipment or newly-acquired equipment that has been used in another facility.

- Manufacturers should decide whether or not to conduct finished product testing based on an evaluation of risk. Customer requirements (i.e., Certificates of Analysis) may also dictate the need for finished product testing.
 - Whenever finished product testing is performed, the tested lot should be isolated, placed on hold, and released into commerce only if the product tests negative for *Salmonella*.
 - **If a product sample tests positive for *Salmonella*, the tested lot is considered adulterated and should not be released into commerce. As noted previously, retesting should not be conducted for the purpose of negating the initial test results (31, 48). Resampling almost always increases the chance of accepting a contaminated lot. The lower the prevalence level of *Salmonella* in the product, the more difficult it will be to confirm, and it is virtually impossible to confirm very low prevalence by resampling (31).**
 - Retesting for investigational purposes only (i.e., to try to determine the level or incidence of contamination in the sample) may be appropriate.
 - The lot associated with a positive sample may be reworked using a validated inactivation step. In addition to product disposition, other corrective actions may be taken as appropriate (see below).

TABLE 4. Examples of corrective action procedures following positive *Salmonella* findings in the plant environment

Zone 2, 3, or 4: Response to a Single Positive

Corrective actions must be taken when a *Salmonella* positive is found in any zone. Corrective actions should be initiated based on presumptive positive test results. The actions should aim to eliminate potential sources of the contamination.

Corrective actions common to Zone 2, 3, and 4 may include the following:

- ∞ Initiate pre-assigned response team to conduct a preliminary investigation to determine potential cause or source for the contamination (e.g., water leaks, maintenance activity, construction, etc.). The suspect site and surrounding areas should be examined as part of the investigation.
- ∞ Take immediate actions to correct any GMP deficiencies based on findings. These may include:
 - Quarantine the suspect area and limit access to the area.
 - Reinforce hygienic practices with appropriate employees (retrain if necessary).
 - Re-examine cleaning frequencies and revise as appropriate.
 - Eliminate water and water collection points, if present.
 - Repair damaged floors/walls and other structural damage as appropriate.
 - Re-examine traffic patterns. Where necessary and feasible, limit traffic flows (both employees and mobile equipment) through the area, restrict fork truck movement, redirect high risk traffic patterns from adjacent areas, etc.
- ∞ If desired, conduct investigational sampling of the suspect and surrounding areas prior to cleaning. Precaution should be taken to avoid spreading potential contamination from the suspect area to other areas in the plant.
- ∞ Thoroughly clean/sanitize and dry the positive site and the surrounding area. Use dry, controlled wet, and/or wet cleaning as appropriate, according to guidelines described in Element 4 (14).
- ∞ Re-sample the implicated area and other sites within the surrounding and traffic pattern areas. If the positive is found in Zone 3, Zone 2 sites in the implicated area should be sampled and tested to verify that contamination has not spread to areas closer to PCSs; if the positive is in Zone 4, all Zone 3 sites close to the implicated area should be sampled and tested to verify that contamination has not spread into the process area.
- ∞ Increase sampling frequency, e.g., from weekly to once every two days in Zone 3, from weekly to daily for Zone 2. After 3 consecutive negatives, the routine sampling frequency and rotation plan for the *Salmonella* monitoring may be resumed.

Zone 4 areas are remote from production and generally present low risk to product. However, results from Zone 4 do provide information about the non-production environment and traffic flow. Although it is expected that *Salmonella* may be found occasionally in Zone 4, a positive finding should prompt additional actions beyond routine sanitation.

A Zone 3 positive, in the absence of a Zone 2 positive, is an early indicator of a sanitation program that is not robust enough. The implicated process may or may not be suspended based on the positive location and its proximity to product contact surfaces.

Zone 2: Additional Actions for a Single Positive

- ∞ Stopping production for sanitation may be appropriate under certain circumstances where finished product or PCSs may be at risk.
- ∞ Whether or not to disassemble the line depends on the equipment associated with the positive site and how close the site is to finished product. Breaking down the line may not always be warranted if cleaning and re-sampling can be conducted without affecting PCSs. For example, the outside of a cooling tunnel and support frames may fall into a Zone 2 sampling category, and these sites should not affect product contact surfaces or cause the line to be broken down. However, if deemed necessary, break down the line from the positive site on, and disassemble equipment as necessary to ensure all PCSs are accessible for cleaning and sanitation. Thoroughly clean, sanitize, and dry the line and the surrounding areas starting from the positive site through the end of the line.

TABLE 4. *Continued*

- ∞ Conduct pre-operational inspections on the line equipment and in the area as applicable. Include Zones 2 & 3, and possibly Zone 1, as necessary in the sampling plan to re-qualify the line. Pre-operational test results should be obtained and confirmed negative prior to start-up if Zone 1 samples are included.
- ∞ Product testing may or may not be necessary depending on where the positive site was located. If finished product testing is already conducted as part of the overall food safety program (e.g., products with a *Salmonella* specification), intensified product testing may be initiated following any Zone 2 *Salmonella* positive finding. For example, the stringency of the sampling plan may increase from a plan with 3 samples of 25 g each to a case 11 (n = 10), case 14 (n = 30), or case 15 (n = 60), depending on the situation, with c = 0 in all cases; or from testing a 375 g composite to testing 2 × 375 g (750 g) or 4 × 375 g (1500 g). Whenever a product lot is subjected to testing, the lot should be held and released only if the test result is negative for *Salmonella*.

Special Circumstances: Consecutive Positives (all Zones)

When a sound control program for *Salmonella* is in place, finding multiple and/or consecutive positives may indicate that the primary source is a harborage site, where the organism may have become established and is multiplying. This can lead to an increased risk for spreading the organism and ultimately process line contamination. Corrective actions outlined below may be followed for problem resolution.

- ∞ Map the contamination sites on a layout of the facility to aid in locating the source of contamination, or at least suggest additional sites to sample. It is critical that a harborage site, if one exists, be found and eliminated. This usually means taking more samples than those taken during routine monitoring in the affected and traffic flow areas.
- ∞ Reinforce GMP training and hygienic practices and provide additional attention to sanitation procedures.
- ∞ Visually inspect areas for potential niches. Intensify cleaning activities around these areas.
- ∞ Visually inspect handling practices (production, sanitation, maintenance, material handling) and correct non-hygienic employee practices.
- ∞ Review equipment cleaning and preventative maintenance protocols and revise if necessary.
- ∞ Examine processing equipment and consider equipment redesign if necessary.
- ∞ PCS or product testing may be necessary or need to be intensified for Zone 2 consecutive positives. In some operations, testing may involve testing of worst-case samples on the line, e.g., sifter tailings on a spray dryer system. Line samples may be taken at various times and/or from various locations to help pinpoint potential contamination sites. Investigational samples should be analyzed individually, not as composites.
- ∞ Depending on the location of the positive, consideration should be given to testing Zone 1 sites. For example, consideration should be given to testing Zone 1 sites (i.e., PCSs) as a response to multiple positives in Zone 2. Consideration may also be given to Zone 1 testing under other circumstances, such as qualification for new equipment or relocated equipment, positive product tests or implication of products by epidemiologic investigations in an outbreak.

- An official or validated method should be used to test samples taken from the environment or finished product.
 - The FDA BAM method (5) and the ISO 6579 method (32) apply to various products described in the methods, as well as to environmental samples. The FDA BAM

method and the ISO 6579 method are considered the official method in the US and EU, respectively. A method that has been validated to be equivalent in specificity and sensitivity to one of these official methods may also be used. According to the FDA (5), a validated rapid method is generally used for screen-

ing, with negative results accepted as such, but positive results require cultural confirmation by the appropriate official method. Isolate subtyping with a method such as serotyping or genetic fingerprinting may be used for tracking and troubleshooting purposes.

TABLE 5. Examples of locations and situations in facilities that can serve as potential sources for spread of *Salmonella*

Process area

- Aspirator line
- Dust collection system
- Filter sock
- Air conveyance system, e.g., rotary air lock, cyclone, air locks, duct work, pneumatic conveyance system
- Inside a pump that was disassembled
- Inside an air duct
- Exposed insulation
- Eroded flooring
- Space between walls
- Poorly sealed wall/floor junction
- Leaky roof
- Leaky drain pipe
- Conveyor
- Bucket elevator
- Fork lift
- Employees
- Fans
- Cat walks
- Central and/or portable vacuums
- Maintenance tools
- Floor scrubber
- Floor squeegee
- Mop head
- Drain
- Insects, rodents, and other pests

Outside of process area

- Fire exit, for example, used by construction crew to enter and exit the facility
- Entrance to employee locker room
- Pathway to trash compactor
- Receiving dock
- Insect light traps
- Areas where employees may congregate, such as a designated smoking area

* This list is by no means all-inclusive.

TABLE 6. An example of intensified environmental monitoring and control in response to special plant events

Plant events include construction, new equipment installation in the processing areas, or other events that may affect the Primary *Salmonella* Control Area. Plant traffic controls, room air pressure, sanitation activities, etc. should be assessed during construction activities. Intensified environmental control procedures and action steps may be required, including:

- ∞ Reinforce GMP practices and traffic patterns with outside contractors.
- ∞ Set up temporary control barriers within the plant as applicable.
- ∞ Increase cleaning frequency of adjacent areas during construction, after equipment installation, and after major repairs are completed.
- ∞ Perform sampling and testing for *Salmonella* in the construction areas and adjacent areas during construction.
- ∞ Increase environmental monitoring (frequency and/or number of samples) after construction, equipment installation, or major repairs are completed. The sampling sites and frequency should be determined based on a team evaluation of the following: plant location of construction activities; type of construction (e.g., installation, demolition, material removal); duration of construction activities; types of environmental controls implemented, etc.

- Compositing environmental samples (combining multiple sponges or swabs into one pre-enrichment) or pooling (combining 2–5 post-enrichment samples into one test sample to be run on a rapid method) is generally not recommended. A positive finding on a composited sample cannot identify the specific location of the positive and results in broader, less focused corrective actions. However, there may be some situations where compositing may be appropriate, e.g., samples taken from multiple drains in the same processing area, where it is less important to pinpoint the site. If a "pooled" sample comes up positive, the individual enrichments that made up the pooled sample can be immediately retested separately to pinpoint the positive sample(s). However, this process adds delay in determining the location of a positive, compared to testing samples individually. The ability to composite or pool samples is method dependent and must be validated. Implications of compositing or pooling should be carefully considered.

- Corrective actions must be taken when *Salmonella* is detected in an environmental monitoring or finished product sample. In most

cases, corrective actions are triggered by presumptive *Salmonella* test results, since waiting for the final confirmation could take up to a week.

- If a positive is found in any of the four sampling zones, the site should be examined and potential causes investigated. It may be advantageous to have a pre-assigned team to assist in the investigation and to help direct corrective actions.
- Corrective actions to be taken should be based on an assessment of the potential for finished product contamination, given the location of the positive site in the environment. (A positive in Zone 2, 3, or 4 (non-PCS) does not automatically implicate finished product.)
- Corrective actions should include appropriate procedures, such as those described in Table 4, and be accompanied by re-sampling of the initial positive and adjacent areas.
- All corrective actions taken, including re-sampling results, should be documented.

SUMMARY AND KNOWLEDGE GAPS

Several significant outbreaks of food-borne salmonellosis have been linked to products produced in low-moisture-food manufacturing environments. The control of *Salmonella* in these environments is challenging and highly specialized.

Validation is complicated by the increased heat resistance of *Salmonella* at low a_w s. Stringent environmental monitoring regimens are essential to verify control of *Salmonella* in the facility. The guidance presented in this paper and its two companion papers has been developed on the basis of a synthesis of industry practices and programs, as well as information from the literature. Application of the guidance, in terms of control elements and stringency of control, will depend on the product and process, including the intended use of the product.

Knowledge gaps remain to be filled. The lack of adequate *Salmonella* inactivation data in specific products at various water activity levels has hindered industry's ability to evaluate the adequacy of certain processes (such as baking of peanut butter cookies) in the event that an ingredient was found contaminated with *Salmonella*. For example, in response to the 2008–2009 *Salmonella* Typhimurium outbreak linked in part to peanut butter, many peanut butter-containing products were recalled because there was little basis for the companies involved to evaluate the adequacy of the lethality of the specific processes. Although heat resistance data for *Salmonella* in peanut butter were available, data on inactivation of *Salmonella* in peanut butter-containing cookie dough had not been published. The application of the data based on peanut butter was not appropriate to determine whether the baking process was adequate to eliminate the level of *Salmonella* expected in the contaminated ingredient (i.e., peanut butter).

Development and validation of additional dry cleaning methods is needed to

help minimize the risk of post processing contamination. Further work is needed to develop practical molecular subtyping tools with high discriminatory power to facilitate more effective environmental monitoring and *Salmonella* control. Molecular subtyping tools will help establish links between isolates (e.g., from ingredients and processing environment) and differentiate transient versus resident strains in the environment (30). Conducting surveys to determine the prevalence and concentration of *Salmonella* in widely used raw ingredients, in combination with using such data to conduct risk assessments for various products or product/process combinations, will generate further scientific support for the appropriate log reduction, and will facilitate the determination and evaluation of effective control measures and risk mitigation strategies. To this end, more research on dose-response is needed to improve risk assessments, because available *Salmonella* dose-response models, such as the one derived from human studies (20, 24) in which a cocktail of serotypes in buffer was fed to healthy adults, may not be representative of the susceptibility of the general population or the risk from low-moisture products. As indicated previously, in some instances, illnesses occurred upon consumption of low-moisture products contaminated at levels < 1 CFU/g, depending on the host, the product, and the *Salmonella* strain.

Continuing research to enhance knowledge in areas such as molecular subtyping tools, more efficient environmental sampling, rapid detection, effective thermal and non-thermal *Salmonella* inactivation processes, and the determination of the appropriate level of *Salmonella* reduction in various low-moisture products, coupled with sharing common industry practices, will enable industry to more efficiently and effectively reduce the risk of *Salmonella* contamination in low-moisture products.

ACKNOWLEDGMENTS

The authors wish to acknowledge the assistance from other members of the GMA *Salmonella* Control Task Force in developing the guidance. Beside the authors, the Task Force consists of Joan Pinkas (McCormick & Company), Karl Olson (Abbott Nutrition), Kurt Deibel (PepsiCo), Dick Smittle (Silliker, Inc.), Russ Flowers (Silliker, Inc.), Sterling Thompson (the Hershey Company), Richard Podolak (GMA), Elena Enache (GMA), and Warren Stone (GMA). The input to the guidance document by the GMA Microbiological Safety Committee and the Scientific and Regulatory Affairs Council is also greatly appreciated.

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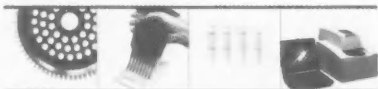
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DAIRY

- D1010 The Bulk Milk Hauler: Protocol & Procedures**—(8 minutes). Teaches bulk milk haulers how they contribute to quality milk production. Special emphasis is given to the hauler's role in proper milk sampling, sample care procedures, and understanding test results. (Iowa State University Extension—1990) (Reviewed 1998)
- D1030 Cold Hard Facts**—This video is recommended for training personnel associated with processing, transporting, warehousing, wholesaling, and retailing frozen foods. It contains pertinent information related to good management practices necessary to ensure high quality frozen foods. (National Frozen Food Association—1993) (Reviewed 1998)
- D1031 Dairy Plant**—(28 minutes). Join in on this video as it follows a tour of the University of Wisconsin Dairy Plant. Observe the gleaming machinery and learn the ins and outs of milk processing, packaging, and storage. Watch as workers manufacture butter, cheese, yogurt, sour cream and ice cream, and learn about secondary dairy products. (Chipsbooks Company—2003)
- D1040 Ether Extraction Method for Determination of Raw Milk**—(26 minutes). Describes the ether extraction procedure to measure milk fat in dairy products. Included is an explanation of the chemical reagents used in each step of the process. (CA—1988) (Reviewed 1998)
- D1050 Food Safety: Dairy Details**—(18 minutes). Dairy products are prime targets of contamination because of their high protein and water content, but this presentation shows how to maintain dairy foods. It explores techniques such as selection, handling, preparation and storage for milk, yogurt, cheese and other dairy products. (Chipsbooks Company—2003)
- D1060 Frozen Dairy Products**—(27 minutes). Developed by the California Department of Food and Agriculture. Although it mentions the importance of frozen desserts, safety and checking ingredients, emphasis is on what to look for in a plant inspection. Everything from receiving, through processing, cleaning and sanitizing is outlined, concluded with a quality control program. Directed to plant workers and supervisors, it shows you what should be done. (CA—1987) (Reviewed 1997)
- D1070 The Gerber Butterfat Test**—(7 minutes). Describes the Gerber milk fat test procedure for dairy products and compares it to the Babcock test procedure. (CA—1990) (Reviewed 1998)
- D1080 High-Temperature, Short-Time Pasteurizer**—(59 minutes). Developed to train pasteurizer operators and is well done. There are seven sections with the first covering the twelve components of a pasteurizer and the purpose and operation of each. The tape provides the opportunity for discussion after each section or continuous running of the videotape. Flow diagrams, processing and cleaning are covered. (Borden, Inc.—1986) (Reviewed 1997)
- D1100 Mastitis Prevention and Control**—(Two 45-minute tapes). This video is ideal for one-on-one or small group presentations. Section titles include: Mastitis Pathogens, Host Defense, Monitoring Mastitis, Mastitis Therapy, Recommended Milking Procedures, Post milking Teat Dip Protocols, Milk Quality, and Milking Systems. (Nasco—1993)
- D1105 Milk Hauling Training**—(35 minutes). This video covers the procedures and duties of the milk hauler from the time of arrival at the dairy farm, to the delivery of the milk at the processing plant. It also provides the viewer with a general understanding of the quality control issues involved in milk production and distribution. Topics include milk composition breakdown, milk fat content measurement, testing for added water, antibiotic and pesticide residues, somatic cell and bacteria counts, sediment, and aflatoxins. (Avalon Mediaworks LLC—2003)
- D1110 Milk Plant Sanitation: Chemical Solution**—(13 minutes). This explains the proper procedure required of laboratory or plant personnel when performing chemical titration in a dairy plant. Five major titrations are reviewed...alkaline wash, presence of chlorine and iodophor, caustic wash and an acid wash in a HTST system. Emphasis is also placed on record keeping and employee safety. (1989)
- D1120 Milk Processing Plant Inspection Procedures**—(15 minutes). Developed by the California Department of Food and Agriculture. It covers pre- and post-inspection meetings with management, but emphasis is on inspection of all manual and cleaned in place equipment in the receiving, processing and filling rooms. CIP systems are checked along with recording charts and employee lockers and restrooms. Recommended for showing to plant workers and supervisors. (CA—1986)
- D1125 Ohio Bulk Milk Hauling Video**—(15 minutes). Milk haulers, weighers, and samplers are the most constant link between the producer, the producer cooperative, and the milk processor. This video shows their complete understanding of all aspects of farm milk collection and handling, milk quality and quality tests, and sanitation

and sanitary requirements that contribute to the trust between the producer and the dairy plant. The video educates prospective haulers, weighers, and samplers throughout Ohio. (Ohio State University-2001)

- D1130 Pasteurizer: Design and Regulation** – (16 minutes). This tape provides a summary of the public health reasons for pasteurization and a nonlegal definition of pasteurization. The components of an HTST pasteurizer, elements of design, flow-through diagram and legal controls are discussed. (Kraft General Foods-1990) (Reviewed 1998)
- D1140 Pasteurizer: Operation** – (11 minutes). This tape provides a summary of the operation of an HTST pasteurizer from start-up with hot water sanitization to product pasteurization and shut-down. There is an emphasis on the legal documentation required. (Kraft General Foods-1990) (Reviewed 1998)
- D1150 Processing Fluid Milk** – (30 minutes). This slide set was developed to train processing plant personnel on preventing food poisoning and spoilage bacteria in fluid dairy products. Emphasis is on processing procedures to meet federal regulations and standards. Processing procedures, pasteurization times and temperatures, purposes of equipment, composition standards, and cleaning and sanitizing are covered. Primary emphasis is on facilities such as drains and floors, and filling equipment to prevent post-pasteurization contamination with spoilage or food poisoning bacteria. It was reviewed by many industry plant operators and regulatory agents and is directed to plant workers and management. (Penn State-1987) (Reviewed 1998)
- D1180 10 Points to Dairy Quality** – (10 minutes). Provides in-depth explanation of a critical control point in the residue prevention protocol. Illustrated with on-farm, packing plant, and milk-receiving plant scenes as well as interviews of producers, practicing veterinarians, regulatory officials and others. (Dairy Quality Assurance-1992) (Reviewed 1998)

ENVIRONMENTAL

- E2012 Better TEDs for Better Fisheries** – (42 minutes). Introduces the usefulness of turtle excluder devices (TEDs) and demonstrates the working nature of the devices. It covers the major sea turtles and the specific TEDs needed for each. It precedes two segments on installation of appropriate TEDs in shrimp trawl nets. (MS Dept. of Marine Resources-2003)
- E3010 The ABC's of Clean – A Handwashing and Cleanliness Program for Early Childhood Programs** – For early childhood program employees. This tape illustrates how proper hand washing and clean hands can contribute to the infection control program in daycare centers and other early childhood programs. (The Soap & Detergent Association-1991)
- E3020 Acceptable Risks?** – (16 minutes). Accidents, deliberate misinformation, and the rapid proliferation of nuclear power plants have created increased fears
- of improper nuclear waste disposal, accidents during the transportation of waste, and the release of radioactive effluents from plants. The program shows the occurrence of statistically anomalous leukemia clusters; governmental testing of marine organisms and how they absorb radiation; charts the kinds and amounts of natural and man-made radiation to which man is subject; and suggests there is no easy solution to balancing our fears to nuclear power and our need for it. (Films for the Humanities & Sciences, Inc.-1993) (Reviewed 1998)
- E3030 Air Pollution: Indoor** – (26 minutes). Indoor air pollution is in many ways a self-induced problem...which makes it no easier to solve. Painting and other home improvements have introduced pollutants, thermal insulation and other energy-saving and water-proofing devices have trapped the pollutants inside. The result is that air pollution inside a modern home can be worse than inside a chemical plant. (Films for the Humanities & Sciences, Inc.) (Reviewed 1998)
- E3031 Allergy Beware** – (15 minutes). Designed to educate food and beverage company employees about their role in preventing an accidental allergic reaction caused by a product their company produces. Recommended for product development, production, labeling, scheduling and cleaning. Everyone has an important role to prevent cross contamination and mislabeling issues. (Food and Consumer Products Manufacturers of Canada-2003)
- E3040 Asbestos Awareness** – (20 minutes). This videotape discusses the major types of asbestos and their current and past uses. Emphasis is given to the health risks associated with asbestos exposure and approved asbestos removal abatement techniques. (Industrial Training, Inc.-1988) (Reviewed 1998)
- E3055 Effective Handwashing – Preventing Cross-Contamination in the Food Service Industry** – (3.5 minutes). It is critical that all food service workers wash their hands often and correctly. This video discusses the double wash method and the single wash method, and when to use each method. (Zep Manufacturing Company-1993)
- E3060 EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Ceriodaphnia)** – (22 minutes). Demonstrates the Ceriodaphnia Seven-day Survival and Reproduction Toxicity Test and how it is used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. The tape covers the general procedures for the test including how it is set up, started, monitored, renewed and terminated. (1989) (Reviewed 1998)
- E3070 EPA Test Methods for Freshwater Toxicity Tests (Using Fathead Minnow Larva)** – (15 minutes). A training tape that teaches environmental professionals about the Fathead Minnow Larva Survival and Growth Toxicity Test. The method described is found in an EPA document entitled, "Short Term Methods for Estimating the Chronic Toxicity of Effluents & Receiving Waters

to Freshwater Organisms." The tape demonstrates how fathead minnow toxicity tests can be used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. (1989) (Reviewed 1998)

- E3075 EPA: This is Super Fund** – (12 minutes). Produced by the United States Environmental Protection Agency (EPA) in Washington, D.C., this videotape focuses on reporting and handling hazardous waste sites in our environment. The agency emphasizes community involvement in identifying chemical waste sites and reporting contaminated areas to the authorities. The primary goal of the "Super Fund Site Process" is to protect human health and to prevent and eliminate hazardous chemicals in communities. The film outlines how communities can participate in the process of cleaning up hazardous sites. The program also explains how federal, state and local governments, industry and residents can work together to develop and implement local emergency preparedness/response plans in case chemical waste is discovered in a community.
- E3080 Fit to Drink** – (20 minutes). This program traces the water cycle, beginning with the collection of rain-water in rivers and lakes, in great detail through a water treatment plant, to some of the places where water is used, and finally back into the atmosphere. Treatment of the water begins with the use of chlorine to destroy organisms; the water is then filtered through various sedimentation tanks to remove solid matter. Other treatments employ ozone, which oxidizes contaminants and makes them easier to remove; hydrated lime, which reduces the acidity of the water; sulfur dioxide, which removes any excess chlorine; and flocculation, a process in which aluminum sulfate causes small particles to clump together and precipitate out. Throughout various stages of purification, the water is continuously tested for smell, taste, titration, and by fish. The treatment plant also monitors less common contaminants with the use of up-to-date techniques like flame spectrometers and gas liquefaction. (Films for the Humanities & Sciences, Inc.—1987)
- E3110 Garbage: The Movie** – (25 minutes). A fascinating look at the solid waste problem and its impact on the environment. Viewers are introduced to landfills, incinerators, recycling plants, and composting operations as solid waste management solutions. Problems associated with modern landfills are identified and low-impact alternatives such as recycling, reuse, and source reduction are examined. (Churchill Films) (Reviewed 1998)
- E3120 Global Warming: Hot Times Ahead** – (23 minutes). An informative videotape program that explores the global warming phenomenon and some of the devastating changes it may cause. This program identifies greenhouse gases and how they are produced by human activities. Considered are: energy use in transportation, industry and home; and effects of deforestation, planting of trees and recycling as means of slowing the build-up of greenhouse gases. (Churchill Films—1995)
- E3125 Good Pest Exclusion Practices** – (28 minutes). Most pests you find inside come from outside your food plant. This video covers numerous tactics of keeping pests out of food processing and distribution operations. Tactics include grounds, landscaping and building design; inbound trailer and bulk transportation materials inspection; and key employee actions. Learn how to defend your perimeter with one of the best weapons in the battle against pests – exclusion. (CTI Publications—2004)
- E3128 Integrated Pest Management (IPM)** – (28 minutes). This video develops the IPM concept into a comprehensive 12-point program. To emphasize this concept, computer-animated, digital graphics are used to piece together the IPM puzzle. This dramatic effect assists participants in visualizing and retaining key points of the video. To paint the complete picture, each of the 12 points is discussed providing an IPM overview. (CTI Publications—2004)
- E3130 Kentucky Public Swimming Pool and Bathing Facilities** – (38 minutes). Developed by the Lincoln Trail District Health Department in Kentucky and includes all of their state regulations which may be different from other states, provinces, and countries. This tape can be used to train those responsible for operating pools and waterfront bath facilities. All aspects are included of which we are aware, including checking water conditions and filtration methods. (1987) (Reviewed 1998)
- E3131 Key Pests of the Food Industry** – (28 minutes). Many types of pests can cause waste and loss of profits. Keeping food processing operations free of pest problems is a challenge. This video will assist food plant employees in the review of basic identification, biology, habits and control options of three key groups of pests frequently associated with food processing operations: birds, insects, and rodents. (CTI Publications—2004)
- E3133 Physical Pest Management Practices** – (28 minutes). Do you feel that you cannot do your job without pesticides? There are solutions. Many of them are what we call physical controls. This video will provide you with some of the things which can help you manipulate the physical environment in a manner that will prevent the growth of the pest population, causing them to leave or die. (CTI Publications—2004)
- E3140 Putting Aside Pesticides** – (26 minutes). This program probes the long-term effects of pesticides and explores alternative pest-control efforts, biological pesticides, genetically engineered microbes that kill objectionable insects, the use of natural insect predators, and the cross-breeding and genetic engineering of new plant strains that produce their own anti-pest toxins. (Films for the Humanities & Sciences, Inc.) (Reviewed 1999)
- E3150 Radon** – (26 minutes). This videotape explains the danger associated with hazardous chemical handling and discusses the major hazardous waste handling requirements presented in the Resource Conservation and Recovery Act.

E3160 RCRA-Hazardous Waste – (19 minutes). This videotape explains the dangers associated with hazardous chemical handling and discusses the major hazardous waste handling requirements presented in the Resource Conservation and Recovery Act. (Industrial Training, Inc.)

E3161 The Kitchen Uncovered: Orkin Sanitized EMP – (13 minutes). This video teaches restaurant workers what they can do to prevent pest infestation, and what health inspectors look for. An excellent training tool for food service workers that can be used in conjunction with HACCP instruction. (Orkin-1997)

The New Superfund: What It Is and How It Works – A six-hour national video conference sponsored by the EPA. Target audiences include the general public, private industry, emergency responders and public interest groups. The series features six videotapes that review and highlight the following issues:

E3170 Tape 1 – Changes in the Remedial Process: Clean-up Standards and State Involvement Requirements – (62 minutes). A general overview of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and the challenge of its implementation. The remedy process – long-term and permanent clean-up – is illustrated step-by-step, with emphasis on the new mandatory clean-up schedules, preliminary site assessment petition procedures and the hazard ranking system/National Priority List revisions. The major role of state and local government involvement and responsibility is stressed.

E3180 Tape 2 – Changes in the Removal Process: Removal and Additional Program Requirements – (48 minutes). The removal process is a short-term action and usually an immediate response to accidents, fires, and illegal dumped hazardous substances. This program explains the changes that expand removal authority and require procedures consistent with the goals of remedial action.

E3190 Tape 3 – Enforcement & Federal Facilities – (52 minutes). Who is responsible for SARA clean-up costs? Principles of responsible party liability; the difference between strict, joint, and several liability; and the issue of the innocent land owner are discussed. Superfund enforcement tools-mixed funding, De Minimis settlements and the new nonbinding preliminary allocations of responsibility (NBARs) are explained.

E3210 Tape 4 – Emergency Preparedness & Community Right-to-Know – (48 minutes). A major part of SARA is a free-standing act known as Title III: the Emergency Planning and community Right-to-Know Act

of 1986, requiring federal, state, and local governments and industry to work together in developing local emergency preparedness/response plans. This program discusses local emergency planning committee requirements, emergency notification procedures, and specifications on community right-to-know reporting requirements such as using OSHA Material Safety Data Sheets, the emergency and hazardous chemical inventory and the toxic chemical release inventory.

E3220 Tape 5 – Underground Storage Tank Trust Fund & Response Program – (48 minutes). Another addition to SARA is the Leaking Underground Storage Tank (LUST) Trust Fund. One half of the US population depends on ground water for drinking – and EPA estimates that as many as 200,000 underground storage tanks are corroding and leaking into our ground water. This program discusses how the LUST Trust Fund will be used by EPA and the states in responding quickly to contain and clean-up LUST releases. Also covered is state enforcement and action requirements, and owner/operator responsibility.

E3230 Tape 6 – Research & Development/Closing Remarks – (33 minutes). An important new mandate of the new Superfund are the technical provisions for research and development to create more permanent methods in the handling and disposing of hazardous wastes and managing hazardous substances. This segment discusses the SITE (Superfund Innovative Technology Evaluation) program, the University Hazardous Substance Research Centers, hazardous substance health research and the DOD research, development and demonstration management of DOD wastes.

E3235 Regulatory and Good Manufacturing Practices – (42 minutes). This video comes in two parts. Part one is a professional, 20-minute drama using real actors emphasizing the importance of food safety and GMPs. This dramatization will focus your emotions on the importance of cleanliness. Part two is a comprehensive 22-minute video introducing your employees to basic GMP elements. This training video uses numerous split screens of “good” and “bad” practices, and will help viewers understand GMPs and basic food safety. (CTI Publications-2004)

E3236 Rodent Control Strategies – (22 minutes). Pest control is a vital part of food safety, and leading pest-control specialist Dr. Bobby Corrigan shows you how to design and maintain a rodent-control program at food processing establishments. (J.J. Keller-2004)

- E3240 Sink a Germ** – (10 minutes). A presentation on the rationale and techniques for effective hand washing in health care institutions. Uses strong imagery to educate hospital personnel that hand washing is the single most important means of preventing the spread of infection. (The Brevis Corp.–1986) (Reviewed 1998)
- E3245 Wash Your Hands** – (5 minutes). Hand washing is the single most important means of preventing the spread of infection. This video presents why hand washing is important and the correct way to wash your hands. (LWB company–1995)
- E3250 Waste Not: Reducing Hazardous Waste** – (35 minutes). This tape looks at the progress and promise of efforts to reduce the generation of hazardous waste at the source. In a series of company profiles, it shows activities and programs within industry to minimize hazardous waste in the production process. “Waste Not” also looks at the obstacles to waste reduction, both within and outside of industry, and considers how society might further encourage the adoption of pollution prevention, rather than pollution control, as the primary approach to the problems posed by hazardous waste. (Umbrella Films)
- E3251 Would Your Restaurant Kitchen Pass Inspection?** – (29 minutes). Help ensure a perfect score on any health inspection with this video by addressing safe food-handling techniques in the food service industry. Learn how foodborne illness is spread and how it can be prevented. Dramatizations display specific techniques students and employees can use to help any restaurant kitchen meet the highest standards. (Chipsbooks Company–2003)
- E3260 Swabbing Techniques for Sampling the Environment and Equipment** – (DVD) (60 minutes). This training program is designed to assist in providing effective training to technicians that collect environmental samples for APC and *Listeria*. It will help assure that technicians understand the basic principles and best practices, and can demonstrate good sample collection techniques. (Silliker Labs–2005)

FOOD

- F2007 The Amazing World of Microorganisms** – (12 minutes). This training video provides your employees with an overview of how microorganisms affect their everyday lives and the foods they produce. The video explores how microscopic creatures are crucial in producing foods, fighting disease, and protecting the environment. In addition, certain microorganisms – when given the proper time and conditions to grow – are responsible for food spoilage, illness, and even death. Equipped with this knowledge, your employees will be better able to protect your brand. (Silliker Laboratories Group, Inc.–2001)
- F2008 A Recipe for Food Safety Success** – (30 minutes). This video helps food-industry employees understand their obligations in the areas of safety and cleanliness... what the requirements are, why they exist, and the consequences for all involved if they're not adhered to consistently. Critical information covered includes the role of the FDA and USDA; HACCP systems; sanitation and pest control; time and temperature controls that fight bacteria growth; and the causes and effects of pathogens. (J. J. Keller–2002)
- F2009 Basic Personnel Practices** – (18 minutes). This training video covers the practical GMPs from the growing field to the grocery store with a common sense approach. Employees learn the necessary training to help them understand the basic principles of food safety. (AIB International–2003)
- F2010 Close Encounters of the Bird Kind** – (18 minutes). A humorous but in-depth look at *Salmonella* bacteria, their sources, and their role in foodborne disease. A modern poultry processing plant is visited, and the primary processing steps and equipment are examined. Potential sources of *Salmonella* contamination are identified at the different stages of production along with the control techniques that are employed to insure safe poultry products. (Topek Products, Inc.) (Reviewed 1998)
- F2011 Available Post Harvest Processing Technologies for Oysters** – (8 minutes). This video explains three currently available post-harvest processing (PHP) technologies for oysters that continue to be developed to provide safer oysters to consumers. The Gulf oyster industry increasingly adopts solutions offered by modern technology in its efforts to continue to promote quality, food safety and extended shelf life of oysters. (MS Dept. of Marine Resources–2003)
- F2012 Control of *Listeria monocytogenes* in Retail Establishments** – (45 minutes). English and Spanish) (DVD) – Retail establishments play a key role in the control of *Listeria monocytogenes* in foods they sell. In this program, you will learn the sources and factors that contribute to *Listeria monocytogenes* in the retail environment. This dvd will also explore the design, implementation and maintenance of a *Listeria monocytogenes* control program. (Penn State University–2006)
- F2013 Control of *Listeria monocytogenes* in Small Meat and Poultry Establishments** – (26 minutes). (English and Spanish) – This video addresses a variety of issues facing meat processors who must meet

revised regulations concerning *Listeria monocytogenes* in ready-to-eat meats. Topics covered include personal hygiene, sanitation, biofilms, cross contaminations, in plant sampling, and microbiological testing. (Penn State college of Ag Sciences—2003)

- F2014 Controlling Food Allergens in the Plant** – (16 minutes). This training video covers key practices to ensure effective control in food plants and delivers current industry knowledge to help companies enhance in-plant allergen training. Visually communicates allergen-specific Good Manufacturing Practices, from checking raw material to sanitation, to prevent serious, costly problems. (Silliker Laboratories, Inc.—2004)
- F2015 Controlling Listeria: A Team Approach** – (16 minutes). In this video, a small food company voluntarily shuts down following the implication of one of its products in a devastating outbreak of *Listeria monocytogenes*. This recall dramatization is followed by actual in-plant footage highlighting key practices in controlling *Listeria*. This video provides workers with an overview of the organism, as well as practical steps that can be taken to control its growth in plant environments. Finally, the video leaves plant personnel with a powerful, resounding message: Teamwork and commitment are crucial in the production of safe, quality foods. (Silliker Laboratories—2000)
- F2016 Bloodborne Pathogens: What Employees Must Know** – (English) – (DVD) (20 minutes). This program provides an overview of the hazards and controls for worker exposure to bloodborne pathogens. Specifically, the program covers the basic requirements of the standard; definitions of key terms (including AIDS, contaminated sharps, and occupational exposure); engineering controls and work practices; housekeeping techniques; Hepatitis B and more. (J.J. Keller—2005)
- F2017 Building a Better Burger – Improving Food Safety in the Food Supply Chain** – (29 minutes). From ground beef to spinach to adulterated ingredients, the food industry has seen the huge downside of supply chain safety and quality failures. In addition to audits, many processors now mandate that suppliers implement Statistical Process Control (SPC) programs. Since 2003, the USDA National School Lunch Program ground beef purchasing has demonstrated the success of process-based supply chain management. This video demonstrates how the program has improved quality while reducing safety risks to show the way to get the food safety job done right. (Northwest Analytical, Inc.—2007)
- F2020 Egg Handling and Safety** – (11 minutes). Provides basic guidelines for handling fresh eggs which could be useful in training regulatory and industry personnel. (American Egg Board—1997)
- F2021 Egg Production** – (46 minutes). Live action footage of a completely automated operation follows the egg from the chicken to the carton. Watch the eggs as they roll down onto the main line, are washed, “candled,” sorted by weight, placed into their packing containers, and prepared for shipment. Sanitation and health concerns are addressed. (Chipsbooks Company—2003)
- F2025 “The Special of the Day: The Eggceptional Egg”** – (DVD – 10 minutes). This DVD has been developed to train foodservice workers on today’s standards for the expert care, handling, and preparation of “The incredible edible egg”. (American Egg Board—2007)
- F2030 “Eggs Games” Foodservice Egg Handling & Safety** – (18 minutes). Develop an effective egg handling and safety program that is right for your operation. Ideal for manager training and foodservice educational programs, this video provides step-by-step information in an entertaining, visually exciting format. (American Egg Board—1999)
- F2035 Fabrication and Curing of Meat and Poultry Products** – (2 tapes – 165 minutes). (See Part 2 Tape F2036 and Part 3 F2037) This is session one of three-part meat and poultry teleconference cosponsored by AFDO and the USDA Food Safety Inspection Service. Upon viewing, the sanitarian will be able to (1) identify typical equipment used for meat and poultry fabrication at retail and understand their uses; (2) define specific terms used in fabrication of meat and poultry products in retail establishments, and (3) identify specific food safety hazards associated with fabrication and their controls. (AFDO/USDA—1997)
- F2036 Emerging Pathogens and Grinding and Cooking Comminuted Beef** – (2 tapes – 165 minutes). (See Part 1 Tape F2035 and Part 2 Tape F2037) This is session two of a three-part meat and poultry teleconference co-sponsored by AFDO and the USDA Food Safety Inspection Service. These videotapes present an action plan for federal, state, and local authorities, industry, and trade associations in a foodborne outbreak. (AFDO/USDA—1998)
- F2037 Cooking and Cooling of Meat and Poultry Products** – (2 tapes – 176 minutes). (See Part 1 Tape F2035 and Part 2 Tape F2036) This is session three of a three-part meat and poultry teleconference cosponsored by AFDO and the USDA Food Safety Inspection Service. Upon completion of viewing these videotapes, the viewer will be able to (1) recognize inadequate processes associated with the cooking and cooling of meat and poultry at the retail level; (2) discuss the hazards associated with foods and the cooking and cooling processes with management at the retail level; (3) determine the adequacy of control methods to prevent microbiological hazards in cooking and cooling at the retail level; and (4) understand the principle for determining temperature with various temperature measuring devices. (AFDO/USDA—1999)
- F2039 Food for Thought – The GMP Quiz Show** – (16 minutes). In the grand tradition of television quiz shows, three food industry workers test their knowledge of GMP principles. As the contestants jockey to answer questions, the video provides a thorough and timely review of GMP principles. This video is a cost-effective tool to train new hires or sharpen the knowledge of veteran employees. Topics covered include employee practices – proper attire, contamination, stock rotation, pest control, conditions for microbial growth, and employee traffic patterns. Food safety terms such as

- HACCP, microbial growth niche, temperature danger zone, FIFO, and cross contamination, are also defined. (Silliker Laboratories-2000)
- F2040 Food Irradiation** – (30 minutes). Introduces viewers to food irradiation as a new preservation technique. Illustrates how food irradiation can be used to prevent spoilage by microorganisms, destruction by insects, over-ripening, and to reduce the need for chemical food additives. The food irradiation process is explained and benefits of the process are highlighted. (Turnelle Productions, Inc.) (Reviewed 1998)
- F2045 Food Microbiological Control** – (6 tapes – 12 hours). Designed to provide information and demonstrate the application of basic microbiology, the Good Manufacturing Practices (GMPs), retail Food Code, and sanitation practices when conducting food inspections at the processing and retail levels. Viewers will enhance their ability to identify potential food hazards and evaluate the adequacy of proper control methods for these hazards. (FDA-1998)
- F2050 Food Safe-Food Smart – HACCP and Its Application to the Food Industry (Parts I & 2)** – (2 tapes – 16 minutes each). (1) Introduces the seven principles of HACCP and their application to the food industry. Viewers will learn about the HACCP system and how it is used in the food industry to provide a safe food supply. (2) Provides guidance on how to design and implement a HACCP system. It is intended for individuals with the responsibility of setting up a HACCP system. (Alberta Agriculture, Food and Rural Development) (Reviewed 1998)
- F2060 Food Safe Series I** (4 videos) – (4 tapes – 10 minutes each). (1) "Receiving and Storing Food Safely" details for food service workers the procedures for performing sight inspections for the general conditions of food, including a discussion of food labeling and government approval stamps. (2) "Food service Facility and Equipment" outlines the requirements for the proper cleaning and sanitizing of equipment used in food preparation areas. Describes the type of materials, design, and proper maintenance of this equipment. (3) "Microbiology for Foodservice Workers" provides a basic understanding of the microorganisms which cause food spoilage and foodborne illness. This program describes bacteria, viruses, protozoa, and parasites and the conditions which support their growth. (4) "Foodservice Housekeeping and Pest Control" emphasizes cleanliness as the basis for all pest control. Viewers learn the habits and life cycles of flies, cockroaches, rats, and mice. (Perennial Education-1991) (Reviewed 1998)
- F2070 Food Safe Series II** (4 videos) – (4 tapes – 10 minutes each). Presents case histories of foodborne disease involving (1) *Staphylococcus aureus*, (sauces) (2) *Salmonella*, (eggs) (3) *Campylobacter*, and (4) *Clostridium botulinum*. Each tape demonstrates errors in preparation, holding or serving food; describes the consequences of those actions; reviews the procedures to reveal the cause of the illness; and illustrates the correct practices in a step-by-step demonstration. These are excellent tapes to use in conjunction with hazard analysis critical control point training programs. (Perennial Education-1991) (Reviewed 1998)
- F2080 Food Safe Series III** (4 videos) – (4 tapes – 10 minutes each). More case histories of foodborne disease. This set includes (1) Hepatitis "A"; (2) *Staphylococcus aureus* (meats); (3) *Bacillus cereus*; and (4) *Salmonella* (meat). Viewers will learn typical errors in the preparation, holding and serving of food. Also included are examples of correct procedures which will reduce the risk of food contamination. (Perennial Education-1991) (Reviewed 1998)
- F2081 Food Safety Begins on the Farm** (DVD) – (15 minutes). From planting to consumption, there are many opportunities to contaminate produce. This is an excellent resource for training fruit and vegetable growers Good Agricultural Practices (GAPs). It includes seven PowerPoint presentations that deal with all aspects of food safety relative to growing, harvesting, and packing fresh fruits and vegetables. (Cornell Good Agricultural Practices Program-2000)
- F2090 Food Safety: An Educational Video for Institutional Food Service Workers** – (10 minutes). Provides a general discussion on food safety principles with special emphasis on pathogen reductions in an institutional setting from child care centers to nursing homes. (US Dept of Health & Human Services-1997)
- F2095 Now You're Cooking** – (DVD and video) (15 min-utes). Using a food thermometer can improve the quality and safety of meat. This 15-minute video describes the why and how of using a food thermometer when cooking small cuts of meat like meat patties, chicken breasts, and pork chops. Topics include: why color is not a good indicator of doneness; how to choose an appropriate food thermometer for small cuts of meat; quick and easy steps for using an instant-read thermometer; how to calibrate an instant-read thermometer; and the most effective cooking methods for reducing *E. coli* O157:H7 in hamburger patties. (University of Idaho-2005) (Reviewed-2005)
- Food Safety for Food Service Series I** – An employee video series containing quick, 10-minute videos that teach food service employees how to prevent foodborne illness. This video series examines sources of foodborne illness, plus explores prevention through awareness and recommendations for best practices for food safety. It also looks at how food safety affects the food service employee's job. (J.J. Keller & Associates-2000)
- F2101 Tape 1 – Food Safety for Food Service: HACCP** – (10 minutes). This video takes the mystery out of HACCP for your employees, and explains the importance of HACCP procedures in their work. Employees will come away feeling confident, knowing how to make HACCP work. The seven steps of HACCP and how HACCP is used in foodservice are some of the topics discussed.
- F2103 Tape 2 – Food Safety for Food Service: Time and Temperature Controls** – (10 minutes). This video examines storage and handling of raw and cooked ingredients,

and explains how to ensure their safety. Employees learn how to spot potential problems and what to do when they find them. Topics include: correct thermometer use, cooling, thawing and heating procedures, food storage procedures, holding temperature requirements, and handling leftovers.

Food Safety for Food Service Series II – An employee video series containing quick, 10-minute videos that boost safety awareness for food service employees and teach them how to avoid foodborne illness. (J.J. Keller & Associates–2002)

F2104 Tape 1 – Basic Microbiology and Foodborne Illness – (10 minutes). Covers four common microorganisms in food, how they get into food, and simple ways to prevent contamination. Stresses the importance of keeping food at the right temperature, having proper personal hygiene, and cleaning and sanitizing work surfaces.

F2105 Tape 2 – Handling Knives, Cuts, and Burns – (10 minutes). Explains why sharp knives are safer than dull ones, provides tips for selecting a good knife, and gives techniques for cutting food safely. Also explains first aid for cuts and burns and the most common causes of burns.

F2106 Tape 3 – Working Safely to Prevent Injury – (10 minutes). Discusses common lifting hazards and how back injuries can happen. Gives proper lifting and carrying techniques to prevent soreness and injury. Also covers how to prevent slips, trips, and falls.

F2107 Tape 4 – Sanitation – (10 minutes). Provides tips for good personal hygiene habits, including the proper way to wash your hands, dress, and prepare for work. Also covers cleaning and sanitizing equipment; storing chemicals and cleaning supplies; and controlling pests that can contaminate work areas and food.

F2110 Food Safety is No Mystery – (34 minutes). This is an excellent training visual for foodservice workers. It shows the proper ways to prepare, handle, serve and store food in actual restaurant, school and hospital situations. A policeman sick from food poisoning, a health department sanitarian, and a foodservice worker with all the bad habits are featured. The latest recommendations on personal hygiene, temperatures, cross contamination, and storage of foods are included. (USDA–1987) (Reviewed 1998)

F2111 Controlling Salmonella: Strategies That Work – (16 minutes). This training video provides practical guidelines to prevent the growth of *Salmonella* in dry environments and avoid costly product recalls. Using this video as a discussion tool, supervisors can help employees learn about water and how it fosters conditions for the growth of *Salmonella* in

dry processing plants with potentially devastating consequences. (Silliker Laboratories–2002)

F2120 Food Safety: For Goodness Sake Keep Food Safe – (15 minutes). Teaches food handlers the fundamentals of safe food handling. The tape features the key elements of cleanliness and sanitation, including: good personal hygiene, maintaining proper food product temperature, preventing time abuse, and potential sources of food contamination. (Iowa State University Extension–1990) (Reviewed 1998)

F2121 Food Safety the HACCP Way – (11.5 minutes). Introduces managers and line-level staff to HACCP, or the Hazard Analysis Critical Control Point food safety system. The HACCP system is a seven-step process to control food safety, and can be applied to any size and type of food establishment.

Food Safety Zone Video Series – A one-of-a-kind series that helps get your employees to take food safety issues seriously. These short, to-the-point videos can help make your employees aware of various food hazards, and how they can help promote food safety. The four topics are: Basic Microbiology, Cross Contamination, Personal Hygiene, and Sanitation. (J.J. Keller & Associates–1999)

F2125 Tape 1 – Basic Microbiology and Foodborne Illness – (10 minutes). Covers four common microorganisms in food, how they get into food, and simple ways to prevent contamination. Stresses the importance of keeping food at the right temperature, having proper personal hygiene, and cleaning and sanitizing work surfaces.

F2126 Tape 2 – Food Safety Zone: Cross Contamination – (10 minutes). Quickly teach your employees how they can help prevent cross contamination. Employees are educated on why contaminants can be extremely dangerous, cause serious injury and even death, to consumers of their food products. This fast-paced video will give your employees a deeper understanding of the different types of cross contamination, how to prevent it, and how to detect it through visual inspections and equipment. The emphasis is that prevention is the key to eliminating cross contamination.

F2127 Tape 3 – Food Safety Zone: Personal Hygiene (English and Spanish) – (10 minutes). After watching this video, your employees will understand why their personal hygiene is critical to the success of your business. This video teaches employees about four basic good personal hygiene practices: keeping themselves clean, wearing clean clothes, following specific hand washing procedures, and complying with all related work practices. Personnel are also taught that personal hygiene practices are designed to prevent them from accidentally introducing bacteria to food products, and

are so important that there are federal laws that all food handlers must obey.

- F2128 Tape 4—Food Safety Zone: Sanitation**—(10 minutes). Don't just tell your employees why sanitation is important, show them! This training video teaches employees about the sanitation procedures that cover all practices to keep workplaces clean, and the food produced free of contaminants and harmful bacteria. Four areas covered include personal hygiene, equipment and work areas, use and storage of cleaning chemicals and equipment, and pest control.
- F2129 Food Technology: Irradiation**—(29 minutes). Video covers the following issues: history and details of the irradiation process; effects of irradiation on treated products; and consumer concerns and acceptance trends. Other important concerns addressed include how food irradiation affects food cost, the nutritional food industry, food science and research, and irradiation regulatory industries (such as the Nuclear Regulatory Commission) add insight into the process of irradiation. (Chipsbooks—2001)
- F2130 Food Safety: You Make the Difference**—(28 minutes). Through five food workers from differing backgrounds, this engaging and inspirational documentary style video illustrates the four basic food safety concepts: hand washing, preventing cross contamination, moving foods quickly through the danger zone, and hot/cold holding. (Seattle—King County Health Dept.—1995)
- F2131 Fruits, Vegetables, and Food Safety: Health and Hygiene on the Farm** (DVD and video)—(15 minutes). This presentation shows ways to prevent contamination of fruits and vegetables while you work. It was filmed in real production fields and packinghouses in the United States. Organisms of concern in fruits and vegetables are discussed, along with proper hygiene practices when handling and harvesting fruits and vegetables. (Cornell University—2004)
- F2133 Food Safety First** (English and Spanish) (DVD and Video)—(50 minutes). Presents causes of foodborne illness in foodservice and ways to prevent foodborne illness. Individual segments include personal hygiene and hand washing, cleaning, and sanitizing, preventing cross contamination, and avoiding time and temperature abuse. Food handling principles are presented through scenarios in a restaurant kitchen. (GloGerm—1998)
- F2134 Food Safety: Fish and Shellfish Safety**—(21 minutes). Seafood tops the list for foods that can become contaminated with bacteria—causing foodborne illness. This video shows how to protect yourself from fish and shellfish contamination by learning proper selection, storage, preparation and safe consumption. (Chipsbooks Company—2003)
- F2135 Get with a Safe Food Attitude**—(40 minutes). Consisting of nine short segments which can be viewed individually or as a group, this video presents safe food handling for moms-to-be. Any illness a pregnant woman contracts can affect her unborn child whose immune system is too immature to fight back. The video follows four pregnant women as they learn about food safety and preventing foodborne illness. (US Dept. of Agriculture—1999)
- F2136 GLP Basics: Safety in the Food Micro Lab**—(16 minutes). This video is designed to teach laboratory technicians basic safety fundamentals and how to protect themselves from inherent workplace dangers. Special sections on general laboratory rules, personal protective equipment, microbiological, chemical, and physical hazards, autoclave safety, and spill containment are featured. (Silliker Laboratories—2001)
- F2137 GMP Basics: Avoiding Microbial Cross-Contamination**—(15 minutes). This video takes a closer look at how harmful microorganisms, such as *Listeria*, can be transferred to finished products. Employees see numerous examples of how microbial cross contamination can occur from improper traffic patterns, poor personal hygiene, soiled clothing, unsanitized tools and equipment. Employees need specific knowledge and practical training to avoid microbial cross contamination in plants. This video aids in that training. (Silliker Laboratories—2000)
- F2140 GMP Basics: Employee Hygiene Practices**—(20 minutes). Through real-life examples and dramatization, this video demonstrates good manufacturing practices that relate to employee hygiene, particularly hand washing. This video includes a unique test section to help assess participants' understanding of common GMP violations. (Silliker Laboratories—1997)
- F2143 GMP Basics: Guidelines for Maintenance Personnel**—(21 minutes). Developed specifically for maintenance personnel working in a food processing environment, this video depicts a plant-wide training initiative following a product recall announcement. Maintenance personnel will learn how GMPs relate to their daily activities and how important their roles are in the production of safe food products. (Silliker Laboratories—1999)
- F2147 GMP Basics: Process Control Practices**—(16 minutes). In actual food processing environments, an on-camera host takes employees through a typical food plant as they learn the importance of monitoring and controlling key points in the manufacturing process. Beginning with receiving and storing, through production and ending with packaging and distribution, control measures are introduced, demonstrated and reviewed. Employees will see how their everyday activities in the plant have an impact on product safety. (Silliker laboratories—1999)
- F2148 GMP—GSP Employee**—(38 minutes). This video was developed to teach food plant employees the importance of "Good Manufacturing Practices" and "Good Sanitation Practices." Law dictates that food must be clean and safe to eat. This video emphasizes the significance of each employee's role in protecting food against contamination. Tips on personal cleanliness and hygiene are also presented. (L.J. Bianco & Associates)
- F2150 GMP: Personal Hygiene and Practices in Food Manufacturing** (English, Spanish, and Vietnamese)—(14 minutes). This video focuses on the personal

hygiene of food-manufacturing workers, and explores how poor hygiene habits can be responsible for the contamination of food in the manufacturing process. This is an instructional tool for new food-manufacturing line employees and supervisors. It was produced with "real" people in actual plant situations, with only one line of text included in the videotape. (Penn State-1993)

A GMP Food Safety Video Series – This five-part video series begins with an introduction to GMPs and definitions, then goes on to review specific sections of the GMPs: personnel, plant and grounds, sanitary operations, equipment and utensils, process and controls, warehousing, and distribution. Developed to assist food processors in training employees on personnel policies and Good Manufacturing Practices (CMPs), the series includes different types of facilities, including dairy plants, canning factories, pasta plants, bakeries, and frozen food manufacturing facilities. (J.J. Keller-2003)

F2151 Tape 1 – Definitions – (12 minutes). Provides the definitions necessary to understand the meaning of the CMPs.

F2152 Tape 2 – Personnel and Personnel Facilities – (11 minutes). Covers selection of personnel, delegation of responsibilities, development of plant policies for employees, and operational practices.

F2153 Tape 3 – Building and Facilities – (16 minutes). Discusses guidelines for the construction and maintenance of the manufacturing plant and grounds around the plant.

F2154 Tape 4 – Equipment and Utensils – (12.5 minutes). Provides guidelines for the construction, installation, and maintenance of processing equipment.

F2155 Tape 5 – Production and Process Controls – (20 minutes). Covers establishing a food safety committee, in-house inspections, analysis of raw materials and ingredients, cleaning schedules and procedures, and more.

F2160 GMP: Sources and Control of Contamination during Processing – (20 minutes). This program, designed as an instructional tool for new employees and for refresher training for current or reassigned workers, focuses on the sources and control of contamination in the food-manufacturing process. It was produced in actual food plant situations. A concise description of microbial contamination and growth and cross contamination, a demonstration of food storage, and a review of aerosol contaminants are also included. (Penn State-1995)

GMPs for Food Plant Employees – (Five-volume Video Series Based on European Standards and Regulations). Developed to assist food processors in training employees in the Good Manufacturing Practices. Examples are drawn from a variety of

processing facilities including dairy plants, canning facilities, pasta plants, bakeries, frozen food facilities, etc. (AIB International-2003)

F2161 Tape 1 – Definitions – (13 minutes). Begins with an introduction to the GMPs and traces a basic history of food laws in Europe, ending with the EC Directive 93/43/EEC of June 1993 on the hygiene of foodstuffs.

F2162 Tape 2 – Personnel and Personnel Practices – (13 minutes). Selecting personnel, delegating responsibilities, developing plant policies for employees and visitors, and establishing operational practices.

F2163 Tape 3 – Building and Facilities – (17 minutes). Guidelines for the construction and maintenance of the manufacturing facility and grounds around the factory.

F2164 Tape 4 – Equipment and Utensils – (13 minutes). Guidelines for construction, installation, and maintenance of processing equipment.

F2165 Tape 5 – Production/Process Controls – (22 minutes). Covers production and process controls, establishing a food safety committee, conducting in-house inspections, analyzing raw materials and ingredients, developing operational methods, establishing cleaning schedules and procedures, creating pest control programs and record keeping.

F2168 HACCP Advantage – Good Manufacturing Practices – (English and Spanish) – (DVD) (40 minutes). The HACCP Advantage is based on HACCP principles and was developed by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMARFA). HACCP Advantage was designed to be a practical, cost-effective and preventative food safety system for all nonfederally registered food processing facilities, regardless of size, commodity or volume processed. OMAFRA has developed a 3-step approach to food safety management that makes it easier for small and medium-sized food processors to adopt a HACCP food safety program that meets their requirements. These three components – GMP Advantage, HACCP Advantage and HACCP Advantage Plus+ – collectively encompass all the elements of the original HACCP Advantage program as well as new elements to meet the evolving needs of modern food safety systems. (OMARFA-2006)

F2169 HACCP: Training for Employees – USDA Awareness – (15 minutes). This video is a detailed training outline provided for the employee program. Included in the video is a synopsis of general federal regulations; HACCP plan development; incorporation of HACCP's seven principals; HACCP plan checklist; and an HACCP employee training program. (J.J. Keller & Associates-1999)

- F2170 The Heart of HACCP** – (22 minutes). A training video designed to give plant personnel a clear understanding of the seven HACCP principles and practical guidance on how to apply these principles to their own work environment. This video emphasizes the principles of primary concern to plant personnel such as critical limits, monitoring systems, and corrective actions that are vital to the success of a HACCP plan. (Silliker Laboratories–1994)
- F2172 HACCP: Training for Managers** – (17 minutes). Through industry-specific examples and case studies, this video addresses the seven HACCP steps, identifying critical control points, record keeping and documentation, auditing, and monitoring. It also explains how HACCP relates to other programs such as Good Manufacturing Practices and plant sanitation. (J.J. Keller & Associates–2000)
- F2173 Inside HACCP: Principles, Practices and Results** (English and Spanish) – (15 minutes). This video is designed to help you build a more knowledgeable work-force and meet safety standards through a comprehensive overview of HACCP principles. Employees are provided with details of prerequisite programs and a clear overview of the seven HACCP principles. "Inside HACCP" provides short, succinct explanations of how HACCP works and places special emphasis on the four principles – monitoring, verification, corrective action, and recordkeeping – in which employees actively participate. (Silliker Laboratories–2001)
- F2175 Inspecting for Food Safety – Kentucky's Food Code** – (100 minutes). Kentucky's Food Code is patterned after the Federal Food Code. The concepts, definitions, procedures, and regulatory standards included in the code are based on the most current information about how to prevent foodborne diseases. This video is designed to prepare food safety inspectors to effectively use the new food code in the performance of their duties. (Dept. of Public Health Commonwealth of Kentucky–1997) (Reviewed 1999)
- F2180 HACCP: Safe Food Handling Techniques** – (22 minutes). The video highlights the primary causes of food poisoning and emphasizes the importance of self inspection. An explanation of potentially hazardous foods, cross contamination, and temperature control is provided. The main focus is a detailed description of how to implement a Hazard Analysis Critical Control Point (HACCP) program in a food service operation. A leader's guide is provided as an adjunct to the tape. (The Canadian Restaurant & Foodservices Assoc.–1990) (Reviewed 1998)
- F2190 Is What You Order What You Get? Seafood Integrity** – (18 minutes). Teaches seafood department employees about seafood safety and how they can help insure the integrity of seafood sold by retail food markets. Key points of interest are cross-contamination control, methods and criteria for receiving seafood and determining product quality, and knowing how to identify fish and seafood when unapproved substitutions have been made. (The Food Marketing Institute) (Reviewed 1998)
- F2191 Microbial Food Safety: Awareness to Action** (DVD PowerPoint presentation) – (90 minutes). An overview of GAPs and resources by the United Fresh Fruits and Vegetables Association, a hazard identification self-audit, a sample farm investigative questionnaire, copies of relevant California state information, and US federal regulations. Contains numerous commodity flow charts and photos for more than 30 fruits and vegetables, one dozen PowerPoint presentations containing more than 400 slides, including may in Spanish and two dozen supplemental documents on a variety of food safety topics. (UC Davis–2002)
- F2210 Northern Delight – From Canada to the World** – (13 minutes). A promotional video that explores the wide variety of foods and beverages produced by the Canadian food industry. General in nature, this tape presents an overview of Canada's food industry and its contribution to the world's food supply. (Ternelle Production, Ltd.) (Reviewed 1998)
- F2220 Proper Handling of Peracetic Acid** – (15 minutes). Introduces peracetic acid as a chemical sanitizer and features the various precautions needed to use the product safely in the food industry.
- F2230 Purely Coincidental** – (20 minutes). A parody that shows how foodborne illness can adversely affect the lives of families that are involved. The movie compares improper handling of dog food in a manufacturing plant that causes the death of a family pet with improper handling of human food in a manufacturing plant that causes a child to become ill. Both cases illustrate how handling errors in food production can produce devastating outcomes. (The Quaker Oats company–1993) (Reviewed 1998)
- F2240 On the Front Line** – (18 minutes). A training video pertaining to sanitation fundamentals for vending service personnel. Standard cleaning and serving procedures for cold food, hot beverage and cup drink vending machines are presented. The video emphasizes specific cleaning and serving practices which are important to food and beverage vending operations. (National Automatic Merchandising Association–1993) (Reviewed 1998)
- F2250 On the Line** (English and Spanish) – (30 minutes). This was developed by the Food Processors Institute for Training food processing plant employees. It creates an awareness of quality control and regulations. Emphasis is on personal hygiene, equipment cleanliness and good housekeeping in a food plant. It is recommended for showing to both new and experienced workers. (The Food Processors Institute–1993) (Reviewed 1998)
- F2260 100 Degrees of Doom...The Time and Temperature Caper** – (14 minutes). Video portraying a private eye tracking down the cause of a *Salmonella* poisoning. Temperature control is emphasized as a key factor in preventing foodborne illness. (Educational Communications, Inc.–1987) (Reviewed 1998)
- F2265 A Day in the Deli: Service, Selection, and Good Safety** – (22 minutes). This training video provides basic orientation for new deli department employees and highlights skills and sales techniques that will build

department traffic and increased sales. The focus will be on the priorities of the deli department freshness, strong customer service, professionalism, and food safety. By understanding the most important issues for their position(s), employees can comprehend their contribution to the financial interests of the store. (Food Marketing Institute—2003)

- F2266 HACCP: A Basic Understanding** – (32 minutes). Explore applications for Hazard Analysis Critical Control Points (HACCP), a system of process controls required by federal and state governments for most areas of the food service industry. Learn to minimize the risk of chemical, microbiological and physical food contamination while focusing on the seven principles of HACCP and the chain of responsibility. (Chipsbooks company—2003)
- F2270 Pest Control in Seafood Processing Plants** – (26 minutes). Covers procedures to control flies, roaches, mice, rats, and other common pests associated with food processing operations. The tape will familiarize plant personnel with the basic characteristics of these pests and the potential hazards associated with their presence in food operations.
- F2271 Preventing Foodborne Illness** – (10 minutes). This narrated video is for food service workers, with emphasis on insuring food safety by washing one's hands before handling food, after using the bathroom, sneezing, touching raw meats and poultry, and before and after handling foods such as salads and sandwiches. Safe food temperatures and cross contamination are also explained. (Colorado Dept. of Public Health and Environment—1999)
- F2280 Principles of Warehouse Sanitation** – (33 minutes). This videotape gives a clear, concise and complete illustration of the principles set down in the Food, Drug and Cosmetic Act and in the Good Manufacturing Practices, as well as supporting legislation by individual states. (American Institute of Baking—1993)
- F2290 Product Safety and Shelf Life** – (40 minutes). This videotape was done in three sections with opportunity for review. Emphasis is on providing consumers with good products. One section covers off-flavors, another product problem caused by plant conditions, and a third the need to keep products cold and fresh. Procedures to assure this are outlined, as shown in a plant. Well done and directed to plant workers and supervisors. (Borden, Inc.—1987) (Reviewed 1997)
- F2310 Safe Food: You Can Make a Difference** – (25 minutes). A training video for food service workers which covers the fundamentals of food safety. An explanation of proper food temperature, food storage, cross-contamination control, cleaning and sanitizing, and hand washing as methods of foodborne illness control is provided. The video provides an orientation to food safety for professional food handlers. (Tacoma—Pierce County Health Dept.—1990) (Reviewed 1998)
- F2320 Safe Handwashing** – (15 minutes). Twenty-five percent of all foodborne illnesses are traced to improper hand washing. The problem is not just that

hand washing is not done, the problem is that it's not done properly. This training video demonstrates the "double wash" technique developed by Dr. O. Peter Snyder of the Hospitality Institute for Technology and Management. Dr. Snyder demonstrates the procedure while reinforcing the microbiological reasons for keeping hands clean. (Hospitality Institute for Technology & Management—1991) (Reviewed 1998)

- F2321 All Hands On Deck** – (12 minutes) Germ Tells All. A Benedict Arnold of the germ world comes clean by teaching the audience to "think like a germ" when it comes to hand washing. The reasons for hand washing are outlined and proper technique is demonstrated along with suggestions for avoiding immediate recontamination before even leaving the rest room. Interesting, informative, humorous and appropriate for virtually any age group. (Brevis Corporation – 2005)
- F2322 The Why, The When and The How Video** – (5 minutes) An excellent tool for motivating good hand hygiene behavior with existing and new employees. Fast paced. Three modules train the why, when, and how of hand washing. (Brevis Corporation—2005)
- F2325 Safe Practices for Sausage Production** – (180 minutes). This videotape is based on a series of educational broadcasts on meat and poultry inspections at retail food establishments produced by the Association of Food and Drug Officials (AFDO) and USDA's Food Safety and Inspection Service (FSIS), along with FDA's Center for Food Safety and Applied Nutrition. The purpose of the broadcast was to provide training to state, local, and tribal sanitarians on processes and procedures that are being utilized by retail stores and restaurants, especially those that were usually seen in USDA-inspected facilities. The program will cover the main production steps of sausage products, such as the processes of grinding, stuffing, and smoking, and typical equipment used will be depicted. Characteristics of different types of sausage (fresh, cooked, and smoked, and dry/semi-dry) will be explained. Pathogens of concern and outbreaks associated with sausage will be discussed. The written manual for the program is available at www.fsis.usda.gov/fof/hrds/STATE/RETAIL/manual.htm (1999)
- F2330 Sanitation for Seafood Processing Personnel** – (20 minutes). A training video suited for professional food handlers working in any type of food manufacturing plant. The film highlights Good Manufacturing Practices and their role in assuring food safety. The professional food handler is introduced to a variety of sanitation topics including: (1) food handlers as a source of food contamination, (2) personal hygiene as a means of preventing food contamination, (3) approved food storage techniques including safe storage temperatures, (4) sources of cross contamination, (5) contamination of food by insects and rodents, (6) garbage handling and pest control, and (7) design and location of equipment and physical facilities to facilitate cleaning. (Reviewed 1998)
- F2340 Sanitizing for Safety** – (17 minutes). Provides an introduction to basic food safety for professional food handlers. A training pamphlet and quiz accompany the

tape. Although produced by a chemical supplier, the tape contains minimal commercialism and may be a valuable tool for training new employees in the food industry. (Clorox-1990) (Reviewed 1998)

F2341 Science and Our Food Supply – (45 minutes). Becoming food safety savvy is as easy as A-B-C! This video includes a step-by-step journey as food travels from the farm to the table; the FightBAC[®] Campaign's four simple steps to food safety, clean, cook, separate (combat cross contamination), and chill, and the latest in food safety careers. Other topics covered include understanding bacteria, food processing and dayAlliance training courses. There are 12 training modules in the course that cover all of the information on HACCP principles, their application to seafood products, and the FDA regulation. Experience has shown that HACCP implementation can be more effective when a number of key people in the operation have a good understanding of the system and its requirements. (Cornell University-2004)

F2342 Seafood HACCP Internet Training Course – (Interactive DVD) This CD contains the on-line equivalent material found in the Seafood HACCP Alliance Internet Training course (<http://seafoodhaccp.cornell.edu>). There are 12 training modules in the course that cover all of the information on HACCP principles, their application to seafood products, and the FDA regulation. Experience has shown that HACCP implementation can be more effective when a number of key people in the operation have a good understanding of the system and its requirements. (Cornell University- 2004)

F2350 ServSafe Steps to Food Safety (DVD and Video) (English and Spanish) – The ServSafe food safety series consists of six videos that illustrate and reinforce important food safety practices in an informative and entertaining manner. The videos provide realistic scenarios in multiple industry segments. (National Restaurant Association Education Foundation-2000)

Tape 1 Step One: Starting Out with Food Safety – (12 minutes). Defines what foodborne illness is and how it occurs; how foods become unsafe; and what safety practices to follow during the flow of food.

Tape 2 Step Two: Ensuring Proper Personal Hygiene – (10 minutes). Introduces employees to ways they might contaminate food; personal cleanliness practices that help protect food; and the procedure for thorough hand washing.

Tape 3 Step Three: Purchasing, Receiving and Storage – (12 minutes). Explains how to choose a supplier; calibrate and use a thermometer properly; accept or reject a delivery; and store food safely.

Tape 4 Step Four: Preparing, Cooking and Serving – (11 minutes). Identifies proper practices for thawing, cooking, holding, serving, cooling, and reheating food.

Tape 5 Step Five: Cleaning and Sanitizing – (11 minutes). Describes the difference between cleaning and sanitizing; manual and machine warewashing; how sanitizers work; how to store clean items and cleaning supplies; and how to set up a cleaning program.

Tape 6 Step Six: Take the Food Safety Challenge: Good Practices, Bad Practices – You Make the Call – (35 minutes). Challenges viewers to identify good and bad practices presented in five short scenarios from different industry segments.

F2370 Supermarket Sanitation Program – Cleaning and Sanitizing – (13 minutes). Contains a full range of cleaning and sanitizing information with minimal emphasis on product. Designed as a basic training program for supermarket managers and employees (1989) (Reviewed 1998)

F2380 Supermarket Sanitation Program: Food Safety – (11 minutes). Contains a full range of basic sanitation information with minimal emphasis on product. Filmed in a supermarket, the video is designated as a basic program for manager training and a program to be used by managers to train employees. (1998) (Reviewed 1998)

F2390 Take Aim at Sanitation (English and Spanish) – (8 minutes). Produced by the Foodservice & Packaging Institute in cooperation with the US Food and Drug Administration, this video demonstrates how to properly store and handle foodservice disposables so customers are using safe, clean products. This video demonstrates: the problem of foodborne illness; how foodservice disposables are manufactured for cleanliness; tips for storing foodservice disposables; tips to help your customers in self-serve areas; guidelines for serving meals and maintaining proper sanitation; and tips for cleaning up after meals. Throughout the program a roving microscope "takes aim" at common mistakes made by workers to help audiences identify unsanitary handling and storage practices. (Foodservice & Packaging Institute, Inc.)

F2391 Understanding Foodborne Pathogens – (40 minutes). Explore the major causes of foodborne illness and review the practices used to minimize the risk of contracting or spreading a foodborne disease. Learn about microorganisms associated with foodborne illness such as parasites, viruses, fungi and bacteria. Study ways to reduce harmful pathogens through proper handling, storage, and cooking. (Chipsbooks Company-2003)

F2410 Wide World of Food Service Brushes – (18 minutes). Discusses the importance of cleaning and sanitizing as a means to prevent and control foodborne illness. Special emphasis is given to proper cleaning and sanitizing procedures and the importance of having properly designed and constructed equipment (brushes) for food preparation and equipment cleaning operations. (1989)

F2420 **Your Health in Our Hands, Our Health in Yours** – (8 minutes). For professional food handlers, the tape covers the do's and don'ts of food handling as they relate to personal hygiene, temperature control, safe storage, and proper sanitation. (Jupiter Video Production–1993) (Reviewed 1998)

F2430 **Smart Sanitation: Principles and Practices for Effectively Cleaning Your Food Plant** – (20 minutes). A practical training tool for new sanitation employees or as a refresher for veterans. Employees will understand the food safety impact of their day-to-day cleaning and sanitation activities and recognize the importance of their role in your company's food safety program. (Silliker Laboratories–1996)

F2440 **Cleaning and Sanitizing in Vegetable Processing Plants: Do It Well, Do It Safely!** (English and Spanish) – (16 minutes). This training video shows how to safely and effectively clean and sanitize in a vegetable processing plant. It teaches how it is the same for a processing plant as it is for washing dishes at home. (University of Wisconsin Extension–1996)

F2450 **A Guide to Making Safe Smoked Fish** – (21 minutes). Smoked fish can be a profitable product for aquaculturalists, but it can be lethal if not done correctly. This video guides you through the steps necessary to make safe smoked fish. It provides directions for brining, smoking, cooling, packaging, and labeling, and cold storage to ensure safety. The video features footage of fish smoking being done using both traditional and modern equipment. (University of Wisconsin–Madison–1999)

F2451 **A HACCP–Based Plan Ensuring Food Safety in Retail Establishments (DVD)** – (11 minutes). This is an educational DVD that provides a brief summary of HACCP. It explains the purpose and execution of each of the seven principles. Can be used as part of a wide range of HACCP training programs beyond retail establishments. The major emphasis is on proper documentation and validation. (Ohio State University–2004)

F2460 **Safer Processing of Sprouts** – (82 minutes). Sprouts are enjoyed by many consumers for their taste and nutritional value. However, recent outbreaks of illnesses associated with sprouts have demonstrated a potentially serious human health risk posed by this food. FDA and other public health officials are working with industry to identify and implement production practices that will assure that seed and sprouted seed are produced under safe conditions. This training video covers safe processing practices of sprouts including growing, harvesting, milling, transportation, storage, seed treatment, cleaning and sanitizing, sampling and microbiological testing. (CA Dept. of Health Service, Food & Drug Branch–2000)

Fast Track Restaurant Video Kit – These five short, direct videos can help make your employees more aware of various food hazards and how they can promote food safety. (Diversey Lever–1994)

F2500 **Tape 1 – Food Safety Essentials** – (23 minutes). This video provides an overview of food safety. All food service employees learn six crucial guidelines for combating foodborne illness. Prepares employees for further position-specific training to apply the six food safety principles to specific jobs.

F2501 **Tape 2 – Receiving and Storage** – (22 minutes). Make sure only safe food enters your doors! Receiving and storage staff learn what to look for and how to prevent spoilage with proper storage with this video.

F2502 **Tape 3 – Service** – (22 minutes). Servers are your last safety checkpoint before guests receive food. This video helps you make sure they know the danger signs.

F2503 **Tape 4 – Food Production** – (24 minutes). Food production tasks cause most food safety problems. Attack dangerous practices at this critical stage with this video training tool.

F2504 **Tape 5 – Warewashing** – (21 minutes). Proper sanitation starts with clean dishes! With this video, warewashers will learn how to ensure safe tableware for guests and safe kitchenware for co-workers.

Worker Health and Hygiene Program for the Produce Industry

F2505 **Manager Guide to Worker Health and Hygiene: Your Company's Success May Depend on It!** (English) – (18 minutes). Covers the importance of foodborne illness as related to the produce industry and provides practical hands-on information of managers/operators on teaching health and hygiene to the workers in their operations (University of Florida/IFAS–2006)

F2506 **Worker Health and Hygiene: Your Job Depends On It!** (English and Spanish) – (11 minutes). Covers the importance of personal health and hygiene and simple hands-on information on foodborne illness and how produce handlers could spread disease if proper personal hygiene is not practiced. Also provides stepwise handwashing procedures for produce handlers in any situation (University of Florida/IFAS–2006)

F2600 **Food Industry Security Awareness: The First Line of Defense** – (24 minutes) (Video and DVD). This video reinforces the importance of security awareness in all phases of product handling, from receiving ingredients to processing and shipping. With this program, you can have an immediate impact on plant security with very little time or resources, all while helping maximize the effectiveness of your overall security investment. Everything you need to turn your biggest security challenge into your biggest security asset is covered. (J. J. Keller–2006)

OTHER

M4010 **Diet, Nutrition and Cancer** – (20 minutes). Investigates the relationship between a person's diet and the risk of developing cancer. The film describes the cancer development process and identifies various types of food believed to promote and/or inhibit cancer. The film also provides recommended dietary guidelines to prevent or greatly reduce the risk of certain types of cancer.

M4020 Eating Defensively: Food Safety Advice for Persons with AIDS – (15 minutes). While HIV infection and AIDS are not acquired by eating foods or drinking liquids, persons infected with the AIDS virus need to be concerned about what they eat. Foods can transmit bacteria and viruses capable of causing life-threatening illness to persons infected with AIDS. This video provides information for persons with AIDS on what foods to avoid and how to better handle and prepare foods. (FDA/CDC-1989)

M4030 Ice: The Forgotten Food – (14 minutes). This training video describes how ice is made and where the critical control points are in its manufacture, both in ice plants and in on-premises locations (convenience stores, etc.). It documents the potential for illness from contaminated ice and calls on government to enforce good manufacturing practices, especially in on-premises operations where sanitation deficiencies are common. (Packaged Ice Association-1993)

M4050 Personal Hygiene and Sanitation for Food Processing Employees – (15 minutes). Illustrates and describes the importance of good personal hygiene and sanitary practices for people working in a food processing plant. (Iowa State University-1993)

M4060 Psychiatric Aspects of Product Tampering – (25 minutes). This was presented by Emanuel Tanay, M.D. from Detroit, at the Fall 1986 conference of CSAFDA. He reviewed a few cases and then indicated that abnormal behavior is like a contagious disease. Media stories lead up to 1,000 similar alleged cases, nearly all of which are false. Tamper-proof packaging and recalls are essential. Tampering and poisoning are characterized by variable motivation, fraud and greed. Law enforcement agencies have the final responsibilities. Tamper-proof containers are not the ultimate answer. (1987)

M4070 Tampering: The Issue Examined – (37 minutes). Developed by Culbro Machine Systems, this videotape is well done. It is directed to food processors and not regulatory sanitarians or consumers. A number of industry and regulatory agency management explain why food and drug containers should be made tamper evident. (Culbro-1987)

M4071 Understanding Nutritional Labeling – (39 minutes). Learn why the government initiated a standardized food labeling system and which foods are exempt. Explore each component listed on the label including cholesterol, carbohydrates, protein, fat, health or nutritional claims, service size, percentage of daily value, and standard calorie reference/comparison. (Chipsboosk Company-2003)

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- D1140 Pasteurizer: Operation
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- E3128 Integrated Pest Management (IPM)
- E3151 Key Pests of the Food Industry
- E3153 Physical Pest Management Practices
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- E3236 Rodent Control Strategies
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FOOD

- F2005 A Lot on the Line
- F2007 The Amazing World of Microorganisms
- F2008 A Recipe for Food Safety Success
- F2009 Basic Personnel Practices
- F2011 Available Post Harvest Processing Technologies for Oysters
- F2012 Control of *Listeria monocytogenes* in Retail Establishments
- F2013 Control of *Listeria monocytogenes* in Small Meat and Poultry Establishments
- F2014 Controlling Food Allergens in the Plant
- F2015 Controlling *Listeria*: A Team Approach
- F2016 Bloodborne Pathogens: What Employees Must
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- F2037 Cooking and Cooling of Meat and Poultry Products
- F2039 Food for Thought - The GMP Quiz Show
- F2040 Food Irradiation
- F2045 Food Microbiological Control
- F2050 Food Safe-Food Smart - HACCP and Its Application to the Food Industry (Part 1 & 2)
- F2060 Food Safe Series I (4 videos)
- F2070 Food Safe Series II (4 videos)
- F2080 Food Safe Series III (4 videos)
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- F2090 Food Safety: An Educational Video for Institutional Food Service Workers
- F2095 Food Safety for Food Service Series I
- F2095 Now You're Cooking
- F2101 Tape 1 - Food Safety for Food Service: HACCP
- F2103 Tape 2 - Food Safety for Food Service: Time and Temperature Controls Food Safety for Food Service Series II
- F2104 Tape 1 - Basic Microbiology and Foodborne Illness
- F2105 Tape 2 - Handling Knives, Cuts, and Burns
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- F2128 Tape 4 - Food Safety Zone: Sanitation
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- F2134 Food Safety: Fish and Shellfish Safety
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- F2143 GMP Basics: Guidelines for Maintenance Personnel
- F2147 GMP Basics: Process Control Practices
- F2148 GMP - GSP Employee
- F2150 GMP: Personal Hygiene and Practices in Food Manufacturing
- F2151 GMP Food Safety Video Series
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- F2152 Tape 2 - Personnel and Personnel Facilities
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- F2154 Tape 4 - Equipment and Utensils
- F2155 Tape 5 - Production and Process Controls
- F2160 GMP: Sources and Control of Contamination during Processing
- F2160 GMPs for Food Plant Employees
- F2161 Tape 1 - Definitions
- F2162 Tape 2 - Personnel and Personnel Practices
- F2163 Tape 3 - Building and Facilities
- F2164 Tape 4 - Equipment and Utensils
- F2165 Tape 5 - Production/Process Controls
- F2168 HACCP Advantage - Good Manufacturing Practices
- F2169 HACCP: Training for Employees - USDA Awareness
- F2170 The Heart of HACCP
- F2172 HACCP: Training for Managers
- F2173 Inside HACCP: Principles, Practices and Results
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- F2191 Microbial Food Safety: Awareness to Action
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- F2230 Purely Coincidental
- F2250 On the Line
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- F2266 HACCP: A Basic Understanding
- F2271 Preventing Foodborne Illness
- F2280 Principles of Warehouse Sanitation
- F2290 Produce Safety and Shelf Life
- F2320 Safe Handwashing
- F2321 All Hands on Deck
- F2322 The Why, The When, and The How Video
- F2325 Safe Practices for Sausage Production
- F2340 Sanitizing for Safety
- F2342 Seafood HACCP Alliance: Internet Training Course
- F2350 ServSafe Steps to Food Safety
- F2350-1 Step One: Starting Out with Food Safety
- F2350-2 Step Two: Ensuring Proper Personal Hygiene
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- F2430 Smart Sanitation: Principles and Practices for Effectively Cleaning Your Food Plant
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- F2450 A Guide to Making Safe Smoked Fish
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- F2500 Tape 1 - Food Safety Essentials
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- F2504 Worker Health and Hygiene Program for the Produce Industry
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- F2506 Food Industry Security Awareness: The First Line of Defense
- F2600
- 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

OTHER

Visit our Web site at www.foodprotection.org for detailed tape descriptions



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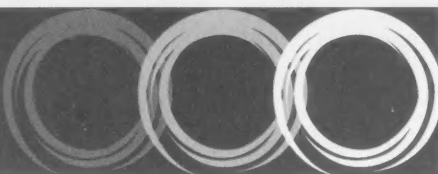
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WHAT'S HAPPENING IN FOOD SAFETY



3-A SSI Announces Withdrawal of 3-A Symbol Authorization

3-A Sanitary Standards, Inc. (3-A SSI) announces the revocation of a current 3-A Symbol license due to the need for corrective actions for equipment manufactured in accordance to 3-A Sanitary Standard #68-00, Ball-type Valves. The action concerns equipment manufactured by Chiang Sung Enterprise Co., Ltd. (CSE) for models of ball-type valves listed in 3-A Symbol authorization #1327.

The 3-A SSI action was made in accordance with provisions of the 3-A Sanitary Standards, Inc. Manual for Third Party Verification for 3-A Symbol Authorization and 3-A Process Certification. The ball-type valves subject to the corrective action by CSE bear the 3-A Symbol and are sold under the model designations 'Ball Valve Series Y Clamp & Weld Ends'. The Manual provides for CSE to send notice of this action to all customers of record since January 15, 2008, the date of the most recent independent Third Party Verification (TPV) Report of Conformance.

The action announced by 3-A SSI applies only to equipment listed in the CSE 3-A Symbol authorization #1327 for equipment manufactured to 3-A Sanitary Standard #68-00. CSE maintains three other 3-A Symbol authorizations for equipment manufactured under 3-A Sanitary Standards #58-00, Vacuum Breakers and Check Valves; #65-01, Sight and/or Light Windows and Sight Indicators in Contact with Product; and #63-03, Sanitary Fittings.

3-A SSI issues certificates of 3-A Symbol authorization to licensees that agree to meet specific conditions for use of the 3-A Symbol. Voluntary use of the 3-A Symbol on dairy and food equipment assures processors that equipment meets sanitary standards, provides accepted criteria to equipment manufacturers for sanitary design, and establishes guidelines for uniform evaluation and compliance by sanitarians.

3-A SSI maintains a list of 3-A Symbol holders, both current and discontinued, on the 3-A SSI web site at http://www.3-a.org/symbol/3-a_symbol_holders.pdf. The public list is available to assist fabricators, processors, regulatory sanitarians and other interested parties identify the type of equipment and the suppliers that hold a current 3-A Symbol authorization and license.

Colorado Firm Expands Recall of Beef Products Due to Possible *E. coli* O157:H7 Contamination

JBS Swift Beef Company, a Greeley, CO establishment is voluntarily expanding its June 24 recall to include approximately 380,000 pounds of assorted beef primal products that may be contaminated with *E. coli* O157:H7, the US Department of Agriculture's Food Safety and Inspection Service (FSIS) has announced.

Together with traceback information and laboratory data, the recall is being expanded as a result of FSIS' cooperation with the Centers for Disease Control and Prevention (CDC) in an ongoing investigation into 24 illnesses in multiple states, of which at least 18 appear to be

associated. This investigation prompted the company to re-examine the effectiveness of their food safety system for the April 21 production of beef primals, and they are conducting this recall out of an abundance of caution as the safety of the products produced on a portion of that day could not be assured.

The beef products were produced on April 21, 2009 and were distributed both nationally and internationally.

Each box bears the establishment number "EST. 969" inside the USDA mark of inspection as well as the identifying package date of "042109" and a time stamp ranging from "0618" to "1130." However, these products were sent to establishments and retail stores nationwide for further processing and will likely not bear the establishment number "EST. 969" on products available for direct consumer purchase. Customers with concerns should contact their point of purchase.

The recalled products include intact cuts of beef, such as primals, sub-primals, or boxed beef typically used for steaks and roasts rather than ground beef. FSIS is aware that some of these products may have been further processed into ground products by other companies. The highest risk products for consumers are raw ground product, trim or other non-intact product made from the products subject to the recall.

E. coli O157:H7 H7 is a potentially deadly bacterium that can cause bloody diarrhea, dehydration, and in the most severe cases, kidney failure. The very young, seniors and persons with weak immune systems



are the most susceptible to food-borne illness. Individuals concerned about an illness should contact a physician.

Consumer questions regarding the recall should be directed to the company's Consumer Hotline at 800.685.6328.

European Public Health Agencies Evaluate Antibiotic Resistance of *Staphylococcus aureus*

The European Food Safety Authority (EFSA), the European Centre for Disease Control and Prevention (ECDC) and the European Medicines Agency (EMA) have published a joint scientific report on methicillin-resistant *Staphylococcus aureus* (MRSA) in livestock, pets and foods.

Following a request from the European Commission, EFSA's Panel on Biological Hazards and ECDC concluded that food-producing animals such as pigs, veal calves and broiler chickens often carry without symptoms a specific strain of MRSA called CC398. However, while food may be contaminated by MRSA there is currently no evidence that eating or handling contaminated food can lead to an increased health risk for humans. The report also noted that people in contact with live animals that carry the CC398 strain of MRSA could be at risk of infection. This specific strain of MRSA has been associated, albeit rarely, with serious skin and soft tissue infections, pneumonia and blood poisoning in humans. Pet animals can also be infected with MRSA, where the bacteria first pass from humans to pets and then back to humans. The document noted the importance of basic hygiene measures, especially hand washing before and after contact with animals, and if possible, avoiding direct contact with nasal secretions, saliva and wounds.

The report concluded that as animal movement and contact between live animals and humans are likely to be important factors in the transmission of MRSA, the most effective control measures will be at farm level.

In a parallel review, the European Medicines Agency looked at the risk of colonization or infection of livestock and companion animals with MRSA in the context of the authorization and the use of antimicrobial veterinary medicines. The Committee for Medicinal Products for Veterinary Use (CVMP) found that MRSA is resistant to virtually all antibiotics from the beta-lactam group, and very often also to other antimicrobials. Prudent use of antimicrobials in animals should remain a key measure and the CVMP recommended monitoring of animal consumption of antimicrobials to identify any sources of unnecessary use. The Committee also recommended that medicines of last resort for MRSA treatment in humans should be avoided in animals, so as to ensure their continued efficacy in humans.

MRSA infections are widespread in hospitals in many EU Member States and are a major cause of hospital-acquired infections which can lead to severe illness and in some cases fatalities. In recent years a link has also been established between MRSA in animals and human MRSA infections. In the areas of the EU where MRSA is found amongst food producing animals, people in contact with these animals, such as farmers, veterinarians and their families, are at risk of acquiring an MRSA infection. Given the severity of some MRSA infection, ECDC is supportive of measures to ensure prudent use of antibiotics in food producing animals. Through the European Antibiotic Awareness Day initiative, ECDC is actively engaged in initiatives to raise awareness about the

risks associated with inappropriate use of antibiotics and how to use antibiotics responsibly.

FDA Warns Consumers Not to Eat Nestle Toll House Prepackaged, Refrigerated Cookie Dough

The US Food and Drug Administration and the Centers for Disease Control and Prevention are warning consumers not to eat any varieties of prepackaged Nestle Toll House refrigerated cookie dough due to the risk of contamination with *E. coli* O157:H7 (a bacterium that causes foodborne illness).

The FDA advises that if consumers have any prepackaged, refrigerated Nestle Toll House cookie dough products in their home that they throw them away. Cooking the dough is not recommended because consumers might get the bacteria on their hands and on other cooking surfaces.

Retailers, restaurateurs, and personnel at other food-service operations should not sell or serve any Nestle Toll House prepackaged, refrigerated cookie dough products subject to the recall.

Nestle USA, which manufactures and markets the Toll House cookie dough, is fully cooperating with the ongoing investigation by the FDA and CDC. The warning is based on an ongoing epidemiological study conducted by the CDC and several state and local health departments. Since March 2009 there have been 66 reports of illness across 28 states. Twenty-five persons were hospitalized; 7 with a severe complication called Hemolytic Uremic Syndrome (HUS). No one has died.

E. coli O157:H7 causes abdominal cramping, vomiting and a diarrheal illness, often with bloody stools. Most healthy adults can recover completely within a week. Young children and the elderly are



at highest risk for developing HUS, which can lead to serious kidney damage and even death.

Individuals who have recently eaten prepackaged, refrigerated Toll House cookie dough and have experienced any of these symptoms should contact their doctor or health care provider immediately. Any such illnesses should be reported to state or local health authorities.

The FDA reminds consumers they should not eat raw food products that are intended for cooking or baking before consumption. Consumers should use safe food-handling practices when preparing such products, including following package directions for cooking at proper temperatures; washing hands, surfaces, and utensils after contact with these types of products; avoiding cross-contamination; and refrigerating products properly.

For more information on safe food handling practices, go to <http://www.fda.gov/Food/ResourcesForYou/Consumers/ucm109899.htm>.

NSF International and the American Society for Nutrition to Administer New Smart Choices Program

NSF International and the American Society for Nutrition has announced their joint roles in administering a new nutritional front-of-package labeling program, the Smart Choices Program™. This nutrition labeling program will provide manufacturers and retailers with a reliable front-of-pack icon plus calorie information that helps consumers recognize smarter food and beverage products within product categories.

The goal of this new labeling program is to bring consistency and clarity to the US marketplace. With the proliferation of front-of-pack labels, there is little uniformity, which often makes it difficult for

manufacturers to convey the nutritional benefits of their products and can cause consumer confusion. The Smart Choices Program will make it easier for consumers to quickly identify products and select smarter food and beverage choices within product categories. It provides an opportunity for manufacturers to communicate with consumers about better-for-you products in a clear and consistent manner.

The American Society for Nutrition (ASN) and NSF International will act as program administrators providing both scientific and technical expertise to a board of directors comprised of non-profit, scientific and industry representatives.

"NSF International's core business is certifying products and writing standards for food, water and consumer goods in order to protect public health. This labeling program will assist consumers in choosing nourishing foods and beverages that fit within their daily caloric needs," said Nancy Culotta, NSF vice president. "We look forward to working with ASN to administer the program and ultimately help educate consumers on nutritional labeling."

"The Smart Choices Program was developed through an unprecedented collaboration of scientists, public health advocates, food industry representatives and health organizations, and it is based on sound, consensus science. As the preeminent professional society for nutrition science, ASN looks forward to working with this exciting new program that will aid consumers in making healthier food selections when they shop," said Jim Hill, ASN president.

To qualify for the Smart Choices Program, all products must meet standards for specific "nutrients to limit," and, for most categories, products must also meet criteria for positive attributes – "nutrients to encourage" or "food groups to encourage." Specific qualifying crite-

ria were developed for 19 different product categories, such as beverages, cereals, meats, dairy and snacks:

- Nutrients to limit: total fat, saturated fat, trans fat, cholesterol, added sugars and sodium
- Nutrients to encourage: calcium, potassium, fiber, magnesium, vitamin A, vitamin C, and vitamin E
- Food groups to encourage: fruits and vegetables, whole grains, low-fat or fat free dairy

The Smart Choices Program is not based on a scoring system; but rather it identifies foods based on science-based nutrition criteria within specific product categories. Products that meet the criteria are eligible to bear the Smart Choices icon on the front of the package. Accompanying the Smart Choices icon will be information on the number of calories per serving, as well as the number of servings in the package. The straight-forward and transparent nutrition criteria distinguish the Smart Choices Program from others in the marketplace.

For more information on the Smart Choices Program, contact Sarah Krol, General Manager, Smart Choices Program at info@smart-choicesprogram.com.

Award for Joy Gaze, Deputy Head of Microbiology at Campden BRI

Campden BRI is delighted that Joy Gaze, deputy head of microbiology, received the IAFP 2009 GMA (US Grocery Manufacturers Federation) Food Safety Award, in recognition of her pre-eminence in and contribution to the field of microbiological food safety. It was presented at the International Association for Food Protection Awards Banquet in Texas in July. Joy has over 30 years of



applied research experience and is widely recognized as an authority in the area of thermal microbiology, having provided consultancy to many national and international companies and contributed to many international microbiology conferences.

Mike Stringer, Campden BRI's director of food technology, said, "The award further enhances our reputation for scientific excellence here in the UK and internationally and I am very pleased Joy has won it. It is one of the top awards for food safety in our industry and recognizes the huge advances Joy and her team have made to ensure the food we eat is as safe as possible."

Leslie G. Sarasin Named President and Chief Executive Officer of the Food Marketing Institute

The Partnership for Food Safety Education (PFSE) announced the election of Leslie G. Sarasin, president and chief executive officer of the Food Marketing Institute, as the new chairman of the Board of Directors, succeeding outgoing chairman Bryan Silbermann, president and chief executive officer, Produce Marketing Association. Pamela G. Bailey, president and chief executive officer of the Grocery Manufacturers Association, has been elected as the PFSE's new vice chairman. The changes took effect on June 30.

Steritech Names Gonzalo Checa as President, Food Safety Division

The Steritech Group Inc., a provider of specialized brand protection services, has appointed Gonzalo Checa as

President of its fast growing Food Safety Division, reporting to Chief Operating Officer Rich Ennis. In this newly created position, Mr. Checa will be responsible for managing the day-to-day operations, developing new service offerings and growing the Steritech brand.

A seasoned business leader, Mr. Checa spent seven years in the business-to-business division of Kimberly-Clark in the US, most recently as marketing director for the company's Do-It-Yourself Business Group. He had previously worked as a brand manager for consumer products Procter and Gamble in his native Peru. In both companies, he oversaw strategy, marketing and had P&L accountability for products.

"Gonzalo brings a proven record of delivering strong operating results, as well as a wealth of experience in strategic thinking and marketing with some of the world's best known consumer brands," said Steritech's Chief Executive Officer Mark Jarvis. "For our clients, fully delivering on their brand promises, especially in the areas of expected quality such as health, safety and cleanliness is a business imperative. As division president, Gonzalo will be able to leverage his creativity and past work experience to develop meaningful solutions that address our clients' growing concerns around meeting safety and quality standards."

Reporting to Mr. Checa will be Chris Boyles, technical director of the Steritech Institute; Lorri MacHarg, vice president of operations – retail and foodservice; Renee Raines, support services manager; Dr. Bob Strong, vice president quality management systems; and Jim

Wagner, director of operations – supply chain.

Mr. Checa earned a bachelor's degree in business administration from Universidad del Pacifico in Lima, Peru in 1995 and a master's degree in business administration from Harvard Business School in Boston, MA in 2001.

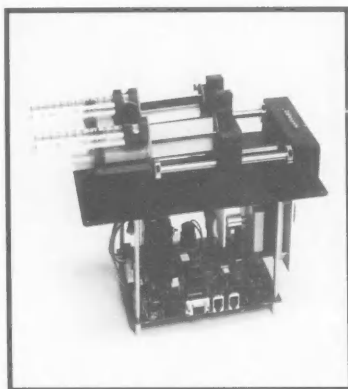
Mr. Checa will be based at the company's corporate headquarters in Charlotte, NC.

Microbia, Inc. Names Alex Chu as Vice President of Process Development

Microbia, Inc. (formerly Microbia Precision Engineering) has appointed Alex Chu as vice president of process development. Dr. Chu's responsibilities will include directing all process development activities from laboratories to commercial manufacturing, including the launch of Microbia's pipeline of naturally derived carotenoids for the human and animal food ingredient and nutritional supplement markets.

Alex Chu brings diverse experience in bioprocess development and manufacturing to Microbia. He was most recently the vice president of manufacturing and process development at Adnexus Therapeutics, Bristol-Myers Squibb. Prior to this, he held multiple scientific and management positions at Abbot Laboratories and Abbott BioResearch Center, including director of manufacturing program management and director, process development, Pharma. Alex earned a bachelor's degree in chemical engineering from National Taiwan University and a Ph.D. in biochemical engineering from the University of Wisconsin-Madison.

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Fungal Toxin Mystery Solved Using Biolog's Phenotype MicroArray™ Technology

An important breakthrough in fungal toxin biology has been made possible through the use of Biolog's Phenotype MicroArray technology.

The fungus *Fusarium graminearum* is a major pathogen of wheat. It is the causative agent of head blight and results in substantial worldwide crop losses. Central to the infection process, the fungus produces a trichothecene toxin called deoxynivalenol. Although the toxin is produced at high levels during wheat infection, researchers have never been able to induce *Fusarium* to produce significant levels under laboratory culture conditions. This inability has hampered study of head blight disease and approaches to disease prevention.

Now, this decades-old mystery has been solved. The CSIRO researchers used Biolog Phenotype MicroArray plates to culture the fungus simultaneously in hundreds of different micro-scale culture conditions. The set of culture conditions is designed to contain a diverse range of nutritional and stress conditions that a microbial cell might encounter. To facilitate detection, the CSIRO researchers constructed a special strain of the fungus, placing the green fluorescent protein under the genetic control region for the first step in the toxin synthesis pathway. If any culture condition induced synthesis of the toxin gene, the cells in that micro-well would exhibit green

fluorescence. In a single experiment, they quickly screened hundreds of conditions and determined that key factors for turning on toxin synthesis are the presence of specific nitrogen compounds (arginine, agmatine, putrescine) as well as low extracellular pH.

Even more generally, this work demonstrates the feasibility of using Biolog Phenotype MicroArray technology to study the induction of any microbially produced toxin or secondary metabolite. Toxins, and other secondary metabolites such as bacteriocins and other antibiotic compounds are typically produced under some special culture conditions that are difficult to determine. Biolog's technology can provide breakthrough discovery in a single experiment. The utility is further demonstrated in a commercial application in a recent publication from Wyeth Research (Maya Singh, *Journal of Microbiological Methods* 77:102) who found culture conditions for high levels of antibacterial chemical production by fungi. Data from Phenotype MicroArray experiments have also contributed to the realization that intracellular hexose phosphates are chemical signals that turn on production of the toxin listeriolysin O during human infections by the bacterium *Listeria monocytogenes* (Barry Bochner, *FEMS Microbiology Reviews* 33:191).

Phenotype MicroArray technology, developed with SBIR funding from NIH, is more and more proving to be an important breakthrough technology. It allows scientists to study the growth properties and

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culture condition responses of bacterial cells, fungal cells, and even human cells. As such it is becoming a core technology for cell assay and many other cellular studies.

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DuPont Sustainable Packaging Expanding to Multiple Market Segments

A diverse group of businesses in multiple market segments are turning to sustainable packaging solutions to improve the environmental profile of their product offerings, according to DuPont as the company announced the winners of the 21st DuPont Awards for Packaging Innovation at the industry's first online interactive exchange on sustainable packaging. Winners include well-known brands such as Estee Lauder, Procter & Gamble, Unilever and ConAgra for food, pharmaceutical, personal care and other packaging segments.

DuPont Vice President and General Manager William F. Weber announced 10 winners and 8 notable achievements for breakthroughs in improving sustainability of packaged goods. This year's winners span many market segments and focus on source reduction, which yields both cost and sustainability benefits. "Sustainable packaging is a growing and important focus area for DuPont and demand continues to grow across multiple sectors despite the economy. At DuPont, we work with consumer goods companies to minimize packaging content

and improve environmental performance, as well as to be more cost effective. This year's award submissions also demonstrated a focus on source reduction, which provides the double benefit of an improved product environmental profile and cost reduction," said William Weber.

During the event, members of the program's independent jury panel provided their perspectives on the achievements of 10 winners from a diverse cross-section of food, pharmaceutical, cosmetics and other packaging segments. Julian Carroll, managing director of the European Organization for Packaging and the Environment (EUROPEN), led an interactive session on issues arising from lack of consensus on standards for reporting sustainability of packaging. Ronald Cotterman, executive director of sustainability for Sealed Air Corporation, led a session on future post-use solutions for packaging after it has fulfilled its primary purpose of protecting food and other products.

"To reduce the event's environmental footprint, DuPont is using web-based technology for the award ceremonies and related activities taking place at the DuPont Sustainable Packaging Exchange. This enables the entire industry to learn from winners of this year's DuPont Awards, which focuses on breakthroughs in sustainable packaging and to interact with industry experts. This is aligned with DuPont's commitment to help reduce the environmental footprint of the value chains where we participate," added Weber.

The DuPont Awards for Packaging Innovation is the industry's

longest running, independently judged global awards program honoring packaging materials, technology and service innovations. The program has a special emphasis on recognizing innovations that demonstrate sustainable packaging breakthroughs. This year's panel was facilitated by Anne Johnson, director of the Sustainable Packaging Coalition. Over 120 entries were received from around the world.

DuPont Qualicon
1.302.695.9400
Wilmington, DE
www2.dupont.com

Symbiosis Announces ProtoCOL at Major Food Technology Center

Symbiosis, a manufacturer of automated microbiological systems has announced its ProtoCOL automated colony counter is being used for training and research at a food technology center, the College of Agriculture, Food and Rural Enterprise, (CAFRE) in Northern Ireland, UK to accurately count different bacteria isolated from many food types.

Microbiologists and food hygiene students at CAFRE's Loughry Campus are using the ProtoCOL to automatically perform total cell counts of many bacterial species spiral plated on Plate Count Agar. The ProtoCOL is also being applied to counting red *E. coli* colonies on a background of blue coliforms plated on selective Coli ID plates, making it quick and easy to detect potentially hazardous levels of *E. coli*.

Edmund Slaine, a scientific officer at CAFRE commented, "We have used a ProtoCOL system for

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over four years, both for education and research purposes. It is an excellent instrument for students because they can easily obtain accurate results from complex counts of different colored colonies on the same plate with minimal training."

"We also use the ProtoCOL to help with product innovation. By counting bacteria isolated from shellfish, sausages and beef burgers, we can rapidly provide feedback to the food industry on how to improve food safety," continued Slaine.

Martin Smith of Synbiosis concluded, "The amount of analysis and training in which the ProtoCOL is used at CAFRE by novice and experienced scientists alike is a great endorsement of this product's performance and robustness. The continued use of the system at such a major food technology facility to precisely count many colony types isolated from different foods shows ProtoCOL is a versatile, essential tool that will save valuable time in any food microbiology laboratory."

Synbiosis
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Frederick, MD
www.synbiosis.com

Mettler-Toledo Hi-Speed Showcased CM9400 Canweigh™ Checkweigher

Mettler-Toledo Hi-Speed showcased its CM9400 Canweigh™ checkweigher, ideal for round containers such as cans. The system delivers accurate weighing of high volume food production lines in excess of 800 ppm and its compact washdown construction minimizes



Mettler-Toledo

space requirements offering a low overall cost of operation.

Mettler-Toledo Hi-Speed patented seam-to-seam technology eliminates timing screws that can cause line jams delivering maximum uptime. The multi-diameter design allows processing of both large and small diameter cans with minimal changeover time and effort. Integral side transfers enable the CM9400 to run in parallel to existing production lines for fast, flexible, and cost-effective installations.

The CM9400 Canweigh™ incorporates a large 15" dashboard style washdown touch screen controller which makes line monitoring, product set-up, and changeover error-free and fast. Comprehensive Fieldbus, OPC, Ethernet interfaces enable transfer of valuable data to information networks and real time machine status to SCADA and other factory floor automations systems for seamless process integration.

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tions, product testing, customer service and training in the industry.

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Introducing VIP Gold™, the Latest Advancement in Lateral Flow Technology

BioControl Systems, Inc., has announced the introduction of their new VIP Gold™ pathogen detection kits. VIP Gold represents the latest achievement in lateral flow technology. It merges advanced particle design and highly specific antibodies in a new innovative multi-test format. The result is a simple, easy-to-use system providing rapid and accurate detection of food-borne pathogens.

"The superior particle technology allows for both faster sample flow and more distinct line formation producing a clean background with crisp, clear lines and easy-to-read results," states Anita Kressner, vice president of sales and marketing, BioControl. "Additionally, the configuration of the tests can significantly improve lab efficiencies. The multi-test format with break-away devices reduces the set up time and handling required with other lateral flow devices. VIP Gold is a versatile detection system ideal for both low and high volume test days," says Kressner. VIP Gold is available for *Listeria*, *Salmonella*, and *E. coli* O157:H7.

BioControl Systems, Inc.
425.603.1123
Bellevue, WA
www.biocontrols.com

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INDUSTRY PRODUCTS

Active Packaging Solutions from Multisorb Technologies Helps Keep Natural Foods Natural and Fresher for Longer

With more consumers choosing to eat at home, retail shelves are the stage for fierce competition. Keeping in mind the importance of freshness and flavor in consumer attitudes towards food, national and private label brand owners are challenged to consistently deliver and sustain products that reflect high quality in form as well as flavor. Many are finding new ways to keep their products not only fresh but also fresh-looking as a means of differentiating their brands.

To help meet these growing industry needs, Multisorb Technologies offers its extensive active packaging technologies and value-added packaging programs for preserving the

wholesomeness and appeal, while extending shelf life of packaged food products

To extend the saleable life of fresh meat at retail, Multisorb will spotlight its industry leading MAPLOXSM program during IFT. This low-oxygen case-ready packaging program maintains the fresh flavor and wholesome appearance of packaged meats during distribution to assure that when individual packages are removed from the master bag at retail, the meat has full display life, and reflects the quality of the brand under which it is sold.

Multisorb will also highlight its solutions that enable manufacturers of natural and organic foods to meet "clean label" requirements. By preventing oxidation and moisture-mediated degradation, Multisorb's suite of active packaging technologies helps streamline the ingredient profiles while maintaining shelf life,

preventing spoilage and preserving color, taste, aroma, mouth feel and flavor.

New technologies from Multisorb make it possible for packaging materials to both absorb oxygen and block ingress. Structures are specifically designed to meet product needs and may be utilized in molded, thermoformed, or film applications.

FreshBlend's unique attributes also address environmental concerns by providing a monolayer barrier to replace a multilayer structure, making the packaging more economical and easier to recycle. Furthermore, it can potentially permit the use of thinner gauge materials, replace expensive passive barrier materials, and reduce the carbon footprint of the package.

Multisorb Technologies

716.824.8900

Buffalo, NY

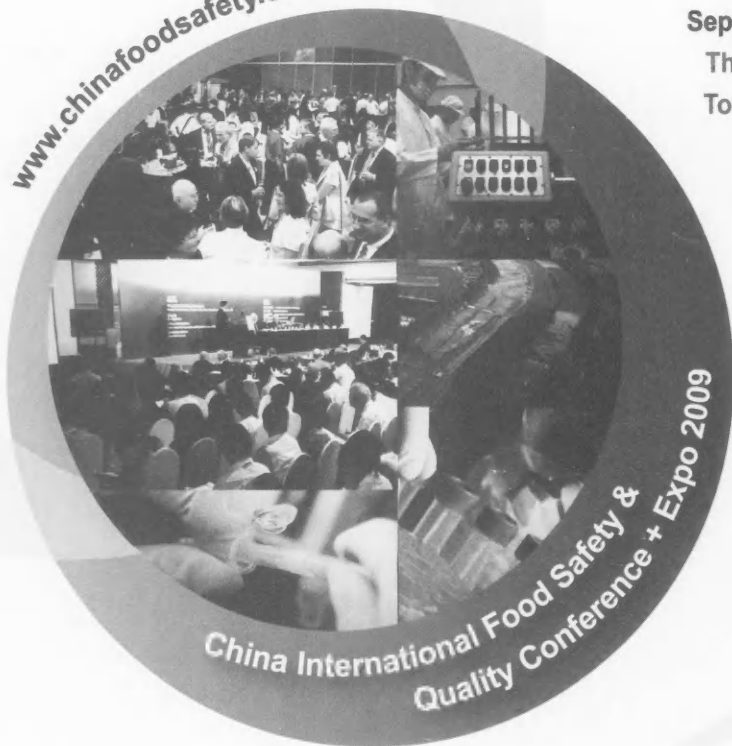
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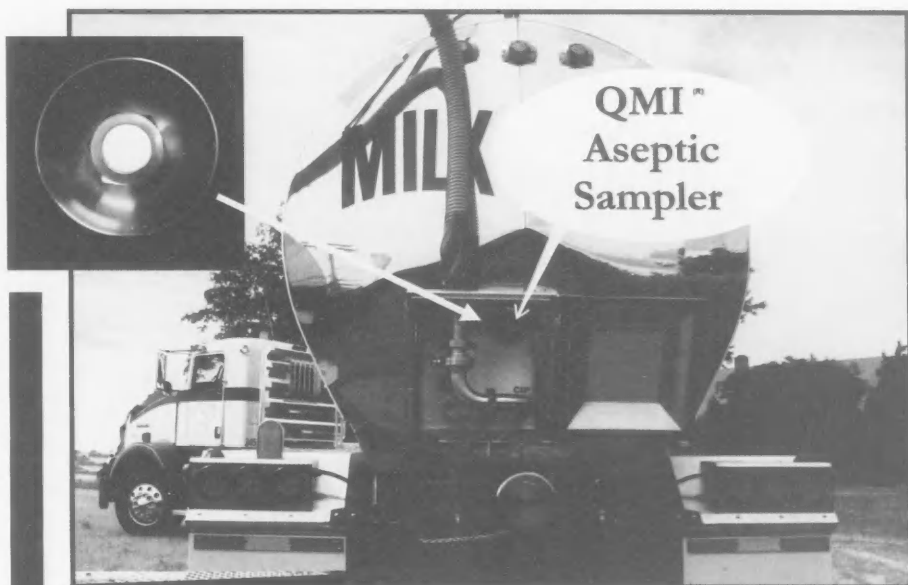


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COMING EVENTS

SEPTEMBER

- **8-9, Implementing SQF 2000 Systems Training Course**, Eagan, MN. For more information, contact foodsafety@ecolab.com.
 - **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 or go to www.6icpmf.org.
 - **13-16, 123rd AOAC Annual Meeting**, Philadelphia, PA. For more information, go to 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.aaccnet.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/.
 - **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.
 - **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.
 - **16-17, Implementing SQF 2000 Systems Training Course**, Eagan, MN. For more information, contact Tatiana Lorca at tatiana.lorca@ecolab.com.
 - **20-24, IDF World Dairy Summit-United Dairy World 2009**, Maritim Hotel Berlin, Berlin, Germany. For more information, go to 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.
 - **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.
 - **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.
 - **23-24, China International Food Safety and Quality Conference and Expo**, Landmark Hotel and Towers, Beijing, China. For more information, go to www.chinafoodsafety.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.
- ## 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.
 - **5-7, Process Expo 2009**, Las Vegas Convention Center, Las Vegas, NV. For more information, go to 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.
 - **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.
 - **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.
 - **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/.
 - **12-13, Advanced HACCP Training Course**, Greensboro, NC. For more information, contact Tatiana Lorca at tatiana.lorca@ecolab.com.
 - **13, Good Food Manufacturing Practices**, New Brunswick, NJ. For more information, contact Jenna Kimock at ocpe@njaes.rutgers.edu.
 - **13-16, 2009 ASTHO Annual Meeting**, Vienna (Tysons Corner), VA. For more information, go to www.astho.org.
 - **14-15, Implementing SQF 2000 Systems Training Course**, Greensboro, NC. For more information, contact Tatiana Lorca at tatiana.lorca@ecolab.com.
 - **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/.
 - **21-22, British Columbia Food Protection Association 10th Anniversary Fall Technical Session and Conference**, Delta Vancouver Airport Hotel, Richmond, BC. For more information, contact Terry Peters at 604.666.1080; E-mail: terry_peters@telus.net.

COMING EVENTS

- **26-29, North Dakota Environmental Health Association Annual Conference**, Doublewood Inn, Fargo, ND. For more information, go to www.ndeha.org.
- **28-31, Worldwide Food Expo**, McCormick Place, Chicago, IL. For more information, go to 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.
- **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 or go to inocuidad.cucei.udg.mx.
- **7-11, 137th APHA Annual Meeting and Exposition**, Philadelphia, PA. For more information, go to www.apha.org/meetings.
- **9-10, Advanced HACCP Training Course**, Ecolab Inc., Eagan, MN. For more information, contact Tatiana Lorca at tatiana.lorca@ecolab.com.
- **9-11, 3rd Halal Expo**, Dubai, U.A.E. For more information, go to 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.
- **11-12, Implementing SQF 2000 Systems Training Course**, Ecolab Inc., Eagan, MN. For more information, contact foodsafety@ecolab.com.
- **11-13, 2009 EFFoST Annual Conference**, Budapest Hungary. For more information, go to www.effostconference.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.
- **18-20, HACCP: A Basic Concept for Food Protection**, New Brunswick, NJ. For more information, contact Jenna Kimock at ocpe@njaes.rutgers.edu.

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- **7-10, Pasteurization Workshop**, Murfreesboro, TN. For more information, call 205.595.6455; E-mail: kristy.clark@raiconsult.com.
- **14-15, Advanced HACCP Training Course**, Ecolab Inc., Eagan, MN. For more information, contact Tatiana Lorca at tatiana.lorca@ecolab.com.
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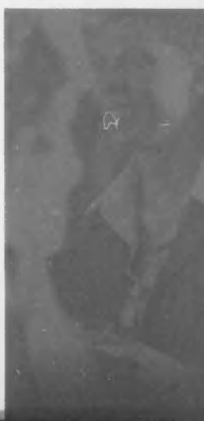
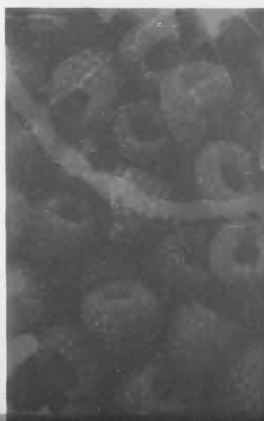


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