

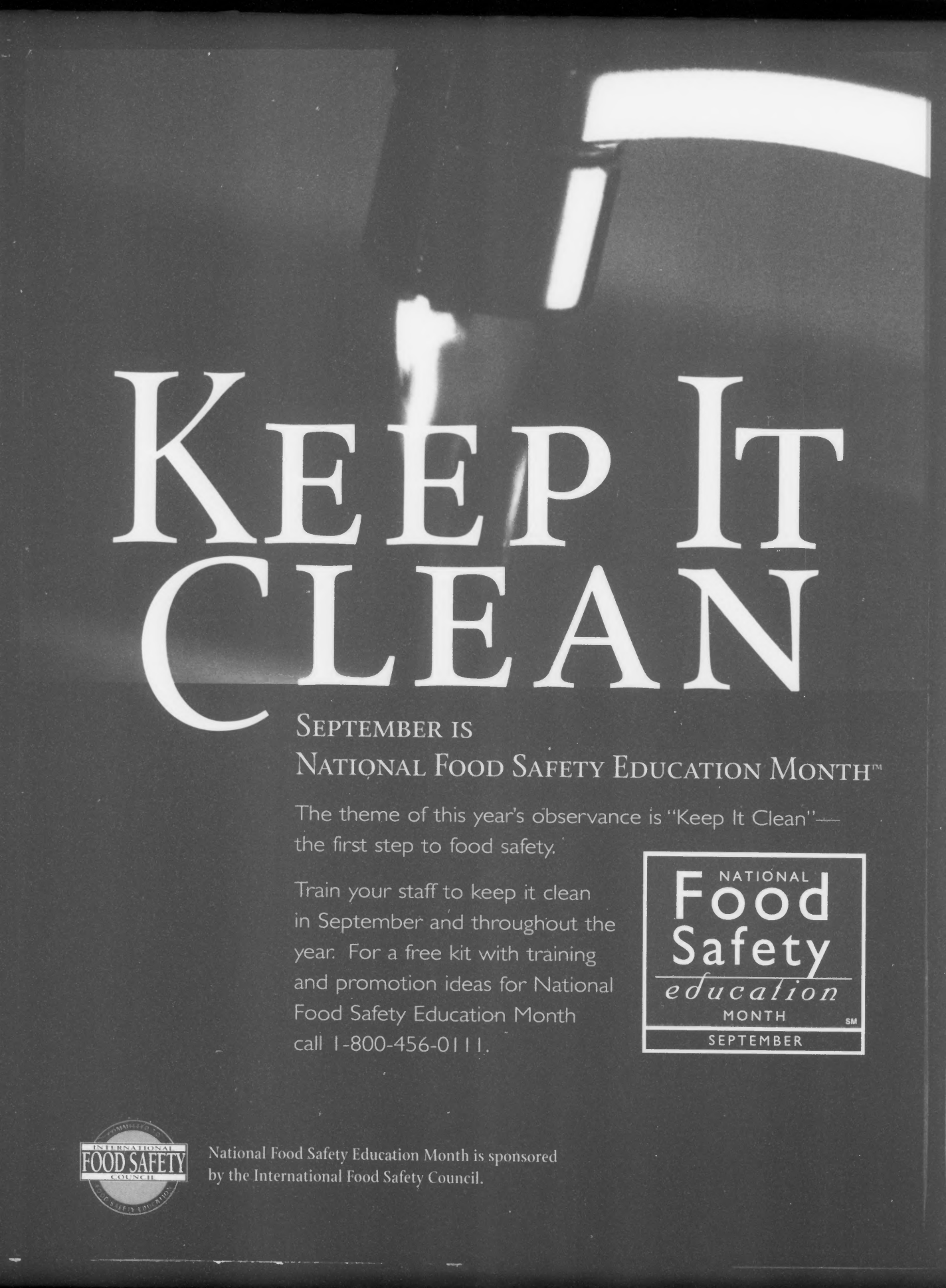
DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC. SEPTEMBER 1998



- Call for 1999 Abstracts and Awards
- IAMFES Lending Library

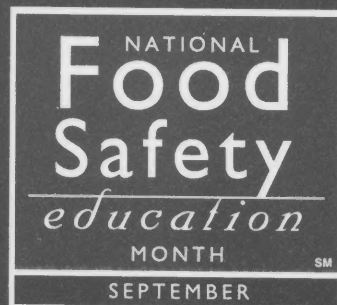


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The Foundation Fund is supported by membership of IAMFES sustaining members and from individual members. Sustaining members are corporations, companies and individuals whose business interests reflect the goals and mission of IAMFES. Funds in the Foundation are kept separate from the operating funds of IAMFES and are used for worthy causes which enrich the Association.

What does the Foundation Fund support?

Revenue from the Foundation Fund currently supports the IAMFES:

- Ivan Parkin Lecture
- Audio-Visual Lending Library
- Co-sponsorship of the Crumbine Award
- Developing Scientist Oral and Poster Competition
- Shipment of volumes of surplus *JFP* and *DFES* journals to developing countries through FAO in Rome
- Recruitment of exceptional speakers for IAMFES Annual Meetings

Why should I contribute to the IAMFES Foundation Fund?

Any contribution, no matter how large or small will help build a secure Foundation for the future of IAMFES. The future of IAMFES depends on how well we can meet the needs of our membership in providing educational programs, journals, products, and services, and on how well IAMFES fulfills its mission. The Foundation Fund was created to provide a long-lasting legacy of information and service for protecting the milk, food, water, and environment throughout the world.

ABOUT THE COVER...

FIGHT BAC!™ courtesy of the Partnership for Food Safety Education.

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EDITOR'S NOTE

In the July 1998 issue of *Dairy, Food and Environmental Sanitation* on page 441, Table 1 was omitted from the article. We have printed Table 1 on page 579 of this issue. We apologize to the author for this error.

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ILSI North America Conference on the National Food Safety Initiative: Implications for Microbial Data Collection, Analysis, and Application

October 14-16, 1998

Doubletree Hotel National Airport
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This conference will convene scientists from government, industry, academia, and the public health community to critically examine the relevance and role of microbial data in implementing the National Food Safety Initiative. Objectives of the conference are to assess the magnitude of the public health problem; examine current practice and experience in microbial data collection, analysis, and application; explore the links among food microbiology data, epidemiology, human health, and microbial risk assessment; discuss the role of microbial testing in HACCP validation and verification; identify key issues in the development of new food microbial testing strategies; and develop an agenda for future research and development.

This conference is organized by the International Life Sciences Institute North America (ILSI N.A.) and the ILSI N.A. Technical Committee on Food Microbiology, in collaboration with the Centers for Disease Control and Prevention, Food and Drug Administration, International Association of Milk, Food and Environmental Sanitarians (IAMFES), National Institutes of Health, U.S. Department of Agriculture, and others concerned with microbial food safety.

The meeting will be of interest to Food Protection and Public Health Professionals, including Microbiologists, Epidemiologists, Physicians, and Health Policy Makers; and Researchers from academia, government, and industry.

To receive program and registration information, contact: ILSI NFSI (National Food Safety Initiative) Microbial Data Conference, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2863; Phone: 800.369.6337; 515.276.3344; Fax: 515.276.8655; E-mail: nfsi@iamfes.org.

Program and registration information is available on the ILSI Web site: www.ilsi.org/conference.html#6.

Questions concerning the conference should be directed to Ms. Catherine Nnoka, at 202.659.0074; Fax: 202.659.3859; E-mail: cnnoka@ilsi.org.

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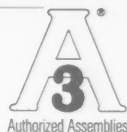
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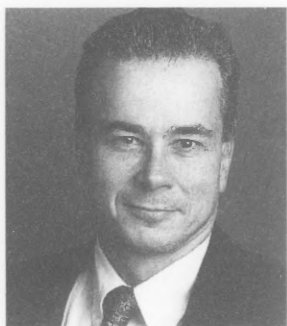
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IAMFES President

“As we continue to grow”

As I write this column, the IAMFES 85th Annual Meeting in Nashville is less than two weeks away and already the meeting is shaping up to be a success. I'm confident that by the time you read this, the meeting will have gone down in history as a huge success. The attendance at last year's meeting in Orlando for the first time in IAMFES history exceeded 1,000. However, attendance for this year's meeting will likely be even better! At last count, pre-registrations alone for this year's meeting have already exceeded the total attendance of last year's meeting and we typically see 100 or so on-site registrations. It is

apparent from the past few meetings that both attendance as well as volunteered presentations continue to grow each year. Growth is only one of many positive changes that have been happening to the organization. However, growth is the one aspect of IAMFES on which I will focus in this column.

For some, the growth in the Annual IAMFES Meeting over the past few years has been troubling. Some long-time members have confided in me that they miss the smaller, more intimate meetings that characterized IAMFES not too many years ago. Indeed, there were some advantages to smaller meetings and a smaller membership; we were able to meet in smaller, more modestly priced hotels in less populous cities, and we pretty much knew everybody in attendance. However, these same members that long for the smaller meetings also acknowledge that the reason why more food safety professionals choose to attend our Annual Meeting is that IAMFES is doing something right!

IAMFES has been addressing important food safety issues unlike many other scientific associations. For example, our alliance with the International Life Sciences Institute (ILSI) has enabled us to enlist the participation at our meetings of some of the top food safety researchers in the world. Having these individuals at our meetings provides a “critical mass” of food safety professionals that enables more open discussion, sharing of ideas, and transfer of basic or theoretical research into real-life applications. These same scientists also often publish their results in *Journal of Food Protection*. These cutting-edge papers further en-

hance the stature and importance of IAMFES as the leading professional organization dedicated to food protection. Of course, the participation of ILSI is just one example of how IAMFES is doing things right. The activities of our professional development groups, committees, and IAMFES staff likewise have worked together to meet important food safety needs.

Regardless of our past successes, we cannot become complacent and content with our present position, because despite the growing success of our Annual Meeting, our membership has remained relatively stagnant for the past few decades. This situation is not good and must be changed. In fact, significant future growth of the organization, not just the Annual Meeting, will be critical to the success and stability of IAMFES. Why? The first reason is financial. The per member cost for running IAMFES has risen dramatically in recent years and shows no indication of leveling off in the near future (the specifics of our financial obligations will be discussed in an upcoming column). The simplest way to meet these rising costs is to continue to raise membership dues and registration fees accordingly. For obvious reasons, this is not a good solution and your Executive Board has gone to great lengths to avoid such increases. What is less apparent, however, is that the per member cost for running an organization decreases with increasing numbers of members. Consequently, each new member actually represents a reduced need for dues and registration increases. We need growth if we are to have the financial resources to maintain current levels of service and

provide new services as technology changes.

A second reason why growth is important to IAMFES is intellectual. Scientific and professional organizations such as IAMFES are only as strong as their membership. The membership is not only a financial resource to the organization, but a source of intellectual contribution. New members bring with them fresh ideas, creative solutions to difficult problems, vision for future excellence, and a pool of future leaders! New members keep an organization from becoming a "good 'ol boys' (or girls') club" where new ideas are lacking, perspectives are one-sided, and leadership is stagnant.

So, growth is not only a good idea for IAMFES, it is a requirement. Consequently, the Executive Board has made increasing membership a major priority. The need for growth is not unique to IAMFES, of course. Other organizations have likewise come to this realization and are also facing the challenge of attracting new members. The question is, however, how is this accomplished? The IAMFES

Executive Board and the IAMFES staff have spent countless hours wrestling with this question and have adopted the following strategy.

Although IAMFES is an international organization, our membership has until recently been comprised primarily of individuals located in North America. However, the rest of the world represents a virtually untapped source of potential new members. Consequently, IAMFES will place increased emphasis on attracting and involving more members from countries outside of North America. As the food industry becomes more global, the need for food safety information will likewise increase. Food safety professionals in other countries will need a reliable and credible forum for this information. IAMFES can be that forum.

IAMFES will also continue to form alliances and collaborative associations with other professional organizations concerned with food protection. Members in these other organizations are often either unfamiliar or poorly informed as to the value and benefits of IAMFES

membership. Once exposed to IAMFES, members of these other organizations become more familiar with the organization, and are more likely to join.

Finally, IAMFES is investigating new ways to better serve existing members. How does that help attract new members? Happy and satisfied members are one of the best and least expensive ways to sell the organization. I've found that the personal, one-on-one approach is still the best way to bring in new members into an organization. If our current members are convinced of the value of IAMFES membership, they will convey that message to others as well.

As IAMFES grows, it will undoubtedly require some adjustments in both attitude and procedures. However, it will be worth it! It is my personal vision to see IAMFES become firmly established as THE food protection organization, worldwide. That vision is attainable. However, it will require new people, new resources, and new ways of thinking. It will require growth.



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COMMENTARY

FROM THE EXECUTIVE DIRECTOR



By DAVID W. THARP
IAMFES Executive Director

“Please join me in welcoming Jim Dickson to the Executive Board”

As you know, Jim Dickson from Iowa State University was elected to the position of Secretary for the 1998-1999 year and will take office at the conclusion of this year's Annual Meeting in Nashville. By the time you read this column, the IAMFES 85th Annual Meeting will have concluded and Jim will be the IAMFES Secretary. This begins a five-year commitment to IAMFES on Jim's part. He will make decisions that shape the direction of the Association over the next five years and will last many years into the future. What an exciting opportunity! What a responsibility!

This commitment to IAMFES is not new for Jim, it is just expanded. Jim has been actively involved with IAMFES by serving on Committees and Professional Development Groups. He has convened sessions and given presentations at IAMFES Annual Meetings, so as I said, Jim has

always been committed to IAMFES. But now, he will learn the inner workings of the Association. He will come to know the hows and the whys; the work of so many people that must be coordinated to achieve common goals. It is truly fascinating to watch as new projects develop into a finished product and now Jim will come to know these processes first hand.

Each year after the Secretary election is completed, the newly elected Officer comes to the IAMFES office for orientation. Jim's orientation took place about two weeks prior to the Annual Meeting. It was a stressful time in our office, but gave a good picture of how everyone must work together in preparation for the Meeting.

Such an orientation allows interaction between our staff and the Incoming Secretary. IAMFES staff has the opportunity to learn about the IAMFES Member who will grow into the position of President in a little over three years. Of course the main purpose is to allow our new Secretary to learn all that he or she can about IAMFES operations. Much of the time is spent with our staff, reviewing information and processes.

Jim's orientation began by reviewing the role of our staff, the role of the Executive Board, and the role of our Committees, Professional Development Groups and our Task Forces. We discussed specific duties of the Secretary along with all Executive Board positions. We took time to review the Constitution and Bylaws, the policies and procedures, and the long-range plan for IAMFES. This will form a base of information that will help Jim to make informed decisions during his years on the Executive Board.

During the day, Jim visited with each staff member individually to learn in detail the function of each

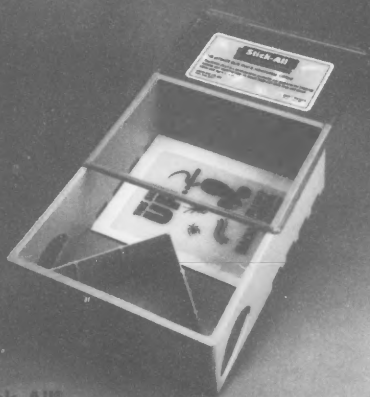
position. He learned about processes we go through from the beginning of our Journals right through a completed issue. We also reviewed each of our periodic publications such as the Membership Directory and the Annual Meeting Program and Abstract Book. Discussion took place about our recent improvements in Member services and Jim learned what is involved in registering for the Annual Meeting – it sounds simple, but there are many details that must be taken care of!

Time was devoted to discussing relationships that IAMFES has with so many organizations such as the 3-A Sanitary Standards, International Life Sciences Institute, International Association of Food Industry Suppliers, our Affiliate Associations, and others. We talked about the months and years of planning that is invested in our Annual Meetings. These types of meetings don't just happen; they take lots of planning and work from our Members, our Board, and our staff.

Ample time was invested in reviewing and learning about the financial statements and the financial position of the Association. Jim learned about the workings of the IAMFES Foundation as well. All of this was covered in one day. One busy day!

I hope this gives you some appreciation for what your colleagues encounter when they are elected to serve you on the Executive Board. Sure it is a visible position and one that carries respect, but each current and past Officer of IAMFES made a decision some time ago to give up personal time to benefit the Association. For that we can all be grateful. Please join me in welcoming Jim Dickson to the Executive Board of IAMFES!

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Reader Service No. 102

Updated Guidelines for Use of Time and Temperature Specifications for Holding and Storing Food in Retail Food Operations

O. Peter Snyder

SUMMARY

The analysis described in this report shows the application of the Ratkowsky et al. equation for predicting growth throughout the entire biokinetic temperature range. Use of this equation allows the calculation of a full set of conservative, safe temperatures and times for holding food that are equivalent to 5°C (41°F) for 7 days and 7°C (45°F) for 4 days, as currently recommended by the FDA 1997 Food Code.

By using these data, a HACCP safe process analysis can be conducted, whereby the amount of growth at each step in a process can be calculated. Use of these data allows the application of HACCP to assess and control the hazard of pathogenic bacterial growth during actual temperature fluctuation in refrigeration systems used by retail food operations.

INTRODUCTION

In a previous report (1), the author compared growth rates obtained from research on various pathogenic bacteria and aerobic spoilage bacteria in food, using the Ratkowsky et al. (9) square root equation model for the probable growth

of bacteria. The analysis was used to develop specific time-temperature standards for safe holding and/or storing of "potentially hazardous" food, in light of FDA 1993 Food Code recommendations (2). Fig. 1 is a graphical summary of this comparison.

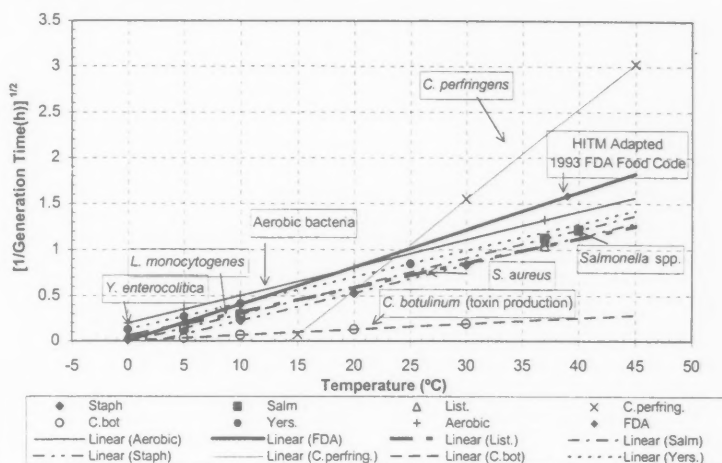
The line representing FDA bacterial growth in food, "HITM-Adapted

1993 FDA Food Code," was based on the following guidelines from the 1993 FDA Food Code (2), which did not change in the 1995 FDA Food Code (3):

- Recommendation for maintaining potentially hazardous food at 60°C (140°F) or above, or at 5°C (41°F) or below [§3-501.16].
- Allowance of a 10-day time period for holding refrigerated, ready-to-eat, potentially hazardous food safely at or below 5°C (41°F) [§3-501.18 (A)].
- Recommendation that potentially hazardous food be served or discarded within 4 hours from the time the food is removed from temperature control and held between 5°C (41°F) and 60°C (140°F) [§3-501.19 (B)].

The last recommendation does not truly represent how pathogenic bacteria grow in food. It is well established that pathogens known to be responsible for foodborne illness disease begin to multiply at -1.5°C (29.3°F) (5) and stop multiplying at about 53.1°C (127.5°F) (10). When the regression model was anchored

Figure 1. Summary of generation times (growth rate data) of pathogenic bacteria in a variety of foods compared to 1993 FDA food code holding/storage recommendations



at 5°C (41°F) for 10 days, with zero growth at 0°C (32°F), and the 4 hours was placed at 38.9°C (102°F), a reasonable set of generation times for pathogens at designated temperatures was developed, as shown by the regression line for "HITM-Adapted 1993 FDA Food Code." [Review the 1996 paper (11) for more details.]

The recommendations for holding ready-to-eat, potentially hazardous food at cold temperatures were changed in the 1997 FDA Food Code Recommendations (4). The reason for this change was probably that the FDA recognized that National Sanitation Foundation (NSF) reach-in refrigeration capacity standards have not changed in many years, nor is any change planned. Refrigeration capacity standards are based on a 4-hour test of a new refrigerator at the factory. During the test, the refrigerator is empty and the door is never opened. However, this is not a valid operations test. In actual operations, during peak periods when doors are opened many times, refrigerators and coolers often "warm up" to 7.2°C (45°F) or above, because there is no capacity to keep food cold when the door is open. If restaurants, food production areas, and other retail food preparation areas are to comply with holding food at or below 5°C (41°F) 100% of the time even if doors are opened frequently, governmental

agencies must allow time for the development of new refrigerators with much larger refrigeration capacities. Additional time must also be allowed for subsequent purchase of these new refrigeration systems to replace refrigeration systems with present cold-holding capacities. The alternative to expensive replacement of refrigerators is to allow holding temperatures above 5°C (41°F). This can be accomplished by controlling multiplications of bacteria during a food handling process to the equivalent multiplication at specified temperatures such as 5°C (41°F) for 10 days or 4 hours at 38.9°C (102°F).

FDA 1997 FOOD CODE COLD FOOD HOLDING GUIDELINES

The 1997 FDA Food Code (4) changed cold food holding recommendations. It states that a ready-to-eat food shall be discarded if not consumed within 7 calendar days from the date of preparation if the food is maintained at 5°C (41°F) or less, or within 4 calendar days from the date of preparation if the food is maintained at 7°C (45°F) or less. Between 7°C (45°F) and 60°C (140°F), food can be out of temperature control for 4 hours if it is discarded at the end of that time. (This is unchanged from the 1993, 1995 Food Codes.)

Revised prediction — adjusting calculations to the 1997 cold food holding guidelines

When the 1996 paper (11) was written, bacterial growth above 38.9°C (102°F) was not calculated because of insufficient published growth data. Since 1996, the author has been working with Dr. V. K. Juneja of the USDA Eastern Regional Research Center, on the growth of *Clostridium perfringens* and *Clostridium botulinum* in food. A more advanced Ratkowsky equation (8) was used to analyze the growth of these pathogenic bacteria over the entire temperature range (unpublished data). This same equation was then applied to the 1996 data to predict bacterial growth over the full growth temperature range of -1.5°C (29.3°F) to 52.9°C (127°F), incorporating the FDA 1997 cold-holding recommendations for ready-to-eat food.

The general form of the Ratkowsky equation (7) for prediction of growth rate (*r*) [which is the same as 1/g, where g is hours per multiplication] over the entire kinetic growth range is:

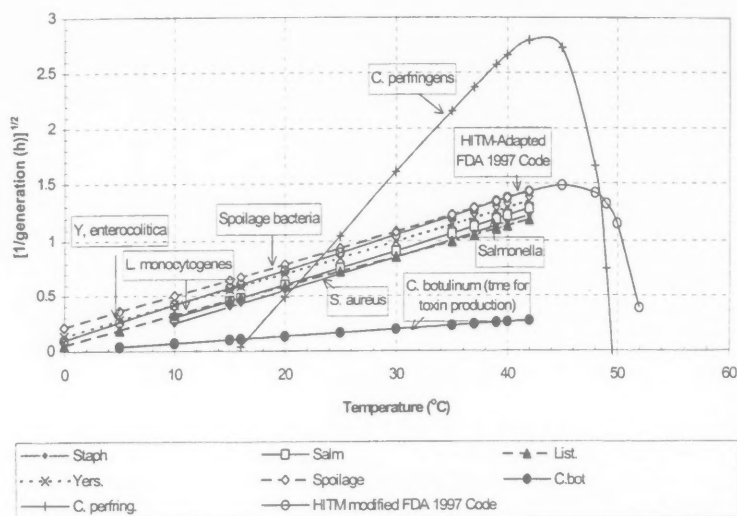
$$\sqrt{r} = b(T - T_{\min}) (1 - \exp(c(T - T_{\max})))$$

While the basic formula calls for the use of temperature in degrees Kelvin, degrees Celsius can be used, because a difference is being calculated, and data are normally in degrees Celsius. T_{\min} and T_{\max} are the minimum and maximum temperatures, respectively, at which the rate of growth is zero. The parameter *b* is the regression coefficient of the square root of growth rate constant vs. degrees Kelvin/Celsius for temperatures below the optimal temperature, whereas *c* is an additional parameter that enables the model to fit the data for temperatures above the optimal temperature.

Figure 2 shows the predicted, HITM-adapted FDA 1997 Food Code time-temperature curve. A non-linear regression analysis utilizing Systat™ version 7.0 was used to predict values. The fitted formula for the regression line that incorporates the FDA temperature constraints is:

$$\sqrt{T/g} = 0.032 (\text{temp} - (-2.924)) (1 - \exp(0.444 (\text{temp} - 52.553)))$$

Figure 2. Summary of generation times (growth rate data of pathogenic bacterio in a variety of foods compared to 1997 FDA food code holding/storage recommendations)



A fitted formula was also calculated for *C. perfringens* and is as follows:

$$\sqrt{1/g} = 0.112 (\text{temp} - 15.674) (1 - \exp(0.386 (\text{temp} - 49.581)))$$

Figure 2 graphically represents the data for FDA 1997 Food Code holding, using the FDA time-temperature standards of 41°F (5°C) for 7 days and 45°F (7.2°C) for 4 days, and assigning 4 hours to a most rapid growing point of about 112°F (44.4°C). Regression lines generated from data gained from research reports on the growth of spoilage bacteria, *Yersinia enterocolitica*, *Listeria monocytogenes*, *Salmonella* spp., *Staphylococcus aureus*, and the time necessary for production of toxin by *C. botulinum* can be compared to the HITM-adapted FDA 1997 Food Code regression line. Some additional data were found on the growth of aerobic spoilage bacteria and were added to the data used in this analysis.

The control points for obtaining the formula were based on:

1. known growth of *L. monocytogenes* and *Y. enterocolitica* in the range of -1 to 1°C multiplication as cited in the 1996 analysis (10).

2. the 1997 FDA Food Code (4) recommendation of 7 days at 5°C (41°F).
3. the 1997 FDA Food Code (4) recommendation of 4 days at 7°C (45°F).
4. the allowance for 4 hours of uncontrolled temperature holding between 7°C (45°F) and 60°C (140°F). In this case, 44.4°C (112°F) was chosen, first, to fit the line and secondly, because *Salmonella* spp. has been reported to multiply about every 24 minutes slightly below this temperature (7). The calculated amount of time for 10 generations of salmonellae in this temperature range is 240 minutes or 4 hours, as is recommended by the FDA Food Code (4).

Note that the analysis is for one generation of growth. The FDA time-temperature points can be related to about 10 pathogen multiplications. At 5°C (41°F) and 7°C (45°F), the generation time falls between *L. monocytogenes* and *Y. enterocolitica*. At 44.9°C (112°F), it is *Salmonella* spp. Again, the regression line predicts a

slightly longer generation time for *Salmonella* spp., than the one research report (7) that reports salmonellae multiplying once every 24 minutes. To illustrate this premise, the prediction equation for the HITM-adapted FDA 1997 Food Code calculates a generation time of 15.55 hours (Table 1) at 5°C (41°F). The FDA allowance is for 7 days or 168 hours. Dividing 168 hours by 15.55 hours gives 10.8 generations of growth.

How does this prediction compare with other pathogens?

Table 1 shows the predicted values for the various pathogenic bacteria, compared with values from the HITM-adapted FDA 1997 Food Code recommendations.

At the top of each column is the mean corrected regression coefficient (R^2) for $\sqrt{1/g}$ for each set of data. Considering that the microbiological growth data have been extracted from a wide number of research reports over the past 20 years, the fit of the data is remarkably good. There is no calculation for the HITM-fitted FDA data points, because it is not necessary (the R^2 is 0.999).

DISCUSSION

The question is, then: "Can these HITM-predicted pathogen growth data be used as a reasonable set of multiplication rates for temperatures between -1.5°C (29.3°F) and 52.9°C (127.3°F)?" An analysis of the predicted pathogen multiplication rates shows that the prediction is quite functional.

1. Below 30°C (86°F), spoilage bacteria grow faster than pathogenic bacteria. This is logical, because we know that ready-to-eat food, even at 12.8°C (55°F), as is found in some iced salad bars and food market displays, invariably "spoils safe" and warns us by odor that it should not be eaten. The lower the temperature, the greater the "spoilage safety factor."

TABLE 1. Calculated rate of multiplication of various bacteria in food compared with HITM-adapted FDA 1997 Food Code recommendations (hours/generation)

Temp. °C	Temp. °F	Spoilage M.O.	<i>L. monocytogenes</i>	<i>Y. enterocolitica</i>	<i>S. aureus</i>	<i>Salmonella</i>	<i>C. bot.</i> (toxin production)	<i>C. perfringens</i>	HITM Adapted FDA 1997 Food Code
		R ² = 0.8514	R ² = 0.9135	R ² = 0.9430	R ² = 0.6048	R ² = 0.7584	R ² = 0.7645	R ² = 0.936	
0	32	22.72	403.22	61.81	NG	NG	NG	NG	114.22
2	35.6	13.94	92.81	29.22	NG	NG	NG	NG	40.28
4	39.2	9.42	40.16	16.96	NG	NG	1214.05	NG	20.37
5	41	7.94	29.28	13.55	NG	NG	816.33	NG	15.55
6	42.8	6.79	22.29	11.07	NG	34.24	586.27	NG	12.26
8	46.4	5.12	14.15	7.79	30.36	18.50	344.21	NG	8.18
10	50	4.00	9.78	5.77	16.98	11.56	226.13	NG	5.85
12	53.6	3.21	7.16	4.45	10.83	7.90	159.83	NG	4.38
14	57.2	2.64	5.46	3.54	7.50	5.74	118.92	NG	3.41
16	60.8	2.20	4.31	2.88	5.50	4.36	91.92	750.12	2.73
18	64.4	1.87	3.48	2.39	4.21	3.42	73.18	14.73	2.23
20	68	1.60	2.87	2.01	3.32	2.76	59.63	4.26	1.86
22	71.6	1.39	2.41	1.72	2.69	2.27	49.52	1.99	1.57
24	75.2	1.22	2.05	1.48	2.22	1.90	41.78	1.15	1.35
26	78.8	1.08	1.77	1.30	1.86	1.61	35.73	0.75	1.17
28	82.4	0.96	1.54	1.14	1.59	1.39	30.90	0.52	1.02
30	86	0.86	1.35	1.01	1.37	1.21	26.99	0.39	0.90
32	89.6	0.77	1.20	0.90	1.19	1.06	23.77	0.30	0.80
34	93.2	0.70	1.07	0.81	1.05	0.94	21.10	0.24	0.72
36	96.8	0.64	0.96	0.73	0.93	0.83	18.85	0.20	0.65
38	100.4	0.58	0.86	0.67	0.83	0.75	16.95	0.16	0.58
40	104	0.53	0.78	0.61	0.74	0.67	15.32	0.14	0.53
42	107.6	0.49	0.71	0.56	0.67	0.61	13.91	0.13	0.49
44	111.2	NG	NG	NG	NG	NG	NG	0.13	0.46
46	114.8	NG	NG	NG	NG	NG	NG	0.15	0.46
48	118.4	NG	NG	NG	NG	NG	NG	0.37	0.50
50	122	NG	NG	NG	NG	NG	NG	2.20	0.76
52	125.6	NG	NG	NG	NG	NG	NG	0.03	6.83

NG= No Growth

HITM = Hospitality Institute of Technology and Management

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EDITOR'S NOTE: This table was left out of manuscript 97-33 from the July issue of *Dairy, Food and Environmental Sanitation*.

TABLE 1. Precautions to decrease botulism risk

Wash all soil-contaminated produce before adding it to an oil infusion. Although washing will not sterilize the food, it will remove major contamination.

Add an acidifying agent such as lemon juice (citric acid) or vinegar (acetic acid) to the recipe at the rate of one tablespoon per cup of oil. Add it as the recipe is being prepared, not at a later date. Mix the acid and the oil by shaking vigorously and frequently.

Keep oil infusions refrigerated. Refrigeration will help retard the growth of most microbes (not just *C. botulinum*), although some strains of *C. botulinum* will grow at refrigerator temperatures.

Discard an oil that becomes cloudy, develops a foul odor, or has gas bubbles. However, don't be deceived by an oil that appears unspiced, as *C. botulinum* may grow and produce toxin without altering the appearance of the oil.

Discard infusions after one week, or sooner if any of the precautions have not been observed.

Spoilage of Acid Products by Butyric Acid Anaerobes — A Review

R. Dale Morton

SUMMARY

Butyric spoilage, or the spoilage of acid products by sporeforming anaerobes such as *Clostridium butyricum* and *Clostridium pasteurianum*, has been documented for over 50 years. Butyric spoilage is characterized by production of gas, a strong butyric acid odor, and increased acidity. As spoilage organisms, *C. butyricum* and *C. pasteurianum* have been isolated from canned tomatoes, pears, blueberries, pineapples, and figs; spoilage of fruit beverages has also been documented. Growth has been reported in acid products with a pH as low as 3.55 but is more common at pH levels above 4.2. When these organisms are present, their destruction may not be ensured by processing of acid foods by hot water or flowing steam below 100°C. Proper sanitation, thorough washing of fruit, and achievement of recommended sterilizing temperatures can control these organisms. Survival and growth is dependent mainly on pH, water activity and thermal process. Spoilage of acid products by *Clostridium thermosaccharolyticum* has been seen mostly in canned tomato products in the pH range 4.1 to 4.5. This organism is a thermophilic anaerobe with an optimum growth temperature of 55°C. Spoilage of acid products by *C. thermosaccharolyticum* will not occur if product is properly cooled and not stored at elevated temperatures.

INTRODUCTION

Butyric spoilage of acid products by sporeforming butyric anaerobes such as *Clostridium butyricum* and *Clostridium pasteurianum* has been documented for over 50 years. Butyric spoilage, as it is known, is characterized by production of gas, a strong butyric acid odor, and increased acidity. As spoilage organisms, *C. butyricum* and *C. pasteurianum* are grouped together and have been isolated from canned tomatoes, pears, blueberries, pineapples, fruit-based beverages, and figs (3, 4, 5, 7, 9, 13, 14, 16). Many canned fruit products are susceptible to spoilage from butyric anaerobes, which could pose significant economic consequences should spoilage occur. Spoilage of acid products by the thermophilic anaerobe *Clostridium thermosaccharolyticum* has been seen mostly in canned tomato products in the pH range 4.1 to 4.5 (1). Although much has been learned about preventing butyric spoilage of acid products by these organisms, they are still a cause of occasional spoilage today.

TABLE 1. Spoilage after heat processing tomatoes, beets and figs containing soil from several farms (adapted from Food Res. 4:231)

Products	No. Cans	No. Swollen Cans	% Swollen Cans
Tomatoes	168	67	40%
Beets	24	22	92%
Figs	72	24	33%

TABLE 2. The effect of pH on spoilage in canned pears inoculated with spores of *C. pasteurianum* and heated to a can center temperature of 92°C (adapted from Food Technol. 8:239)

pH	No. Samples	No. Spoiled	% Spoiled
3.30 to 4.15	9	0	0%
4.15 to 4.25	6	0	0%
4.30 to 4.40	6	3	50%
4.50 to 5.00	9	9	100%

IDENTIFICATION AND CLASSIFICATION

C. H. Spiegelberg (13, 14) provided the first good documentation and classification of butyric anaerobes. From 1930 to 1934, he isolated 34 strains of *Clostridium pasteurianum* from canned pineapple. Spiegelberg studied the physiological characteristics, products of fermentation and serology. In general, he found spoilage was caused by obligate anaerobic, gram positive, sporeforming rods with an optimal growth temperature of 30°C. Although biochemical fermentation patterns differed for each organism, they were grouped together as butyric acid producing strains of *Clostridium pasteurianum*. Spiegelberg found that if the pH was lower than 4.2, no spoilage occurred. He

also found that the spoilage organisms were able to withstand 90°C for 5 min.

Heat resistance and acid tolerance

In 1939, C. T. Townsend (16) published what is considered to be the classic work on heat resistance and acid tolerance of butyric anaerobes. In it he stated, "These bacteria are widely distributed in the soil, and owing to their acid and heat resistance... are of considerable importance to the canning industry." Townsend had isolated butyric anaerobes from spoiled cans of various fruits and tomatoes. Remarkably, he had observed growth in pear juice with a pH as low as 3.55. From his observations, Townsend concluded that the spoilage organisms were brought in from the fields and not

completely removed by peeling and washing operations. He also concluded, on the basis of swabbing, that this was not an equipment buildup issue. Townsend decided to conduct several experiments with soil. In the first experiment, a teaspoon of soil containing 200,000 butyric organisms was placed into cans of tomatoes, figs and pears. The cans were given the standard thermal process: a 12-min exhaust at 96.6°C, and 20-min cook in boiling water. The cans were incubated for seven weeks. Spoilage was widespread. In another experiment, Townsend collected soil from several farms and inoculated cans of tomatoes, beets and figs. The results (Table 1) indicate that if the organism, which was widespread, was present at high levels, all three products were susceptible to spoilage.

Townsend also cited a pH survey conducted between 1934 and 1937 by the National Canner's Association (NCA), in which the average pH range was 4.1 to 4.6 for tomatoes and 4.5 to 4.9 for figs. Townsend concluded that the results were significant in that butyric anaerobes can grow quite readily in products with pH levels above 4.0. Townsend also studied the heat resistance of these organisms over a wide pH range. He filled test tubes with various media, added inoculum and placed them in a boiling water bath for different times. At a pH of 7.0 (buffer), he found that a 40-min boiling cook was necessary to eliminate butyric anaerobes. At a pH of 4.5 (tomato juice), a 20-min boil was needed, and at pH 4.2 (apricot juice), a seven-min boil was needed to control the spoilage of acid foods by butyric anaerobes, Townsend concluded that:

- thorough washing and peeling of fruit to remove soil is necessary;
- acidification of some fruits may be necessary;
- clean wash water is needed to prevent re-inoculation over time, and
- Soil analysis and setting aside fruit from infected soils is not economically feasible.

TABLE 3. The effect of pH and thermal process on spoilage in canned tomatoes inoculated with spores of *C. pasteurianum* (adapted from Food Technol. 8:471)

% Citric Added	pH	Can Center Temp.	% Spoilage
0%	4.30 to 4.40	83.8 to 89.4°C	83%
0%	4.30 to 4.40	93.3 to 95.5°C	0%
0.05%	4.20 to 4.30	83.8 to 89.4°C	75%
0.05%	4.20 to 4.30	93.3 to 95.5°C	0%
0.1%	4.10 to 4.20	83.8 to 89.4°C	25%
0.1%	4.10 to 4.20	93.3 to 95.5°C	0%
0.2%	4.00 to 4.10	83.8 to 89.4°C	0%
0.2%	4.00 to 4.10	93.3 to 95.5°C	0%

TABLE 4. Continental Can culture medium for isolation of butyric anaerobes, formula per liter distilled water (1961)

1. Nutrient agar	23 g
2. Yeast extract	8 g
3. Glucose	1 g
4. Soluble starch	2 g
5. Thioglycollate solution (10%)	1 ml

pH control

J. F. Bowen (3) studied butyric anaerobe spoilage in pears and tomatoes. Over a 12-year period, Bowen monitored and calculated the average pH for Flemish pears (pH 4.4) and Bartlett pears (pH 3.8). Bowen noticed that the spoilage rate was higher for Flemish pears than for Bartlett pears during this period. To confirm his theories on pH vs. spoilage rate, his team conducted two experiments. In the first, the pH of canned Bartlett pears was adjusted from 3.3 to 5.0. The cans were inoculated with 200,000 spores of *C. pasteurianum* and heated to a can center temperature of 92°C. The results (Table 2) indicate that the spoilage rate increases as the pH rises above 4.3. In the pH range above 4.5, 100% spoilage occurred.

In Bowen's second experiment (4), varying amounts of citric acid were added to canned tomatoes (0 to 0.2%). The cans were inoculated with 200,000 spores of *C. pasteurianum* and sealed. One set of cans was given a standard thermal process in which the can center temperature reached 93.3 to 95.5°C. The other set was under-processed to a can center temperature of 83.8 to 89.4°C. The results (Table 3) demonstrate the importance of pH in spoilage. Cans receiving the standard thermal process did not spoil. Cans that were under-processed required the maximum amount of citric acid (0.2%) to inhibit spoilage. It should be noted that the addition of this level of citric acid did not affect the flavor of the product.

To control the spoilage of acid foods by butyric anaerobes, Bowen recommended the following:

- (a) for Flemish pears and other higher pH fruits, addition of citric acid is necessary;
- (b) for products with pH of 4.3 or greater, a can center temperature of 96°C is required and;
- (c) for products with pH of 4.1 or lower, a can center temperature of 84°C is required.

ISOLATION PROCEDURES

In 1961, the National Canner's Association (NCA) (12) developed isolation procedures for wash water in response to butyric anaerobe spoilage in fruit-based products. The following procedure was recommended:

- (a) collect 30 ml of wash water;
- (b) heat for 10 min at 76.6°C;
- (c) distribute water into deep tubes of thermoacidurans agar;
- (d) overlay tubes with thioglycollate agar; and
- (e) incubate five days at 30°C.

Growth + gas = positive butyric anaerobe.

During the same year, Continental Can Co. (6) developed an isolation medium for butyric anaerobes (Table 4).

MUTANTS

Butyric spoilage continued into the 1960s and '70s. In 1966, A. Casolari and L. Giannone (5) published a study on butyric spoilage in the Italian tomato industry. They concluded that the current thermal process used in Italy was inadequate for product with pH levels above 4.40. They recommended for products with a pH over 4.20 that a minimum can center temperature of 95°C be achieved. Over time, processors have documented spoilage by butyric anaerobes in products with proper acidification and thermal process. This suggests that heat resistant mutants could be present, giving rise to spoilage in correctly processed products.

TABLE 5. The effect of pH and water activity to control outgrowth of butyric spoilage in pears (adapted from *Lebensm. - Wiss. U. - Technol.* 8:158)

Water Activity	Inhibiting pH
<0.97	<4.50
0.97 - 0.98	<4.00
0.98 - 0.99	<3.80

FACTORS IN GROWTH OF BUTYRIC ANAEROBES

Water activity

In 1975, M. Jakobsen and H. C. Jensen (9) published a study on the combined effect of water activity and pH to control the outgrowth of butyric anaerobes in pears. They performed a nonthermal inoculated pack, utilizing a seven strain composite of *C. butyricum*. The pH ranged from 3.7 to 4.8, and the water activity ranged from 0.97 to 0.99. They demonstrated that at water activities below 0.97, a pH over 4.5 was needed to inhibit growth. As the water activity rose, lower pH's were needed to inhibit growth (Table 5).

Anaerobic conditions

In 1989, J. de Jong (7) published results of butyric spoilage in brined mung bean sprouts. At the time of the study, canned bean sprouts were acidified to a pH of 4.5 and processed to a can center temperature of 85°C. de Jong found that the cultivation method was contributing to the level of butyric spores on the bean sprouts. Anaerobic conditions were responsible for the high numbers of butyrics that rendered the acidification and thermal process controls inadequate. Control of the oxygen levels above 10% during cultivation prevented the accumulation of butyric spores.

Toxigenic *C. butyricum*

Two disturbing cases of infant botulism in Italy were documented by Aureli et al. (2) in 1986. The responsible organism in both cases

was found to be phenotypically similar to *Clostridium butyricum* (10). J. A. Gimenez and H. Sugiyama (8) found that the toxin produced by the organism was neutralized by type E botulinum anti-toxin. Further studies at the CDC (15) confirmed that the organism was genetically more similar to *C. butyricum* than *C. botulinum*. This could have serious health implications if the organism also had the acid tolerance and heat resistance of *C. butyricum*. The heat resistance and acid tolerance of the two toxigenic strains were studied by Morton (11) in 1989. The heat resistance was compared to an isolate responsible for canned blueberry spoilage. Growth studies were conducted in tomato juice at pH levels ranging from 3.5 to 5.5. The study found that the toxigenic strains were not heat resistant and that they could not grow at pH levels below 5.2. Therefore, the toxigenic strains would not be a concern in acid foods.

CLOSTRIDIUM THERMOSACCHAROLYTICUM

The thermophilic anaerobe *C. thermosaccharolyticum* is worth mentioning because of its ability to grow at pH levels as low as 4.1. It has been isolated from tomatoes, spaghetti with tomato sauce, sweet potatoes, and pumpkin products (1). These organisms occur widely in soil and therefore are found on raw commodities. The thermal process for acid foods is inadequate to destroy the organism. Since the organism is a thermophile, control is achieved through proper cooling and storage of canned fruit products below 35°C.

CONCLUSIONS

Spoilage of acid products by butyric anaerobes is well documented and occurs frequently. Typical spoilage occurs in products with pH above 4.1, but has been documented at pH levels as low as 3.55. Initial control of spoilage can be achieved by reducing the number of organisms through proper peeling, coring and washing. Additional control can be attained through adequate thermal process and acidification of products which have a pH above 4.2. In some cases, spoilage can be reduced by lowering the water activity or controlling commodity growth conditions. We will in all likelihood have to live with the continued occasional spoilage risk associated with these organisms. Manufacturers will need to weigh spoilage risk vs. product quality when dealing with unusually high numbers of butyric anaerobe spores and the occasional heat-resistant or acid-tolerant mutant. Under normal conditions it is not feasible, from a product quality standpoint, to increase thermal processes or acidify products to the point where the risk of spoilage is zero.

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Third in a series of articles related to "Spoilage of Acid and Acidified Foods by Sporeforming Microorganisms" presented at the Institute of Food Technologists 1997 Annual Meeting held in Orlando, FL.

Control of *Alicyclobacillus* in the Juice Industry

D. F. Splittstoesser, C. Y. Lee, and J. J. Churey

SUMMARY

Alicyclobacillus produces aciduric spores that can survive the commercial pasteurization processes commonly given to fruit juices. Apple, white grape, and tomato juices are particularly susceptible to spoilage. Red grape juice does not support growth because of the presence of certain neutral phenolic compounds. High concentrations of soluble solids, as in juice concentrates, increase heat resistance significantly. Sorbic acid and sulfur dioxide did not reduce resistance.

INTRODUCTION

In 1990 we received a sample of commercial apple juice that exhibited an off-odor. Our flavor chemist, Dr. T. E. Acree, determined that the defect was due to the presence of guaiacol. When the juice was passed through 0.45 μ M membrane filters that were then cultured on the surface of pH 3.5 potato dextrose agar (PDA), a low population (under 100 per ml) of acid-tolerant sporeforming bacteria was recovered.

We were very surprised by these findings, because the sporeforming bacteria of importance in foods are rarely this acid tolerant (1). At that time, we were not aware of apple juice spoilage in Europe caused by similar bacteria (2).

Since this initial encounter, our studies have been concerned with

factors affecting growth and death of *Alicyclobacillus*. In this report, we will discuss some of our findings that may be pertinent to the juice industry.

MATERIALS AND METHODS

Cultures

Cultures VF and WAC were isolated from pasteurized single strength apple juice, whereas SAC was obtained from apple juice concentrate. Strain IPC, provided by Tim Fairchild of International Paper Co., had been isolated from aseptically packaged apple juice.

Spores

Spore inocula were used in the various studies. Although spores were formed on PDA at both pH 3.5 and pH

5.6, the latter yielded the better growth and higher colony counts and therefore was used for production of spore crops. Growth was scraped from plates after incubation for seven days at 43°C. The spores were suspended in distilled water and then frozen. Prior to use, the suspensions were heated for 60 min at 60°C to destroy vegetative cells and to activate dormant spores.

Acidified PDA, pH 3.5, was used to select for spores from commercial juices and environmental samples. Prior to culturing, the samples were heated at 60°C for 60 min to destroy aciduric organisms such as yeasts and lactic acid bacteria.

Growth and heat resistance

PDA at pH 5.6 was used in the trials to measure growth and heat resistance (6). Colonies were counted after incubation for five days at 43°C.

Heat resistance was determined in a water bath using a sealed capillary tube procedure (4).

The influence of phenolic compounds on growth was studied by treating grape juice with C₁₈Sep-Paks™ (Waters Associates) to remove neutral and acidic fractions (3).

RESULTS AND DISCUSSION

Spore detection

Our early studies showed that many of the media considered suitable for fastidious bacteria did not support good growth of our

TABLE 1. Influence of Difco protein digests on the recovery of four strains of *Alicyclobacillus*

Digest 5g/L	Relative calany counts			
	Strain VF	WAC	SAC	IPC
None - Control	100	100	100	100
Peptone	62	27	42	28
Neapeptane	<1.5	<1.6	<1.4	<1.4
Peptone no. 2	56	16	4.2	8.0
Peptane no. 3	<1.5	<1.6	<1.4	<1.4

Basal medium per liter: yeast extract, 2.5 g; glucose, 1.0 g; agar, 15 g

TABLE 2. Growth of *Alicyclobacillus* spores VF and WAC in commercial juice beverages

Beverage	pH	°Brix	Response
Apple juice (2) ^a	3.5	11 to 11.4	Growth
Tomato	4.0	7.0	Growth
Apple-grape (3) ^a	2.8 to 3.7	12.2 to 14.8	No growth
Apple-orange-pineapple	2.9	14.8	VF-, WAC+
Apple-grape-cherry	3.7	12.4	Na growth
Concord grape(2 brands)	2.9 to 3.3	13.6 to 15.8	No growth
Cranberry	2.4	14.0	Na growth
Grapefruit	3.2	10.4	VF+, WAC-
Orange	3.6	12.0	VF+, WAC-
Pineapple	3.3	13.4	VF+, WAC-
Prune	3.7	18.8	Na growth

Alicyclobacillus isolates. These included brain heart infusion, trypticase soy, standard plate count and nutrient agars. This was not due to lack of nutrients but rather to the presence of inhibitory substances. Certain peptones, for example, had a significant inhibitory effect on spore recovery (Table 1).

Potato dextrose agar adjusted to pH 3.5 has been a reasonably good selective medium for the detection of the spores of *Alicyclobacillus* in foods. If the food also contains the as-

cospores of heat resistant molds such as *Bysochlamys*, incubating the plates at 53°C completely suppressed mold growth without decreasing the recovery of *Alicyclobacillus* spores.

As observed by other investigators, certain low pH media in addition to acidified PDA are also suitable for the detection of *Alicyclobacillus* in various fruit products.

Strains VF and WAC have been studied to determine whether heat activation actually enhanced the recovery of spores. A mixture of spores

and vegetative cells was suspended in 70% ethanol for 30 min to kill the vegetative rods. The suspension was then centrifuged and washed in water before being subjected to an activation of 30 min at 60°C. This treatment doubled the viable counts, which indicates that about 50% of the spores were in a dormant state that required heat for them to germinate and produce colonies.

Susceptible beverages

Growth was obtained over a pH range of 3.0 to 6.0 when PDA agar was adjusted with HCl or NaOH (6). These results indicated that many juice products might spoil if they were contaminated with viable spores.

When commercial juice beverages were inoculated with *Alicyclobacillus* spores, the results differed depending upon the type of juice (Table 2). Apple and tomato juice consistently supported growth, whereas others gave variable results in that only one of the two spore inocula grew. Concord grape juice at both pH 2.9 and 3.3 did not permit growth of either strain.

Growth was inhibited when the sugar content exceeded 18° Brix (6). This was observed in high-Brix grape juice and when sugars were added to apple juice.

Ethanol concentrations that exceeded 6 percent prevented growth, which means that table wines would not be vulnerable to spoilage (7). Certain hard ciders, on the other hand, might be susceptible.

Studies with different grape juices showed that factors in addition to pH and the solubles concentration had a marked effect on growth, in that white juices permitted growth but red juices did not (Table 3). This suggested that certain phenolic compounds might play a major role. To study this, red juice was passed through C₁₈ Sep-Pak™ cartridges that had been pretreated to remove neutral or acidic phenolics (3). Removal of the neutral but not the acidic fraction was found to eliminate the inhibitory effect. When various neutral phenolics were tested by

TABLE 3. Growth of *Alicyclobacillus* VF and WAC spores in diluted grape juices

Grape Variety	pH	°Brix	Response
White Juice			
Riesling	3.4	10.8	Growth
Seyvol	3.2	9.5	Growth
Elvira	3.4	7.8	Growth
Coyugo White	2.8	8.6	Growth
Red Juice			
Cabernet Sauvignon	3.7	12.2	No growth
Concord	3.5	10.0	No growth
Gamay Noir	3.1	10.2	No growth
Pinotage	3.8	10.9	No growth

TABLE 4. Effect of soluble solids on the heat resistance of *Alicyclobacillus* WAC spores in Concord grape juice

° Brix	°C	D-value ^a	z-value
16	85	53 min	
	90	11	
	95	1.9	6.9°C
30	85	76 min	
	90	18	
	95	2.3	6.6°C
65	85	276 min	
	90	127	
	95	12	7.4°C

^aAverage of four trials

adding them to apple juice, catechin-gallate was found to be inhibitory to *Alicyclobacillus*. Because red juice contains a variety of neutral phenolics, it is likely that others may also have an effect on growth.

Heat resistance

The spores of *Alicyclobacillus* were sufficiently resistant to heat to survive the usual hot fill processes that are given to commercial juices. Comparable D-values have been

obtained in Concord grape juice and apple juice (6). Raising the sugar content of juices increased heat resistance (Table 4). These results show that it would be more difficult to destroy the spores in a juice concentrate than in a single strength juice.

Sulfur dioxide and sorbic acid, which are common juice preservatives, have been shown to reduce the heat resistance of mold ascospores (4, 5). Unfortunately, concentrations of these compounds as high as 100 mg/liter failed to sensitize the spores of *Alicyclobacillus* to heat (data not shown).

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Spoilage of Acid Products by Heat-resistant Molds

Larry R. Beuchat

SUMMARY

Spoilage of thermally processed fruits and fruit products by heat-resistant molds has been recognized in several countries since the early 1930s. *Byssoschlamys fulva*, *B. nivea*, *Neosartorya fischeri*, *Talaromyces macrosporus*, *T. bacillisporus*, and *Eupenicillium brefeldianum* have been most frequently encountered. These molds are distinguished by their ability to produce ascospores that are extraordinarily tolerant to heat, e.g., withstanding several minutes at temperatures exceeding 90°C (194°F). Ascospores formed by molds growing on fruits in the field or during transport or storage contaminate soil, dust, and surfaces to which sound fruits destined for processing are exposed. *Byssoschlamys* appears to be more prevalent on fruits grown in areas with a temperate climate, whereas *Neosartorya* and, perhaps, *Talaromyces* are often associated with fruits grown in tropical and subtropical regions. If present, the number of ascospores in fruit products is low, generally on the order of one ascospore per 100 g product or rarely exceeding 10 per g. Ascospores surviving heat pasteurization treatments applied to some fruit products may, during subsequent storage, germinate and grow; this can occur at oxygen levels as low as 0.1%. Spoilage of fruit concentrate, purees, juices, and drinks is characterized by the development of a mycelial mat, whereas fruit pieces soften as the result of pectic enzyme production. Off flavors and aromas may also occur. *Byssoschlamys* species are capable of producing patulin, byssotoxin A, and byssochlamic acid, all known to have toxic effects on animals. *Neosartorya* is known to produce fumitremorgins, terrein, verruculogen, and fischerin. Therefore, heat-resistant molds may constitute a public health hazard as well as a spoilage problem.

INTRODUCTION

Spores and vegetative cells of most molds are not exceptionally resistant to heat, being inactivated within 5 min upon exposure to 60°C. However, spoilage of thermally processed fruits and fruit products by heat-resistant molds, i.e., those known to produce ascospores with extraordinary tolerance to heat, has been recognized in several countries (9, 12, 15, 16, 21, 24, 29, 36) for at least 70 years (18, 19). Spoilage appears to be more frequent in recent years, in part because of an increased number of commercially pasteurized fruit juices and drinks containing combinations of fruit concentrates originating from sources and geographic locations where higher incidence of heat-resistant molds may occur. Molds most often responsible for spoilage of heat-pasteurized fruit-based products are *Byssoschlamys fulva*, *Byssoschlamys nivea*, *Neosartorya fischeri*, *Talaromyces macrosporus* (previously referred to as *T. flavus*), *Talaromyces bacillisporus*, and *Eupenicillium brefeldianum*. Other genera that produce ascospores with exceptional heat resistance are less often encountered.

Aside from aesthetic problems associated with visible mold growth on the surface of processed fruits and fruit-based beverages, concern also exists over the potential of some heat-resistant molds to produce mycotox-

TABLE 1. Sources from which heat-resistant molds have been isolated

Mold	Heat-processed products	Non-processed products	Miscellaneous
<i>Byssochlamys fulva</i>	Canned blackberries, strawberries, blueberries,	Fruits - apple, blackberries, black currants, blueberries, cherries, grapes, gooseberries, loganberries, passion fruit,	Wooden baskets Trays
	black currants, loganberries, plums, figs,	plums, strawberries, apricots, pears	Glass bottles, jars
	peaches, pears, apricots, apples, cherries	Fruit pulps - strawberry, raspberry, plum, grape,	Vegetation
	Juices - apple, grape, blueberry, passion fruit	loganberry, pineapple, mango, currant, apple, orange	Soil - orchard, vineyard
	Concentrates - pineapple, grape	(rarely)	Mechanical grape harvester
	Drinks - grape, fruit, fruit punch, soft	Decayed plums, grapes	
	Pie filling - blackberry, cherry		
	Pudding - fruit		
	Syrups - fruit		
	<i>Byssochlamys nivea</i>	Canned strawberries, blackberries, fruit	Decayed apples, grapes
Juices - apricot, fruit		Pulp - raspberry	Silage
Concentrates - grape, fruit punch		Dairy products - milk, cream, cheese, fermented milk Cucumber brine	Rotting wood
<i>Byssochlamys species</i>	Drinks - grape, fruit	Fruits - apples, grapes, grapefruit (sections or peeled,	Soil
	Concentrates - grape, fruit punch	whole)	Grape pomace
			Leaves - grape, strawberry Waste water lagoon (grape processor)
<i>Paecilomyces fulvus</i> (anamorph of <i>B. fulva</i>)	Concentrates - apple, grape	Decayed plums	Grape pomace
	Canned - strawberries, figs	Butter	Vegetation (vineyard)
	Juices - apple, grape	Sorghum brandy	Wood
	Sports drink	Bread	Leather
	Blackberry pie filling		Paper Library paste
<i>Neosartorya fischeri</i>	Canned strawberries, fruit	Fruit - strawberries, mango	Soils
	Juices - passion fruit, apple, fruit	Pulp - raspberry	Forage (dry)
	Concentrates - pineapple, mango	Bread flour	Vegetation (orchards, vineyards)
	Filling - cherry, fruit	Pistachio nuts	Air
	Drink - fruit		Lake sediments Mechanical grape harvester
<i>Talaromyces macrosporus</i>	Juices - apple, fruit, grape, pineapple		Soil - 22 of 33 states, 16 countries
	Concentrate - pineapple		
	Canned fruit		

ins. An understanding of natural habitats of these molds, their tolerance to heat, and conditions under which they can grow and produce toxins is necessary before processing schedules can be selected to assure the absence of viable heat-resistant mold ascospores in pasteurized fruit-based products.

SOURCE OF HEAT-RESISTANT MOLDS

Molds, including those that produce heat-resistant ascospores, are widely distributed in the environment. Soil, particularly in vineyards, orchards, and fields in which fruits are grown, can contain these molds

(12, 18, 19, 35, 42). *Byssochlamys* appears to be more prevalent on fruits grown in areas with a temperate climate, whereas *Neosartorya* and, perhaps, *Talaromyces* are more often associated with fruits grown in tropical and subtropical regions, such as pineapple, passion fruit, mango, and papaya. Infection of fallen fruits, fol-

TABLE 2. Tolerance of heat-resistant molds isolated from food¹

Mold	Heat-resistant structure	Heating medium	Heat resistance	Reference
<i>Byssochlamys fulva</i>	Ascospores	Glucose-tartaric acid, pH 3.6	90°C, 51 min, 1000-fold inactivation	(2)
		Grape juice, 26° Brix	85°C, 150 min, 100-fold inactivation	(24)
<i>Byssochlamys nivea</i>	Ascospores	Grape juice	88°C, survived 60 min	(26)
		Apple juice	99°C, survived in juice containing 4.7% sucrose	(1)
<i>Eupenicillium lapidosum</i>	Ascospores	Blueberry juice	81°C, 10 min, survival; 81°C, 15 min, death; z = 10.3°F	(46)
	Cleistothecia	Blueberry juice	93.3°C, 9 min, growth; 93.3°C, 10 min, death; z = 10.6°F	(46)
<i>Eupenicillium brefeldianum</i>	Ascospores	Apple juice	90°C, 1 min, death; z = 7.2°C	(45)
	Cleistothecia	Apple juice	90°C, 220 min, death; z = 11.7°C	(45)
<i>Talaromyces macrosporus</i>	Ascospores	Apple juice	90°C, 2 min, death; z = 7.8°C	(45)
		Fruit-based fillings	D _{91°C} = 2.9 to 5.4 min; z = 9.4 to 23.3°F	(4)
		Apple juice	D _{90.6°C} = 1.4 min; z = 9.5°F	(4)
	Cleistothecia	Apple juice	D _{90.6°C} = 2.2 min; z = 5.2°C	(40)
<i>Monascus purpureus</i>	Whole culture	Apple juice	90°C, 80 min, death; z = 11.7°C	(45)
		Grape juice	Survival several min 100°C	(15)
<i>Humicola fuscoatra</i>	Chlamydo spores	Water	80°C, 101 min, 10-fold inactivation	(27)
<i>Phialophora</i> sp	Chlamydo spores	Apple juice	80°C, 2.3 min, 10-fold inactivation	(20)
<i>Neosartorya fischeri</i>	Ascospores	Water	100°C, 60 min, survival	(23)
		Fruit-based fillings	D _{91°C} = <2.0 min; D _{88°C} = 4.2-16.2 min; z = 5.4 = 11°F	(4)
		Apple juice	87.8°C, 1.4 min; z = 5.6°C	(40)
<i>Neosartorya fischeri</i> var. <i>glaber</i>	Ascospores	Water	90°C, 60 min, survival	(29)
		Grape juice	85°C, 10 min, 10% survival	(41)
<i>Thermoascus aurantiacum</i>	Whole culture	Grape juice	88°C, 60 min, survival	(26)

¹Adapted from 8, 41

lowed by mummification and production of ascospores with extraordinary heat tolerance, is the natural sequence of events leading to most postharvest contamination of sound fruits. Fruits formed close to the ground or harvested from or close to the ground are consequently more likely to be contaminated with ascospores. Growth of molds on improperly cleaned harvesting equipment, baskets, trays, pallets, and other contact surfaces, including those in storage and processing areas, that come in contact with fruits can lead to contamination and eventual spoilage of processed products. Some sources from which heat-resistant molds have been isolated are listed in

Table 1. This group of molds grows on a wide range of substrates but spoilage is nearly always associated with acid products containing fruits or ingredients originating from plants.

The number of heat-resistant ascospores in fruits, fruit products, soil, vegetation, and other sources is generally low, e.g., on the order of one ascospore per 100 g and rarely exceeding 10 per g, making detection and enumeration difficult. Distribution of ascospores from a single infected fruit throughout an entire batch of concentrate containing otherwise sound fruit can result in spoilage of a high percentage of containers of beverage or other products produced

from that concentrate. Sugar may also be a source of heat-resistant ascospores.

SPOILAGE CHARACTERISTICS

Detection of mycelial mats on the surface of fruit-based beverages or visible growth on solid fruits or semi-solid fruit products indicates advanced stages of spoilage by heat-resistant molds. The surface of some types of infected fruits may take on a glossy appearance before mycelial growth is visible. Production of several types of pectic enzymes by *Byssochlamys* can result in complete breakdown of texture of fruits (9, 19, 36) and off-flavor development.

CONDITIONS FOR GROWTH

Like all microorganisms, heat-resistant molds can grow only if the boundaries of certain environmental conditions are not exceeded. These molds are not thermal tolerant in terms of their ability to grow at high temperatures. The optimum temperature for growth ranges from 30 to 37°C. The minimum growth temperature is in the 10 to 12°C range. *Byssochlamys* can grow at pH values between 2.0 and 9.0, whereas *N. fischeri* grows at pHs between 3.0 and 7.9 (44). The lowest a_w for growth of *B. nivea* in fruit juices and nectars is about 0.90. The type and ratio of sugars present in fruit products can also influence the germination and outgrowth of ascospores.

Heat-resistant molds are able to grow in environments containing low levels of oxygen. *B. nivea*, for example, has been observed to grow at atmospheric oxygen contents as low as 0.27% (26), and growth of *N. fischeri* occurs at oxygen levels as low as 0.1% (33). *B. nivea* also has an unusual ability to grow in atmospheres with elevated carbon dioxide concentrations (47).

Germination and outgrowth of ascospores of heat-resistant molds that may survive pasteurization treatment can be controlled by adjustment, within limits, of product pH and a_w , headspace oxygen content, and storage temperature. Benzoate and sorbate salts can also be used to prevent growth in finished products (3). A concentration of 250 ppm of these chemicals has been reported to inhibit growth of *B. fulva* in grape juice (26), whereas 1,000 ppm of sodium benzoate was needed to inhibit growth in fruit pudding and a fruit drink. Growth of some strains of *N. fischeri* is inhibited by as little as 75 ppm benzoate or sorbate (31). At 100 ppm, both chemicals have been reported to control the growth of *T. flavus* (44). Sulfur dioxide can also be effective in controlling the growth of heat-resistant molds (3, 9, 31, 44).

TOLERANCE TO EXTREME TEMPERATURES

Heat-resistant ascospores of *Byssochlamys*, *Neosartorya*, and *Talaromyces* are often in a dormant condition, thus requiring an activation treatment such as heat shock to initiate germination and growth (4, 22, 25, 43). This can be achieved by heating ascospores at 70 to 80°C for up to 10 min. The composition of the heating medium can influence the extent of activation. For example, maximal activation of *B. fulva* and *N. fischeri* ascospores has been observed in grape juice heated at 70°C for 30 min in grape juice; in distilled water at 70°C, 120 min were required to activate *B. fulva*, while only 1% of *N. fischeri* ascospores were activated by heating for 120 min (41). Different strains within the same species may require different treatment times and temperatures to achieve maximal activation (8).

Resistance of ascospores to inactivation at elevated temperatures is affected by the composition of the heating medium and by the mold species (Table 2). Inactivation in fruit syrups and concentrates is particularly difficult, because high sugar concentrations protect against the lethal effect of heat (6, 37). As the a_w of these products is reduced by the addition of sugars or removal of water, at a given temperature, D values often increase dramatically. This occurs regardless of the type of sugar in the product, although, at a given a_w , the type of sugar can influence rates of thermal inactivation. Ascospores have increased tolerance to heat as they age (11).

D values of ascospores generally decrease as the pH of the product decreases from neutrality. Various organic acids, at the same concentration and pH, can have different effects on ascospore activation and inactivation (5). Benzoate, sulfur dioxide, and diethylpyrocarbonate may have a synergistic effect with heat on inactivation of *T. macrosporus* (5) and *B. nivea* ascospores (3).

The addition of sucrose to fruit juices and nectars stored at 7°C and -30°C protects *B. nivea* ascospores against inactivation (10). *N. fischeri* and *T. macrosporus* ascospores remain viable in apple, blueberry, grape, pineapple, and strawberry powders (a_w 0.23) stored at 25°C for up to 30 months (7).

MYCOTOXIN PRODUCTION

Some strains of *Byssochlamys* are able to produce patulin in fruits and fruit products (9, 13, 38, 39). This secondary metabolite which has been found to be toxic to microorganisms, plants, and animals, is suspected to be a health hazard to humans. Headspace oxygen concentrations as low as 0.2% are sufficient to allow patulin production in apple juice. Other toxic metabolites produced by *Byssochlamys* include byssochlamic acid, byssotoxin A, byssotoxin, asymmetrin, and variotin (44).

Some strains of *N. fischeri* are capable of producing toxins such as fumitremorgin A, B, and C (17, 32), terrein (30), and verruculogen (34). Production of these metabolites has been shown to be influenced by a_w , temperature, and light (14). Fischerin, produced by *N. fischeri*, causes lethal peritonitis in mice (14) whereas eugenifeldin, produced by *E. brefeldianum*, is cytotoxic to tissue cultures (28). Conditions under which these toxic metabolites are produced in fruit products are largely unknown.

In summary, a few molds produce ascospores with sufficient tolerance to heat to withstand the pasteurization conditions used for producing some types of fruit products. Spoilage caused by these molds is an endemic problem in pasteurized, fruit-based beverages and thermal processing schemes adequate to kill heat-resistant ascospores are therefore necessary to control spoilage during the intended shelf life of these products.

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3-A Announces New Standards, Amendments, & Revisions

New 3-A Sanitary Standards:

- 3-A Sanitary Standards for Auger-Type Feeders, Number 81-00;
- 3-A Sanitary Standards for Spray Cleaning Devices Intended to Remain in Place, Number 78-00.

Amendments or Revisions to 3-A Sanitary Standards:

1. 2nd Revision to 3-A Sanitary Standards for Packaging Dry Milk and Dry Milk Products, Number 27-04;
2. Amendment to 3-A Sanitary Standards for Refractometers and Energy Absorbing Optical Sensors for Milk and Milk Products, Number 46-02;
3. 1st Revision to 3-A Sanitary Standards for Plug-Type Valves for Milk and Milk Products, Number 51-01;
4. 1st Revision to 3-A Sanitary Standards for Plastic Plug-Type Valves for Milk and Milk Products, Number 52-01;
5. 1st Revision to 3-A Sanitary Standards for Compression-Type Valves for Milk and Milk Products Equipment, Number 53-01;
6. 2nd Revision 3-A Sanitary Standards for Sanitary Fittings for Milk and Milk Products, Number 63-02 and;
7. 11th Revision to 3-A Accepted Practices for Spray Drying Systems for Milk and Milk Products, Number 607-04.

These new, amended, or revised 3-A standards and practices will become effective November 15, 1998 and will be printed in *Dairy, Food and Environmental Sanitation* between November 1998 and March 1999. Reprints will be available from IAMFES in November 1998.

For additional information, contact IAMFES at 515.276.3344; 800.369.6337; Fax: 515.276.8655;

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Outbreak of *Vibrio Parahaemolyticus* Infections Associated with Eating Raw Oysters

During July through August 1997, the largest reported outbreak in North America of culture-confirmed *Vibrio parahaemolyticus* infections occurred. Illness in 209 persons was associated with eating raw oysters harvested from California, Oregon, and Washington in the United States and from British Columbia (BC) in Canada; one person died. This report summarizes the investigations of the outbreak, which suggest that elevated water temperatures may have contributed to increased cases of illness and highlights the need for enhanced surveillance for human infections.

British Columbia

During July 1 to 19, the BC Provincial Laboratory received isolates of *V. parahaemolyticus* from nine patients, more than twice the expected number for July. Because of the high number of isolates identified, the BC Center for Disease Control (BCCDC) conducted interviews with the eight patients who could be contacted; seven had eaten raw oysters during the 24 hours before illness onset, and one had eaten crabs. On July 30, the BC Ministry of Health (BCMOH) issued a public health alert advising that molluscan shellfish (e.g., oysters, clams, mussels, and scallops) should not be eaten raw or undercooked. On July 31, the Vancouver/Richmond Health Board banned the sale of raw molluscan shellfish in restaurants in the cities of Vancouver and Richmond, BC. These actions were followed by a rapid decline in the number of new cases. On August 19, the Federal Department of Fisheries and Oceans (DFO) closed all BC coastal waters to the harvesting of oysters. The BCMOH continued to interview BC residents with culture-confirmed *V. parahaemolyticus* infections; information was obtained from 42 of the 51 persons with illness reported during July 1 to September 26. Of the 42, a total of 39 (93%) had eaten molluscan shellfish and 35 (83%) had eaten raw or undercooked oysters during the 4 days be-

fore onset of illness; 28 had eaten oysters purchased at restaurants or other food establishments in BC; and seven had eaten oysters they had harvested. Oysters eaten by ill persons were traced by BCCDC, the Canadian Food Inspection Agency (CFIA), and BCMOH to harvesting areas along the BC coast. Samples of oysters harvested from these areas contained multiple *V. parahaemolyticus* serotypes at less than 200 colony-forming units (CFU) per gram of oyster tissue. No additional outbreak-related illnesses were reported in BC residents after DFO closed the coastal waters to the harvesting of oysters. The closure remained in effect until September 12, after which no additional cases were reported.

Washington

On July 18, on the basis of reports of illness received from local health departments and from ill persons, the Washington Department of Health (WDOH) issued an advisory that persons eat only thoroughly cooked oysters. On August 14, after additional cases had been reported, the WDOH advised commercial harvesters to refrigerate oysters within 4 hours after harvesting, and on August 20, advised the public to thoroughly cook molluscan shellfish from both commercial and noncommercial sources. On August 23, the U.S. Food and Drug Administration (FDA) also issued a statement regarding proper procedures for cooking oysters (1). WDOH interviewed 54 of the 56 persons who had culture-confirmed *V. parahaemolyticus* during May 26 to September 9. Of the 54, a total of 48 (89%) had eaten molluscan shellfish before becoming ill; 42 (88%) reported eating oysters. Product traceback by the WDOH's Shellfish Program determined that 35 case-patients had eaten molluscan shellfish harvested in Washington. On August 20, members of the Pacific Coast Oyster Growers Association voluntarily halted shipments of shell oysters from Washington, and on August 28, WDOH closed oyster beds in major shellfish harvesting areas. The oyster beds were reopened on September 15, and no additional illnesses were reported.

Oregon

On August 21, the Oregon Health Division (OHD) requested that local county health departments and microbiology laboratories provide immediate notification of illnesses associated with or isolations of *V. parahaemolyticus*. The request was prompted by an increased number of *V. parahaemolyticus* cases detected by the Foodborne Disease Active Surveillance Network (FoodNet) (a collaboration between CDC, the U.S. Department of Agriculture, FDA, and seven states for surveillance of foodborne diseases and related epidemiologic studies) and simultaneous reports from BC and Washington of a *V. parahaemolyticus* outbreak associated with eating raw or undercooked shellfish. OHD interviewed the 13 persons reported with culture-confirmed *V. parahaemolyticus* infections with onsets during July 19-September 27. Twelve had eaten molluscan shellfish; 10 (77%) had eaten raw oysters. Traceback of the oysters that had been eaten indicated they had been harvested in waters near BC (four cases), Washington (four), Oregon (one), and California (one). On August 26, the implicated oyster harvest bed in Oregon was closed by the Oregon Department of Agriculture; only oysters to be cooked could be harvested. On August 28, OHD, in conjunction with the Food Safety Division of the Oregon Department of Agriculture, issued a press release warning persons not to eat raw molluscan shellfish harvested along the Pacific Northwest coast. After closure of the implicated oyster harvest bed in Oregon, no additional cases associated with eating raw oysters harvested from Oregon waters were reported. The sale of oysters to be eaten raw was reestablished on September 30.

California

During May through July, the city and county of San Francisco Department of Public Health reported 11 culture-confirmed *V. parahaemolyticus* infections to the California Department of Health Services (CDHS). On the basis of these cases, on August 18, San Francisco health officials issued a health advisory recommending that persons not eat raw shellfish and advising restaurants not to serve raw oysters, clams, or mussels. On August 19, CDHS issued a warning about eating raw oysters, clams, and mussels harvested off the coasts of BC and Washington. CDHS interviewed each of the 83 persons reported with culture-confirmed *V. parahaemolyticus* infections with onset during June 9 to December 9. Of the 83, a total of 68 (82%) reported eating oysters during the week before onset of illness. Although 59 persons ate oysters identified through traceback as having been harvested off the coast of Washington and BC, nine persons with culture-confirmed illness ate oysters harvested from Tomales Bay, California (40 miles north of San Francisco).

Summary Findings

During July 20 through August 24, culture-confirmed cases of *V. parahaemolyticus* infections associated with

eating shellfish harvested from Washington or BC also were reported to the state health departments of Utah (three), Alaska (one), Maryland (one), and Hawaii (one). A total of 209 culture-confirmed *V. parahaemolyticus* infections were reported throughout North America during this outbreak. Dates of illness onset ranged from May 26 through December 9 (median: August 8). *V. parahaemolyticus* isolates from ill persons included many different serotypes, some of which matched serotypes found in oysters. The median age of patients was 39 years (range: 12 to 85 years); 141 (67%) were male. Clinical histories were available for 196 persons with culture-confirmed infection: 194 (99%) reported diarrhea; 172 (88%), abdominal cramps; 101 (52%), nausea; 77 (39%), vomiting; 64 (33%), fever; and 24 (12%), bloody diarrhea. Of 137 persons providing information on underlying illnesses, 17 (12%) reported an underlying illness. Two patients were hospitalized; one with *V. parahaemolyticus* isolated from her bloodstream died. Mean Pacific coastal sea surface temperatures recorded by the U.S. Navy ranged from 54°F to 66°F (12°C to 19°C) during May 13 to September 9, 1997 (B. McKenzie, U.S. Navy, personal communication, 1998). These temperatures were 2°F to 9°F (1°C to 5°C) above temperatures from the same period in 1996. Oysters from implicated harvest sites contained *V. parahaemolyticus*, but the number of organisms per gram was often less than 200 CFU. The highest levels were greater than 11,000 CFU in samples tested by CFIA. Reported by: M. Fyfe, M.D., Communicable Disease Epidemiology; M. T. Kelly, M.D., Provincial Laboratory, British Columbia Center for Disease Control; S. T. Yeung, M.B.B.S., Field Epidemiology Training Program, Health Canada; P. Daly, M.D., Vancouver/Richmond Health Board; K. Schallie, Canadian Food Inspection Agency; S. Buchanan, Food Protection Programs, British Columbia Ministry of Health. P. Waller, M.S.; J. Kobayashi, M.D., Communicable Disease Epidemiologist; N. Therien, M.P.H., M. Guichard, M.S., S. Lankford, Public Health Laboratories; P. Stehr-Green, Dr. P. H., State Epidemiologist, Washington Dept. of Health; R. Harsch, M.D., Oregon Health Sciences Univ., Portland; E. DeBess, D.V.M., M. Cassidy, T. McGivern, S. Mauvais, D. Fleming, M.D., State Epidemiologist, State Health Div., Oregon Dept. of Human Resources. M. Lippmann, Communicable Disease Control Unit; L. Pong, Environmental Health Management Section, City and County of San Francisco Dept. of Public Health. R. W. McKay, Food Safety Div., Dept. of Agriculture; D. E. Cannon, Environmental Health, Shellfish Program; S. B. Werner, M.D.; S. Abbott, Div. of Communicable Disease Control; M. Hernandez, C. Wojee, J. Waddell, Div. of Food, Drug and Radiation Safety, S. Waterman, M.D., State Epidemiologist, California Dept. of Health Services; J. Middaugh, M.D., State Epidemiologist, State of Alaska Dept. of Health and Social Services. D. Sasaki, DVM, Epidemiology Br., P. Effler, M.D., State Epidemiologist, Hawaii Dept. of Health. C. Groves, M.S., N. Curtis, Maryland State Epidemiology and Disease Control, D. Dwyer, M.D., State Epidemiologist, Maryland State Dept. of Health and

Mental Hygiene. G. Dowdle, MSPH, Communicable Disease Control, C. Nichols, MPA, State Epidemiologist, Utah Dept of Health. Center for Food Safety and Applied Nutrition, U.S. Food and Drug Administration. Foodborne and Diarrheal Diseases Br., Div. of Bacterial and Mycotic Diseases, National Center for Infectious Diseases, CDC.

Editorial Note

The last large outbreak of *V. parahaemolyticus* infections reported in North America occurred in 1982 and resulted in 10 culture-confirmed cases. Although *V. parahaemolyticus* outbreaks are rare, sporadic cases are not infrequent. Most infections are associated with ingestion of raw or undercooked shellfish harvested from both the Gulf of Mexico and the Pacific Ocean. *V. parahaemolyticus* is a gram-negative bacterium that naturally inhabits U.S. and Canadian coastal waters and is found in higher concentrations during the summer (2, 3). The outbreak described in this report may have been associated with elevated water temperatures. Because *V. parahaemolyticus* concentrations in oysters and shellfish increase with warmer temperatures, enhanced surveillance at the beginning of summer may lead to earlier recognition and appropriate public health action. Water temperature monitoring may help determine when oyster beds should be closed to harvesting to prevent further outbreaks (4). Epidemiologic and microbiologic studies conducted during this outbreak primarily implicated eating raw oysters. On the basis of studies suggesting that the infectious dose of *V. parahaemolyticus* might be greater than or equal to 100,000 CFU (5), the United States and Canada allow the sale of oysters if there are less than 10,000 CFU of *V. parahaemolyticus* per gram of oyster. However, adherence to these guidelines did not prevent this outbreak. Closure of implicated shellfish beds by health officials was useful; in Canada, additional human illness rapidly declined following a federally mandated suspension of harvesting of shellfish from BC waters in September. In the United States, shellfish-associated infections continued to occur into December. The mean incubation period for *V. parahaemolyticus* is 15 hours (range: 4 to 96 hours). In immunocompetent persons, *V. parahaemolyticus* causes a mild to moderate gastroenteritis with a mean duration of illness of 3 days. Infection can cause serious illness in persons with underlying disease (e.g., persons who use alcohol excessively or have diabetes, pre-existing liver disease, iron overload states, compromised immune systems, or gastrointestinal problems) (2, 6). During this outbreak, most ill persons

had no underlying illness. To reduce the risk for *V. parahaemolyticus* and other shellfish-associated infections, persons should avoid eating raw or undercooked shellfish. If persons who eat raw or undercooked shellfish develop gastroenteritis within 4 days of ingestion, they should consult a health-care provider and request a stool culture. Only three states (California, Florida, and Louisiana) require visible posting of alerts regarding the risks associated with eating raw oysters at point of retail sale (2, 7, 8). Although assessment of these regulatory educational strategies have indicated compliance is variable (7), other states might consider posting such alerts. *V. parahaemolyticus* is not a reportable disease in all states. During this outbreak, public health officials in Washington and California and in BC promptly became aware of the outbreak through routine reporting; in Oregon, although *V. parahaemolyticus* is not reportable, the outbreak was detected through an active surveillance program. All states should consider making *V. parahaemolyticus* and other vibrios reportable; standard forms are available from CDC's Foodborne and Diarrheal Diseases Branch, Division of Bacterial and Mycotic Diseases, National Center for Infectious Diseases, Phone: 404.639.2206; Fax: 404.639.2205.

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Awards Nominations

The International Association of Milk, Food and Environmental Sanitarians welcomes your nominations for our Association Awards. Nominate your colleagues for one of the Awards listed below. Only IAMFES Members are eligible to be nominated. You do not have to be an IAMFES Member to nominate a deserving professional.

To request nomination criteria, contact:

IAMFES
6200 Aurora Avenue, Suite 200W
Des Moines, Iowa 50322-2863

By telephone: 800.369.6337; 515.276.3344;
Fax: 515.276.8655 or E-mail: iamfes@iamfes.org.

Nominations deadline is February 19, 1999. You may make multiple nominations. All nominations must be received at the IAMFES office by February 19, 1999.

- * Persons nominated for individual awards must be current IAMFES Members. Black Pearl Award nominees must be a company employing current IAMFES Members. NFPA Food Safety Award nominees do not have to be IAMFES Members.
- * Previous award winners are not eligible for the same award.
- * Executive Board Members and Awards Committee Members are not eligible for nomination.
- * Presentation of awards will be during the Awards Banquet at the IAMFES Annual Meeting in Dearborn, Michigan on August 4, 1999.

Nominations will be accepted for the following Awards:

Black Pearl Award — Award with Black Pearl

Presented in recognition of a company's outstanding achievement in corporate excellence in food safety and quality. Sponsored by Wilbur Feagan and F&H Food Equipment Company.

Honorary Life Membership Award — Plaque and Lifetime Membership in IAMFES

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

Harry Haverland Citation Award — Plaque and \$1,000 Honorarium

Presented to an individual for years of devotion to the ideals and objectives of IAMFES. Sponsored by DiverseyLever U.S. Food Group.

Harold Barnum Industry Award — Plaque and \$1,000 Honorarium

Presented to an individual for outstanding service to the public, IAMFES and the food industry. Sponsored by NASCO International, Inc.

Educator Award — Plaque and \$1,000 Honorarium

Presented to an individual for outstanding service to the public, IAMFES and the arena of education in food safety and food protection. Sponsored by Nelson-Jameson, Inc.

Sanitarian Award — Plaque and \$1,000 Honorarium

Presented to an individual for outstanding service to the public, IAMFES and the profession of the Sanitarian. Sponsored by Ecolab, Inc., Food and Beverage Division.

NFPA Food Safety Award — Plaque and \$3,000 Honorarium

Presented to an individual, group, or organization in recognition of a long history of outstanding contribution to food safety research and education. Sponsored by National Food Processors Association.

CALL FOR ABSTRACTS

IAMFES
86th Annual Meeting — August 1-4, 1999
Dearborn, Michigan

Instructions for Preparing Abstracts

Procedure

- ◆ Type abstract in space provided on the abstract form. Abstracts must be double-spaced in a font size no smaller than 12 point. No more than 200 words.
- ◆ Type in the title, CAPITALIZE the first letter of the first word and proper nouns.
- ◆ List the names of authors and institution(s). Capitalize first letters and initials.
- ◆ Give the full name, title, mailing address and the office telephone number of the author who will present the paper.
- ◆ If the paper is to be presented by a student entered in the Developing Scientist Awards Competitions, check the box to indicate this and have the form signed by your Major Professor or Department Head. **(For more information on the Developing Scientist Awards Competitions, see the following pages.)**
- ◆ Mail four (4) printed copies and one (1) electronic version on a 3½ inch disk (saved as text export or ASCII file or rich text format) of the abstract to be received by January 8, 1999 to:

Carol Mouchka
IAMFES
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2863

Enclose one (1) self-addressed postcard for each abstract that is submitted to acknowledge receipt of the abstract. Authors will be notified by mail of acceptance or rejection of their abstract.

***NOTE: Your abstract must be received by the IAMFES office no later than January 8, 1999. Photocopies of the abstract form may be used.**

Content of the Abstract

The abstract should describe briefly:

- (a) the purpose of research/objectives;
- (b) methodology;
- (c) essential results;
- (d) conclusions/significance/implications.

Presentation Format

Papers may be presented orally or by poster format at the discretion of the IAMFES Program Committee. Oral presentations will be scheduled so a speaker has a maximum of 15 minutes, including a 2 to 4 minute discussion. Carousel projectors for 35-mm slides will be available. Other equipment may be used at speaker's expense. Prior authorization must be obtained.

OVERHEAD PROJECTORS ARE NOT TO BE USED.

Subject Matter for Papers

Papers should report the results of applied research on: food, dairy and environmental sanitation; foodborne pathogens; food and dairy microbiology; food and dairy engineering; food and dairy chemistry; food additives and residues; food and dairy technology; food service and food administration; quality assurance/control; mastitis; environmental health; waste management and water quality. Papers may also report subject matter of an educational and/or nontechnical nature.

Criteria for Acceptance of Abstracts

1. Abstract must accurately describe briefly:
 - (a) the problem studied/objectives;
 - (b) methodology;
 - (c) essential results;
 - (d) conclusions/significance/implications.

Results should be summarized. **Do not use tables or graphs.**

2. Abstract must report the results of original research pertinent to the subject matter described above in subject matter for papers section.
3. Research must be based on accepted scientific practices.
4. Research should not have been previously presented nor intended for presentation at another scientific meeting; paper should not have appeared in print prior to the Annual Meeting.

Typical Reasons for Rejection of Abstracts

1. Abstract was not prepared according to "Instructions for Preparing Abstracts."
2. Abstract does not contain essential elements described above in #1, "Criteria for Acceptance."
3. Abstract reports inappropriate or unacceptable subject matter, is not based on accepted scientific practices, or the quality of the research or scientific approach is inadequate.
4. Work reported appears to be incomplete.
5. The abstract was poorly written or prepared including spelling and grammatical errors.
6. Results have been presented/published previously.
7. The abstract was received after the deadline for submission.
8. Abstract contains information that is in violation of the IAMFES Policy on Commercialism.

Additional Abstract Forms

Photocopies of the abstract form may be used.

Membership in IAMFES

Membership in IAMFES is NOT a requirement for presenting a paper at the IAMFES Annual Meeting.

IAMFES Abstract Form

DEADLINE: Must be Received by January 8, 1999

Title of Paper _____

Authors _____

Full Name and Title of Presenter _____

Institution and Address of Presenter _____

Phone Number: _____

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E-mail: _____

Developing Scientist Awards Competitions Yes

Major Professor/Department Head approval (signature and date) _____

Selected presentations may be recorded (audio or visual).

Check the format you prefer: Oral Poster Video Theater No Preference

**Please TYPE abstract, DOUBLE-SPACED, in the space provided here
in a font size no smaller than 12 point. No more than 200 words.**

Call for Entrants in the Developing Scientist Awards Competitions

(Supported by the IAMFES Foundation)

IAMFES is pleased to announce continuation of its program to encourage and recognize the work of students and recent graduates in the field of food safety research. Qualified individuals may enter either the Developing Scientist Oral Competition or the Developing Scientist Poster Competition.

Purpose:

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

DEVELOPING SCIENTIST ORAL AWARDS COMPETITION:

The Developing Scientist Oral Awards Competition is open only to **graduate students enrolled in M.S. or Ph.D. programs or recent M.S. or Ph.D. graduates** in programs at accredited universities or colleges where research deals with environmental, food or dairy sanitation, protection or safety. **Competition entrants cannot have graduated more than one year prior to the deadline for submitting abstracts.**

Prior to the Annual Meeting, up to ten finalists will be selected for Competition and awards will be presented at the Annual Meeting to the top three presenters (first, second and third places). Presentations are limited to fifteen minutes which should include two to four minutes for discussion.

Awards: First Place, \$500 and an engraved plaque; Second Place, \$300 and a framed certificate; Third Place, \$100 and a framed certificate. Award winners will also receive a complimentary, one-year IAMFES membership including both *Dairy, Food and Environmental Sanitation and Journal of Food Protection*.

DEVELOPING SCIENTIST POSTER AWARDS COMPETITION:

The Developing Scientist Poster Awards Competition is open to **enrolled undergraduate and graduate students or recent graduates from undergraduate or**

graduate programs at accredited universities or colleges where research deals with environmental, food or dairy sanitation, protection or safety. **Competition entrants cannot have graduated more than one year prior to the deadline for submitting abstracts.**

Prior to the Annual Meeting, up to ten finalists will be selected for Competition and awards will be presented at the Annual Meeting to the top three presenters (first, second and third places). The presentation must be mounted on an eight foot by four foot (8' x 4') display board provided at the Annual Meeting for the duration of the assigned Poster Session. The presenter must be present at his or her poster for the specified time (approximately two hours) during the assigned session.

Awards: First Place, \$500 and an engraved plaque; Second Place, \$300 and a framed certificate; Third Place, \$100 and a framed certificate. Award winners will also receive a complimentary, one-year IAMFES membership including both *Dairy, Food and Environmental Sanitation and Journal of Food Protection*.

INSTRUCTIONS TO DEVELOPING SCIENTIST AWARDS ORAL AND POSTER COMPETITIONS ENTRANTS:

1. Abstracts must be received by the IAMFES office no later than January 8, 1999.
2. In addition to adhering to the general procedures for abstract preparation and submission required of all individuals submitting abstracts, Competition entrants must submit **two additional** copies of their abstract (i.e., a total of four (4) copies must be submitted). **Competition entrants must also mark the appropriate box on the abstract form to indicate their intention to participate in the Developing Scientist Awards Competition and to designate whether it is "oral" or "poster."**
3. Both the Competition entrant and his or her presentation must be recommended and approved for the Competition by his or her major professor or department head, who must sign the abstract.
4. The work must represent original research done by the Competition entrant and must be presented by the Competition entrant.
5. Competition entrants may enter only one paper in either the Oral or the Poster Competition.

ADDITIONAL INFORMATION:

1. All Competition entrants are required to pay the registration fee (i.e., student member rate, Member rate, or nonmember rate). Nonmembers may join IAMFES and receive the member rate.
2. Acceptance of papers by IAMFES for presentation at the Annual Meeting is independent of acceptance as a Competition finalist. Competition entrants who are chosen as finalists will be notified of their status by the Competition Chairperson by June 1, 1999.
3. All Competition entrants (not just Competition finalists) with abstracts accepted by IAMFES will receive a complimentary, one-year IAMFES membership which includes their choice of *Dairy, Food and Environmental Sanitation* or *Journal of Food Protection*.
4. All Competition finalists will receive a complimentary Awards Banquet ticket and are expected to be present at the banquet where the award winners will be announced and recognized.

JUDGING THE DEVELOPING SCIENTIST AWARDS COMPETITIONS:

Abstracts and presentations will be evaluated by an independent panel of judges. Selection of up to ten finalists for the Developing Scientist Oral and Poster Awards Competitions will be based on evaluations of the

abstracts and the scientific quality of the work (see judging criteria). All Competition entrants will be advised of the judges' decisions by June 1, 1999.

Only the Competition finalists will be judged at the Annual Meeting and will be eligible for the awards. All other Competition entrants with abstracts accepted by the IAMFES Program Committee will be expected to present their papers/posters as part of the regular Annual Meeting program, but their presentations will not be judged and they will not be eligible for the awards.

JUDGING CRITERIA FOR THE DEVELOPING SCIENTIST AWARDS COMPETITIONS:

ABSTRACT:

Clarity; comprehensiveness; conciseness.

SCIENTIFIC QUALITY:

Adequacy of experimental design; extent to which objectives were met; difficulty and thoroughness of research; validity of conclusions based upon data; technical merit; contribution to science.

ORAL PRESENTATION OR POSTER PRESENTATION:

Organization (clarity of introduction, objectives, methods, results and conclusions); quality of visuals; quality and poise of presentation and in answering questions.

***NOTE: Your abstract must be received by the IAMFES office no later than January 8, 1999. Photocopies of the abstract form may be used.**

IAMFES Policy on Commercialism

1. INTRODUCTION

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

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

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

2. TECHNICAL CONTENT OF SUBMISSIONS AND PRESENTATIONS

2.1 Original Work

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

2.2 Substantiating Data

Submissions and presentations should present technical conclusions derived from technical data. If products or services are described, all reported capabilities, features or benefits, and performance parameters must be substantiated by data or by an acceptable explanation as to why the data are unavailable (e.g., incomplete, not collected, etc.) and, if it will become available, when. The explanation for unavailable data will be considered by the PC chairperson and/or technical reviewers

selected by the PC chairperson in order to ascertain if the presentation is acceptable without the data. Serious consideration should be given to withholding submissions and presentations until the data are available as only those conclusions that might be reasonably drawn from the data may be presented. Claims of benefit and/or technical conclusions not supported by the presented data are prohibited.

2.3 Trade Names

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

2.4 "Industry Practice" Statements

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

2.5 Ranking

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

2.6 Proprietary Information (See also 2.2.)

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

2.7 Capabilities

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

3. GRAPHICS

3.1 Purpose

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

3.2 Source

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

3.3 Company Identification

Names or logos of agencies or companies supplying the goods or services must not appear on the graphics, except on the first slide of the presentation. Slides showing products may not include predominant nameplates. Graphics with commercial names or logos added as background borders or corners are specifically forbidden.

3.4 Copies

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

4. INTERPRETATION AND ENFORCEMENT

4.1 Distribution

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

4.2 Assessment Process

Reviewers of submissions and presentations will accept only those that comply with this policy. Drafts

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

4.3 Author Awareness

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

4.4 Monitoring

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

4.5 Enforcement

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

4.6 Penalties

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

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UpDates

New DSM Joins G&H Sales Team

Mike O'Grady has accepted a position with G&H Products Corp. as a District Sales Manager (DSM). His territory includes Illinois, Michigan, Indiana, Ohio, Kentucky, and Tennessee.

O'Grady has spent ten years as a Sales Representative for a valve and fitting company in Illinois. There, he managed a Chicagoland territory that included manufacturing, research and development, food, biotechnology, and OEM accounts. Before his work there, O'Grady held several sales positions with other companies.

O'Grady also has experience conducting customer training programs and working regional and national sales conventions and trade shows. He has a bachelor's degree from John Carroll University and is a member of the International Society for Measurement and Control.

The International Food Safety Council Announces Staff Changes

The International Food Safety Council announces the promotion of Cindy Wilson to Director of Communications and the appointment of James Marovec, FMP, as Manager of Sponsor Relations.

Cindy Wilson joined the National Restaurant Association's Educational Foundation in 1994 as Manager of Communications and was instrumental in helping the organization to develop the International Food Safety Council. In her new role, Wilson's responsibilities will include directing the develop-

ment and implementation of strategies to build industry and public awareness of the Council; National Food Safety Education Month; and serving as the Council's Liaison with the Partnership for Food Safety Education, the Food Safety Training and Education Alliance, and the Conference for Food Protection.

James Marovec, who joined The Educational Foundation in 1993, advanced through a number of sales positions. He was also part of the original Food Safety management team. In his new role as Manager of Sponsor Relations for the Council, Marovec will be responsible for strategies to effectively market and incorporate sponsorships into business plans, developing and implementing the Council's fundraising strategies, managing *Best Practices* advertising, and assisting with the Council's Web site development.

Sherry Greenwood Named as IFPA Communications Director

Sherry Greenwood was recently hired as the Director of Communications for the International Fresh-cut Produce Association (IFPA). She joins the Association after spending four years as the Director of Communications for the National Forest Foundation in Washington, D.C.

Greenwood has more than ten years of communications and public relations experience in the non-profit field. As the Director of Communications for the National Forest Foundation, Greenwood produced award-winning publications, hosted press events focusing

on major projects and sponsors and increased national recognition of the new Foundation. Greenwood also has had experience with client relations, serving as an account executive with the Center for Substance Abuse Treatment while working for an advertising agency. Before moving to the Washington, D.C. area, Greenwood spent six years in fundraising and public relations positions that involved special event planning, grant writing, and strategic communications.

Osmonics Names New Executive Vice President Operations

Osmonics announced the promotion of Kenton Toomey to Executive Vice President Operations, with overall responsibility for operations, including manufacturing and information technology.

Osmonics manufacturing locations will support five new Global Business Units (GBU's) in a matrix-relationship. Osmonics recently established the GBU's to manage strategic leadership of related product lines worldwide. Previously, Osmonics was organized by strategic business units located geographically, each of which managed marketing and manufacturing for its own individual products.

Toomey will also oversee Osmonics' company-wide transition to the SAP management information system. Based on the Manufacturing Resource Planning methodology (MRPII), the system integrates order entry globally and will help Osmonics respond more quickly to customer queries throughout the order process.

Formerly Vice President Operations, Toomey joined Osmonics in April 1997 after more than 25 years managing logistics of component manufacturing for 3M and other large organizations. At 3M he helped lead the company's first just-in-time manufacturing practices. He also began the quality management drive that eventually helped 3M Dental Products Division win the Malcolm Baldrige National Quality Award. Toomey earned his bachelor's degree in industrial engineering from the University of Iowa.

Copesan Hires National Account Manager for West Coast

Copesan Services, Inc., has selected Dennis Madison as its newest National Account Manager. Due to Copesan's tremendous growth, this newly created position has Dennis overseeing Copesan's sales efforts for the West Coast.

Madison brings a wealth of sales experience to his new position, including 15 years in the window covering industry prior to joining Copesan. Most recently he was the Vice President of Sales and Marketing for Sierra Window Fashions.

Quality Chekd Dairies Names New Marketing Director

Quality Chekd Dairies, Inc., has named Molly M. Murphy as Marketing Director. Ms. Murphy's responsibilities include directing and implementing marketing strategies that support Quality Chekd members, the Quality Chekd

brand, and member branded dairy products. She is also in charge of providing targeted marketing consultation and tools to Quality Chekd's member dairies. Quality Chekd licensed dairy processors are committed to fresh taste and quality standards that exceed those mandated by the dairy industry.

Prior to joining Quality Chekd, Ms. Murphy worked for Fort James Corp. for 14 years. She is a graduate of the University of Northern Iowa and holds a bachelor of arts degree.

Claypool Re-elected to Lead A.D.P.I.

Dr. Larry L. Claypool, Dairy Farmers of America, Inc., Springfield, MO, was re-elected President of the American Dairy Products Institute during the association's annual meeting held in Chicago. Claypool, a member of the A.D.P.I. Board of Directors since 1985, has served on the Institute's Executive Committee since 1987; he served as A.D.P.I. Vice President in 1995 and 1996. Claypool was first elected President of A.D.P.I. in 1997.

Re-elected as Vice President was Dr. Lee E. Blakely, Dairyman's Cooperative Creamery Assn., Tulare, CA. Blakely was first elected a Director of the American Dairy Products Institute in 1989 and has been a member of the A.D.P.I. Executive Committee since 1990.

Other officers re-elected to head the association were: Secretary, Mark Davis, Davisco Foods International, Inc., Le Sueur, MN and Treasurer, Wait Wosje, Michigan Milk Producers Assn., Novi, MI.

Re-elected to serve as members of the Institute's executive commit-

tee were the above-named officers and directors Donald L. Brick, Swiss Valley Farms Co., Davenport, IA; Michael P. Fronk, Land O'Lakes, Inc., Minneapolis, MN; Bob L. Hall, O-AT-KA Milk Products Cooperative, Inc., Batavia, NY; John A. Hardy, Foremost Farms USA, Baraboo, WI; Edward R. Kerr, Grande Cheese Co., Brownsville, WI; Harlan H. Mammen, Associated Milk Producers, Inc., New Ulm, MN; William J. Merrick, III, Merrick's, Inc., Middleton, WI; Phillip Dale Smith, Leprino Foods, Denver, CO; Richard W. Stammer, Agri-Mark, Inc., Lawrence, MA; John F. Underwood, Darigold, Inc., Seattle, WA; and John D. Whetten, Challenge Dairy Products, Inc., Dublin, CA.

SRC Vision Announces New Vice President of Engineering

SRC Vision, Inc., has appointed Steve Miner as its new Vice President of Engineering.

Miner has nearly 20 years of engineering experience, most recently with S3, Inc. in Santa Clara, CA, in applications engineering and technical liaison with major OEMs. A graduate of electrical engineering at MIT, Cambridge, MA in 1979, Miner's experience also includes underwater acoustics work at Hazeltine Electric-Acoustics Systems Labs, and Applications Engineer for National Semiconductor Sales in Boston, MA.

Miner also started three successful companies in the areas of power engineering, semiconductor sales and environmental control systems. He is replacing Jack Heffington, who is retiring after 23 years with SRC.

NSF, 3-A Announce Historic First Meeting of Joint Committee on Food Processing Equipment

The Joint Committee on Food Processing Equipment held its first meeting on July 8, 1998 at the World Headquarters of NSF International in Ann Arbor, MI. The Joint Committee, the result of a collaborative effort between NSF International (formerly National Sanitation Foundation) and the 3-A Sanitary Standards Committee, is comprised of food producers and processors, food processing equipment manufacturers, and federal, state and local regulatory officials having food protection responsibilities. The Joint Committee's primary charge has been to develop American National Standards for the hygienic design of food processing equipment and to seek harmonization with the relevant international Standards. The Joint Committee focused on how voluntary consensus Standards may best serve stakeholders in the meat and poultry industry since the elimination of the equipment approval guidelines used by the U.S. Department of Agriculture in regulated plants.

The Joint Committee supported a motion to send ISO/DIS 14159 *Safety of Machinery – Hygienic Requirements for the Design of Machinery* to ballot for adoption as an American National Standard. This Draft International Standard will be balloted in accordance with NSF's Standards Development Procedures, which are accredited by the American National Standards Institute. Following the appropriate ANSI public comment period and the resolution of any comments, the Standard will be designated as an ANSI/NSF/3-A Standard. This Standard, which contains general sanitation requirements for process-



ing equipment, will serve as the foundation for the development of Standards for specific categories of processing equipment, as the need is identified.

The Joint Committee recommended the formation of a Task Group on Meat and Poultry Equipment. The Task Group will define categories of meat and poultry processing equipment for which sanitation Standards are most needed and prioritize the Standard development activities accordingly. The Task Group will be comprised of Joint Committee members and others having a material interest in development of meat and poultry equipment Standards. The Joint Committee recognized that additional Task Groups may be required in the future to address needs in other food industry sectors, while emphasizing the continued recognition of existing processing equipment Standards such as the 3-A Sanitary Standards for dairy equipment.

Those interested in becoming involved in Joint Committee or Task Group activities should submit requests to Andrea Jensen, Vice President of Standards at NSF by Fax at 734.769.0109 or E-mail: jensen@nsf.org.

FDA Guidance on BSE Feed Regulation Available

FDA's Center for Veterinary Medicine (CVM) has released a guide intended to answer questions about "Animal Proteins Prohibited from Animal Feed," the BSE feed regulation. The guide, titled "Questions and Answers – BSE Feed Regulation" (Guidance Document 76) is intended to supplement the Small Entity Compliance Guides for the regulation, specifically the following FDA Guidance for Industry documents:

67 – Renderers; 68 – Protein Blenders, Feed Manufacturers, and Distributors; 69 – Feeders of Ruminant Animals With On-Farm Feed Mixing Operations; and 70 – Feeders of Ruminant Animals Without On-Farm Feed Mixing Operations.

FDA's final rule (21 CFR 589.2000) became effective August 4, 1997, and prohibits the feeding of certain mammalian protein to ruminant animals. It is designed to prevent the establishment and amplification through feed of bovine spongiform encephalopathy (BSE) in the United States.

Recently, CVM cosponsored a national satellite teleconference to show feed mill managers how to comply with the BSE rule and to help assure them that an FDA inspection would find their mill in compliance. Questions and answers from the teleconference will be available soon, and posted on CVM's Internet Home Page, completely separate from this guidance document.

The guide is available through the CVM Internet Home Page (www.fda.gov/cvm) or by calling the CVM Communications Staff at 301.594.1755. Additional information regarding this document may be obtained by contacting Gloria Dunnavan, Center for Veterinary Medicine, Division of Compliance, HFV-230, 7500 Standish Place, Rockville, MD 20855, 301.594.1726.

United States Filter Corporation Acquires Tote Systems Inc.

United States Filter Corporation announced that it has acquired Tote Systems Inc. as part of a strategic move to service the "fill/finish" market, one of the fastest growing segments of the pharmaceutical industry.

USF Industrial Products plans to integrate Tote Systems into its Kinetics group a part of a long-term strategy to develop a one-stop-shop for the pharmaceutical industry. Terms of the transactions were not disclosed.

"Our newly formed relationship with Tote Systems brings expertise to Kinetics in dry powder handling and is a key component of our worldwide turnkey process offering to the pharmaceutical industry," said David J. Shimmon, President and Chief Operating Officer of USF Industrial Products.

U.S. Poultry & Egg Association Backs Food Safety Campaign

The U.S. Poultry & Egg Association will extend its financial support for the Partnership for Food Safety Education's public awareness campaign through 1998. Fight BAC![™] is a multi-pronged effort to teach people of all ages how they can reduce the spread of foodborne illness. The two-year-old campaign is funded by the contributions of U.S. Poultry and eight other industry trade associations. Technical assistance and in-kind support is provided by government agencies and consumer organizations.

The Partnership for Food Safety Education was formed in response to a 1996 independent panel report that called for a public-private partnership to educate the public about safe food handling and preparation.

The multi-year campaign utilizes public service announce-

ments, point-of-purchase materials, and school and community outreach efforts to bring Americans face-to-face with the problem of foodborne illness and to motivate them to take action. Additional information is also available via the Partnership's Web site, located at www.fightbac.org.

The group accomplishes its mission by mobilizing a national network of public health, nutrition, food science, education, and special constituency groups to support the campaign and extend its reach.

Learn about Food Irradiation from New Web Site

Recent outbreaks of foodborne illness and the resulting media focus on foodborne contamination are increasing consumer interest in food irradiation as a method to preserve and maintain the quality of food. A new irradiation Web site, sponsored by the Food Safety Consortium and Iowa State University Extension, answers common consumer questions about the food irradiation process. Visitors to the site see a representation of the Linear Accelerator Facility, the only facility in the country for training, demonstration and education on food irradiation.

The facility gives researchers the opportunity to study irradiation as a method of improving food safety by studying irradiation's effects on foodborne pathogens and meat quality. Many consumers worry that food irradiation may be a substitute for using clean procedures earlier in the processing chain, but Dennis G. Olson, Director of the Facility and Consortium Principal Investigator, disagrees. "When pasteurization of milk was adopted, some expected dairies to become dirtier. Just the opposite happened," says Olson. "Any producer or company that wants to stay in business will need to deliver a uniform, high-quality product. If you're sloppy, you won't

stay in business. And irradiation can only kill bacteria; it can't clean up physical contaminants." The Web site gives consumers the tools they need to make knowledgeable decisions about irradiated foods in their food supply. A glossary of food irradiation terms, animation of a typical irradiation procedure and the history of food irradiation are just a few of the resources available. The Web site address is www.foodsafety.iastate.edu.

KOCH Membrane Systems, Inc. Acquires Fluid Systems Corp.

Koch Membrane Systems, Inc., has acquired Fluid Systems Corporation of San Diego, CA.

"We're very excited about joining the Koch team," said Randy Truby, President of Fluid Systems. "Many membrane systems operating globally already have a combination of Koch and Fluid Systems membrane products. Koch offers leading edge membrane technology, and equally impressive is the research Koch is undertaking. New Koch products, combined with innovations being developed by Fluid Systems' researchers, will provide our customers with a variety of cost-effective solutions to purification challenges for years to come."

Spices May Reduce *Escherichia coli* O157:H7 in Meat

Consumers may have an arsenal of food safety weapons in their spice racks, according to Kansas State University (KSU) researchers, who presented preliminary study results on the antimicrobial properties of spices at the Institute of Food Technologists' (IFT's) 1998 Annual Meeting & Food Expo[®] in Atlanta June 21.

The researchers' poster "Reduction of *Escherichia coli* O157:H7 in Ground Meat by Selected Spices" reported the antimicrobial effects

of 24 spices tested against the food-borne pathogen in a laboratory medium, uncooked hamburger, and uncooked salami. KSU researchers included Erdogan Ceylan, M.S., Donghyun Kang, Ph.D., and Daniel Y.C. Fung, Ph.D.

In the hamburger study, "clove had the highest inhibitory effect, [followed] in potency by cinnamon, garlic, oregano, and sage," Fung said. However, in the laboratory studies, garlic had the highest inhibitory effect.

The addition of 1.0 percent spice (garlic, clove, and cinnamon) to salami mixed with starter culture and *E. coli* O157:H7 resulted in successful salami fermentation and slight reduction of the pathogen. However, the addition of 7.5 percent garlic and clove killed 99 percent of the pathogen and still resulted in successful salami fermentation.

Though finding the right balance between antimicrobial effectiveness and taste was a challenge, the KSU study showed that clove, cinnamon, and garlic may have the potential to be used in meat products, especially in fermented ones, to control the growth of *E. coli* O157:H7. Fung said his research may be also applied to other pathogens because often when *E. coli* is killed, *Salmonella* and other bad bugs are also destroyed.

"If you add more spice to your cooking, you will definitely knock off more microorganisms, especially if you [season with the spices] that we said kill *E. coli*,"

Fung said. "For food manufacturers, similarly, if they use more spice in their products, they will kill more microorganisms."

However, KSU's research has not yet determined whether the amounts of spice that are effective against pathogens are practical for consumers to use in cooking or for food manufacturers to create good-tasting products. Moreover, regardless of how much spice consumers put in their food, they should always use safe food handling practices, including cooking ground beef to an internal temperature of 160°F or until its juices run clear. Only thorough cooking and irradiation can eliminate *E. coli* O157:H7.

Though spices may be able to reduce *E. coli* O157:H7 in meat, they do not appear to be able to eliminate it, which underscores the importance of proper cooking. Eliminating *E. coli* O157:H7 is the only way to eliminate risk of infection since the pathogen has an unusually low infectious dose. In people with compromised immune systems, for example, fewer than 10 cells may cause illness. Spices, however, may potentially add another margin of safety to proper food handling and cooking.

The antimicrobial properties of spices have been noted in several studies, including one published by Cornell University researchers in *The Quarterly Review of Biology* in March 1998.

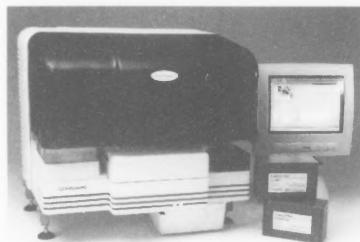
The next step in KSU's research is to test the effect of variables,

such as cooking, on the antimicrobial power of spices in specific meats.

3-A Symbol Council Adopts New Authorization Policy

The Board of Trustees, 3-A Sanitary Standards Symbol Administrative Council, has adopted a new policy regarding authorization to utilize the 3-A Symbol on processing equipment meeting 3-A Sanitary Standards. At its June 5 meeting, the Trustees unanimously agreed to authorize use of the 3-A Symbol only by manufacturers and/or authorized non-manufacturers of new equipment meeting established 3-A Sanitary Standards. Used equipment (including physically modified, remanufactured, etc.) may be authorized to bear the 3-A Symbol if the specific piece of equipment is re-certified by the Symbol Council subsequent to its initial sale. Re-certification may be granted by the 3-A Symbol Council to the original manufacturer of the equipment or to a third party through a certification process approved by the Symbol Council.

Additional information about this re-certification program may be obtained from the 3-A Sanitary Standards Symbol Administrative Council Office, 3020 Bluff Road, Columbia, SC 29209-3502 or from Mr. Earl O. Wright, Secretary-Treasurer, 35 Chelsea Lane, Bella Vista, AR 72714.



Gene Trak Systems

New Automated High Throughput System for *Salmonella* Detection

GENE-TRAK Systems announced the availability of a new rapid automated system for screening *Salmonella* spp. in food. The Transia Elisamatic II is a compact unit specifically designed for use with the Transia Plate *Salmonella* SEP Assay and programmed for walkaway convenience. The Windows® 95 based software offers user-friendly operation and requires minimal training. Up to 186 samples can be analyzed in one run to reduce work load and labor costs. The Transia Elisamatic II features two incubators and two photometric stations, and is capable of multianalyte processing. Ready to use reagents, removable sample racks, and disposable tips offer rapid loading of samples. The Transia Plate *Salmonella* SEP Assay is an immunoassay that detect all motile *Salmonella* spp. using a short enrichment protocol.

Gene-Trak Systems, Hopkinton, MA

Reader Service No. 322

The Dow Chemical Company Introduces VERSENE CA Chelant

Researchers have learned that VERSENE™ CA calcium disodium EDTA is an important additive for beverages, particularly citrus or fruit flavored drinks, to extend product shelf life and quality. Recently, VERSENE CA played a key role in the reformulation of several lemon-lime flavored drinks.

VERSENE CA chelant is food-grade EDTA, a chelating agent that controls metal ions present in beverages and other food products. Control of these ions is important because they cause quality problems and degrade product flavor and appearance. Using VERSENE CA preserves color, flavor, vitamins, and other ingredients of soft drinks and foods. And though its application is not limited to carbonated and uncarbonated soft drinks, it is an area of special interest in the beverage industry.

Metal ions are naturally present in foods and can also be added with process water and equipment used in processing. Soluble metal ions can accelerate chemical reactions that reduce consumer appeal. Even in low concentrations, metal ions can cause spoilage, rancidity, bad smells, and off flavors—always quality problems for the food or beverage processor. Formulators using VERSENE chelating agents to control metal ions ill effects are reaping benefits in the form of higher sales and more repeat business.

VERSENE CA will inhibit undesirable metal catalyzed reactions by forming complexes with metal ions. The resulting structure, known as chelate, deactivates the metal ion and prevents the ion from reacting with other components. VERSENE CA provides the only sufficiently stable complex with metal ions in foods to accomplish this effect. The benefits to food processors and beverage manufacturers are predictable performance, delivering the most appealing product every time.

The Dow Chemical Co.,
Midland, MI

Reader Service No. 323

New *Listeria Monocytogenes* Detection System

Biosynth is pleased to introduce the new BCM® *Listeria monocytogenes* Detection System for the identification and isolation of *Listeria monocytogenes* from food, clinical, or environmental samples. This detection system includes a pre-enrichment broth, a fluorogenic selective enrichment broth, a chromogenic plating medium, and a fluorogenic confirmatory medium. The fluorogenic and chromogenic reactions included in this system identify a specific *Listeria* virulence factor, which makes the system highly specific for *Listeria monocytogenes* and *Listeria ivanovii*. This detection system offers advantages over the

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standard esculinase reaction including a colony specific color reaction compared to a completely black plate, a more rapid test with a presumptive fluorogenic positive possible within 48 hours, and the virtual elimination of false positives.

Biosynth International, Inc., Naperville, IL

Reader Service No. 324

Advanced Design Makes the New V-Master™ Vortex Flowmeter a Standout

ABB has just introduced its V-Master vortex-shedding flowmeter. This flowmeter, able to measure liquid, gas, and steam, has been engineered to excel in applications in the chemical, energy, and processing industries.

This vortex-shedding flowmeter measures process flow by detecting the frequency at which vortices are alternatively shed from a bluff body within the unit. The vortices create a differential force across a sensor wing, flexing it at a frequency proportional to the flow rate.

To ensure maximum safety, this unique flowmeter features fully welded construction in the shedder bar and sensor area. This type of construction makes the unit as strong and safe as a standard pipe of the same wall thickness. It also has no internal gaskets that could fail and lead to hazardous leaks.

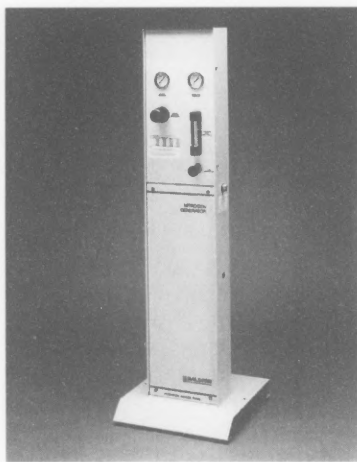
Another design breakthrough called for mounting all electrical parts, including the piezoelectric crystal sensor, outside the pipe. This makes it possible to replace the sensor without shutting down the process or risking exposure to hazardous fluids or gases.

The new V-Master flowmeter has a number of enhancements that make it one of the highest-performance flowmeters in the industry.

Using microprocessor technology, an advanced digital filter applies the laws of fluid mechanics to eliminate noise caused by vibration. The unit's digital readout shows values, settings, and errors in an 8-character-by-2-line alphanumeric display. Finally, built-in loop calibration eliminates the need for external testing equipment.

ABB Instrumentation, Rochester, NY

Reader Service No. 325



Whatman Inc.

New Nitrogen Generation System

Costly, inconvenient cylinders, Dewars of nitrogen supplies can now be eliminated with a new nitrogen generation system now available from Whatman, Inc.

The Balston® Membrane Nitrogen Generator is capable of producing up to 31.5SCFH of high purity compressed nitrogen at a dewpoint of less than -58°F from any compressed air supply regardless of its quality. The generator is engineered to continuously transform standard compressed air into nitrogen at safe, regulated pressures, without operator attention.

Nitrogen is produced with proprietary membrane separation technology. High efficiency prefiltration pretreats the com-

pressed air to remove all contaminants down to 0.01 micron.

The generator is shipped complete with prefilters, autodrain and a final membrane filter. An oxygen analyzer to monitor the oxygen concentration of the nitrogen stream is available as an option.

Whatman Inc., Tewksbury, MA

Reader Service No. 326

New SystemSURE™ Rapid Hygiene Monitoring System

Becton Dickinson Microbiology Systems, Sparks, Maryland, announces the immediate availability of the new system SURE™ Rapid Hygiene Monitoring System, designed to be an integral component of the Hazard Analysis Critical Control Point (HACCP) plans of food, dairy, beverage, cosmetic, and pharmaceutical product manufacturers. Utilizing bioluminescence technology to detect and measure soiling, the system measures the total amount of adenosine triphosphate (ATP), a molecule that provides the energy source for all living organisms, on surfaces. The systemSURE™ Rapid Hygiene Monitoring System provides a measure of not only microbial contamination but also residues that could act as a breeding ground for microorganisms.

In a recent comparative study, the systemSURE™ Rapid Hygiene Monitoring System was shown to be significantly more sensitive than other tests, detecting low levels of contamination, characterized by invisible soils. The system "appeared to be the most sensitive system for detecting residual food residue diluted beyond visibility." The systemSURE™ Rapid Hygiene Monitoring System was also rated "more consistent" in reproducibility, the ability of a system to allow

different users to produce the same results from the same surface/sample consistently.

With ATP bioluminescence, ATP reacts with the systemSURE™ reagents. The amount of light produced is directly proportional to the level of ATP and is measured by the luminometer. In the system-SURE™ testing process, the surface to be checked is swabbed, using the dedicated swab supplied. Reagent is added, and the result is read on the instrument display. The whole test takes less than a minute, and the simple process requires minimal training.

Featuring a truly portable, lightweight, handheld unit weighing less than 1.5 pounds, The systemSURE™ Rapid Hygiene Monitoring System provides a rapid identification of the hygienic status of surfaces. The luminometer case is constructed of sturdy aluminum and the unit is supplied with a water and fire resistant carrying case to protect it from potential hazards in a manufacturing environment.

Becton Dickinson Microbiology Systems, Sparks, MD

Reader Service No. 327

Thermedics Detection Introduces DairyScan™ for Net Content Analysis of Dairy Products

The DairyScan™ Imaging Systems from Thermedics Detection assures proper net content for dairy industry bottlers and fillers. The new DairyScan is now available to determine net content of containers with liquids and detect voids in nonliquid dairy products. This new inspection system provides high speed, noncontact, nondestructive inspection of 100% of the containers on a

production line, at up to 2,400 containers per minute. Milk containers and juice containers are inspected for proper fill levels, improper or missing lids, caps, or tabs with DairyScan. Yogurt containers, cottage cheeses, margarines, other packaged cheeses and ice cream are all inspected for net content, including void detection with DairyScan. DairyScan is accurate and reliable, boasts a very small footprint and offers a variety of means for removing improperly filled containers. The systems are expanded and enhanced versions of the popular InScan x-ray scanning system, designed for quality control in filling lines.

The DairyScan measures and records the net volume content of each container. It provides a statistical software package to help meet FTC reporting requirements.

Thermedics Detection, Chelmsford, MA

Reader Service No. 328

New, Food Grade Synthetic Lubricants Protect Equipment Better than Ever Before

A wide variety of synthetic lubricants designed for use in H1 and/or H2 food grade applications are available from ANDEROL Company. According to the manufacturer, these synthetic products not only outperform food grade mineral oils, they actually perform better than many widely used "premium performance" oils which do not meet USDA requirements. As a result, processors of foods, beverages, pharmaceuticals, and other consumables no longer must sacrifice performance, productivity, or efficiency for regulatory compliance.

Anderol Food Grade Lubricants are designed for use in such food and pharmaceutical applications as baking and bottling, as well as in the processing of pharmaceuticals, fruits, vegetables, meats, poultry, canning, and dairy. Some typical uses include air compressors, gear boxes, tabletizers/capsulators, bearings, canners, packaging equipment, pumps, hydraulic systems, slicers, ways, chains, homogenizers, fillers, wrappers, and seals. Several of the lubricants have earned "OU/Kosher and Pareve" approval.

All these Anderol Food Grade Lubricants maximize equipment performance and minimize wear. They provide good resistance to the water and steam commonly found in food plants, and perform extremely well under rigorous operating conditions, including pressures as high as 3,000 psi and temperatures up to 450°F.

Anderol Company, East Hanover, NJ

Reader Service No. 329

Röhm Enzyme Introduces VERON® 2000

Röhm Enzyme has introduced VERON® 2000 specialty enzyme product that improves dough stability and crumb softness in bread and rolls.

VERON® 2000 can be added to premixes, dough conditioners and at the bakery, together with other baking ingredients.

Obtained from specific cultures of *Aspergillus oryzae*, VERON® 2000 enzyme product ensures better proofing tolerance, improved dough and fermentation stability, excellent machinability, shelf-life extension, improved frozen dough performance, and excellent bromate replacement.

Creanova Inc., Somerset, NJ

Reader Service No. 330

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IAMFES Lending Library

DAIRY

- ❑ **The Bulk Milk Hauler: Protocol & Procedures**—(8 minute videotape). 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) (Rev. 1998)
- ❑ **Causes of Milkfat Test Variations and Depressions**—(30 minute-140 slides-tape-script). This set illustrates the many factors involved in causing milkfat test variations or depressions in your herd, including feeding, management, stage of lactation, age of samples, handling of samples, and testing procedures. The script was reviewed by field staff, nutritionists, laboratory personnel and county extension staff. It is directed to farmers, youth and allied industry. (Penn State-1982)
- ❑ **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) (Rev. 1998)
- ❑ **Ether Extraction Method for Determination of Raw Milk**—(26 minute videotape). Describes the ether extraction procedure to measure milkfat in dairy products. Included is an explanation of the chemical reagents used in each step of the process. (CA-1988) (Rev. 1998)
- ❑ **The Farm Bulk Milk Hauler**—(30 minute-135 slides-tape-script). This set covers the complete procedure for sampling and collecting milk from farms. Each step is shown as it starts with the hauler entering the farm lane and ends when he leaves the milk house. Emphasis is on universal sampling and automated testing. Funds to develop this set were provided by The Federal Order #36 Milk Market Administrator. (Penn State-1982) (Rev. 1998)
- ❑ **Frozen Dairy Products**—(27 minute videotape). 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 and 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) (Rev. 1997)
- ❑ **The Gerber Butterfat Test**—(7 minute videotape). Describes the Gerber milkfat test procedure for dairy products and compares it to the Babcock test procedure. (CA-1990) (Rev. 1998)
- ❑ **High-Temperature, Short-Time Pasteurizer**—(59 minute videotape). Provided by the Dairy Division of Borden, Inc. It was 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) (Rev. 1997)
- ❑ **Mastitis Prevention and Control**—(2-45 minute videotapes). 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, Postmilking Teat Dip Protocols, Milk Quality, Milking Systems. (Nasco-1993)
- ❑ **Milk Plant Sanitation: Chemical Solution**—(13 minute videotape). 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, and caustic wash and an acid wash in a HTST system. Emphasis is also placed on record keeping and employee safety. (1989)
- ❑ **Milk Processing Plant Inspection Procedures**—(15 minute videotape). Developed by the California Department of Food and Agriculture. It covers pre- and post- inspection meeting 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 locker and restrooms. Recommended for showing to plant workers and supervisors. (CA-1986)
- ❑ **Pasteurizer: Design and Regulation**—(16 minute videotape). 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)
- ❑ **Pasteurizer Operation**—(11 minute videotape). 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) (Rev. 1998)
- ❑ **Processing Fluid Milk**—(30 minute-140 slides-script-tape). It 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) (Rev. 1998)

- Safe Milk Hauling—You're the Key—(34 minute videotape). Recommended for anyone who samples, measures and collects milk from dairy farms. The purpose of this tape is to acquaint milk handlers with the proper procedures for sampling and picking up milk at the farm and delivering it safely to the handling plant. This tape provides an excellent review for experienced milk haulers and shows step-by-step procedures for novice milk haulers. (Cornell University)
- 3-A Symbol Council—(8 minute videotape). A video which was developed to make people in the dairy and food industries aware of the 3-A program and its objectives.
- 10 Points to Dairy Quality—(10 minute videotape). 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) (Rev. 1998)

FOOD

- Cleaning and Sanitizing in Vegetables Processing Plants: Do It Well, Do It Safely!—(16 minute videotape) 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 processing plant as it is for washing dishes at home. (University of Wisconsin Extension-1996)(Available in Spanish)
- Close Encounters of the Bird Kind—(18 minute videotape). 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.) (Rev. 1998)
- Egg Handling and Safety—(11 minute videotape). Provides basic guidelines for handling fresh eggs which could be useful in training regulatory and industry personnel. (American Egg Board-1997)
- Food Irradiation—(30 minute videotape). 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, overripening, 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.) (Rev. 1998)
- Food Safe—Food Smart—HACCP and Its Application to the Food Industry—(2-16 minute videotapes). (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) (Rev. 1998)
- Food Safe—Series I—(4-10 minute videotapes). (1) "Receiving & 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 Facilities 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 Food-service 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) "Food-service House-keeping 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) (Rev. 1998)
- Food Safe—Series II—(4-10 minute videotapes). 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)
- Food Safe—Series III—(4-10 minute videotapes). 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) (Rev. 1998)
- Food Safety: An Educational Video for Institutional Food Service Workers—(10 minute videotape). 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. (U.S. Department of Health & Human Services-1997)
- Food Safety is No Mystery—(34 minute videotape). This is an excellent training visual for food-service 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 food-service 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). Also available in Spanish. (Rev. 1998)

- ❑ **Food Safety: For Goodness Sake, Keep Food Safe**—(15 minute videotape). Teaches foodhandlers 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) (Rev. 1998)
- ❑ **Food Safety: You Make the Difference**—(28 minute videotape). Through five food workers from differing backgrounds, this engaging and inspirational documentary style video illustrates the four basic food safety concepts: handwashing, preventing cross-contamination, moving foods quickly through the danger zone, and hot/cold holding (Seattle-King County Health Department-1995)
- ❑ **GMP Basics — Employee Hygiene Practices**—(20 minute videotape). 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)
- ❑ **GMP: Personal Hygiene and Practices in Food Manufacturing**—(14 minute videotape). 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) (Available in Spanish and Vietnamese)
- ❑ **GMP: Sources and Control of Contamination during Processing**—(20 minute videotape). 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)
- ❑ **HACCP: The Hazard Analyses & Critical Control Points System**—(20 minute videotape). Provides a comprehensive overview of HACCP for food processing professionals. Should become "required viewing" for professionals implementing or reviewing HACCP for their food plant. (AgriFood Canada-1996)
- ❑ **HACCP: Safe Food Handling Techniques**—(22 minute videotape). 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 Association-1990) (Rev. 1998)
- ❑ **Is What You Order What You Get? Seafood Integrity**—(18 minute videotape). 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) (Rev. 1998)
- ❑ **Northern Delight—From Canada to the World**—(13 minute videotape). 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.)
- ❑ **On the Front Line**—(18 minute videotape). 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)
- ❑ **On the Line**—(30 minute videotape). 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. (Available in Spanish) (The Food Processors Institute-1993)
- ❑ **Proper Handling of Peracetic Acid**—(15 minute videotape). Introduces peracetic acid as a chemical sanitizer and features the various precautions needed to use the product safely in the food industry.
- ❑ **Purely Coincidental**—(20 minute videotape). 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.) (Available in Spanish.)
- ❑ **100 Degrees of Doom... The Time and Temperature Caper**—(14 minute videotape). 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)
- ❑ **Pest Control in Seafood Processing Plants**—(26 minute videotape). Videotape which 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.

- ❑ **Principles of Warehouse Sanitation**—(33 minute videotape). 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)
- ❑ **Product Safety and Shelf Life**—(40 minute videotape). Developed by Borden Inc., 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 problems 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—1987) (Rev. 1997)
- ❑ **Safe Food: You Can Make a Difference**—(25 minute videotape). 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 handwashing as methods of foodborne illness control is provided. The video provides an orientation to food safety for professional foodhandlers. (Tacoma—Pierce County Health Department—1990) (Rev. 1998)
- ❑ **Safe Handwashing**—(15 minute videotape). Twenty-five percent of all foodborne illnesses are traced to improper handwashing. The problem is not just that handwashing 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 and Management—1991)
- ❑ **Sanitation for Seafood Processing Personnel**—(20 minute videotape). A training video suited for professional foodhandlers working in any type of food manufacturing plant. The film highlights Good Manufacturing Practices and their role in assuring food safety. The professional foodhandler is introduced to a variety of sanitation topics including: 1) foodhandlers 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.
- ❑ **Sanitizing for Safety**—(17 minute videotape). Provides an introduction to basic food safety for professional foodhandlers. 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)
- ❑ **Seafood Q & A**—(20 minute videotape). Anyone who handles seafood, from processor to distributor to retail and food service, must be prepared to answer questions posed by customers. This tape features a renowned nutritionist and experts from the Food & Drug Administration, the National Marine Fisheries Service, and the National Fisheries Institute who answer a full range of questions about seafood safety. Excellent to educate and train employees about seafood safety & nutrition. (National Fisheries Institute)
- ❑ **SERVSAFE® Serving Safe Food**—(4-20 minute videotapes). This video series illustrates and reinforces important food safety practices in an informative and entertaining manner. The material is presented in an easy to understand format, making it simpler for employees to learn and remember this essential information. Each video includes a leader's guide that provides all the information managers need to direct a productive training session. (Educational Foundation of the National Restaurant Association—1993)
- ❑ **SERVSAFE® Serving Safe Food Second Edition**—(6-10 minute videotapes). The program still covers all the major areas of food safety training, but there is an added emphasis on training employees to follow HACCP procedures. The second edition program includes an Employee Guide, Leader's Guide and six instructional videos. (Educational Foundation of the National Restaurant Association—1993)
- ❑ **Smart Sanitation: Principles and Practices for Effectively Cleaning Your Food Plant**—(20 minute videotape). 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 Group—1996)
- ❑ **Supermarket Sanitation Program—"Cleaning and Sanitizing"**—(13 minute videotape). 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)
- ❑ **Supermarket Sanitation Program—"Food Safety"**—(11 minute videotape). Contains a full range of basic sanitation information with minimal emphasis on product. Filmed in a supermarket, the video is designed as a basic program for manager training and a program to be used by managers to train employees. (1989)
- ❑ **Take Aim at Sanitation**—(8 minute videotape). This video features tips on food safety and proper disposal of single service items. Also presented is an emphasis on food contact surfaces as well as the manufacture, storage and proper handling of these items. (Foodservice and Packaging Institute, Inc.—1995) (Available in Spanish)
- ❑ **The Heart of HACCP**—(22 minute videotape). 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 Group—1994)
- ❑ **Wide World of Food-Service Brushes**—(18 minute videotape). 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)

- ❑ **Your Health in Our Hands—Our Health in Yours—**(8 minute videotape). For professional foodhandlers, the tape covers the dos and don'ts of foodhandling as they relate to personal hygiene, temperature control, safe storage and proper sanitation. (Jupiter Video Production—1993) (Rev. 1998)

ENVIRONMENTAL

- ❑ **The ABC's of Clean—A Handwashing & Cleanliness Program for Early Childhood Programs—**For early childhood program employees. This tape illustrates how proper handwashing and clean hands can contribute to the infection control program in daycare centers and other early childhood programs. (The Soap & Detergent Association—1991)
- ❑ **Acceptable Risks?—**(16 minute videotape). 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)
- ❑ **Air Pollution: Indoor—**(26 minute videotape). 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.)
- ❑ **Asbestos Awareness—**(20 minute videotape). 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)
- ❑ **Down in the Dumps—**(26 minute videotape). Garbage is no laughing matter. The fact is that we are running out of space to dump the vast amounts of waste we create each day. Since many of the former methods of disposal are environmentally unacceptable, what are we to do? The program examines the technological approaches to the garbage dilemma, including composting, resource recovery, and high-tech incinerators, and public reaction to the creation of new waste treatment facilities. (Films for the Humanities & Sciences, Inc.)
- ❑ **EPA Test Methods for Freshwater Effluent Toxicity Tests (using Ceriodaphnia)—**(22 minute videotape). Demonstrates the Ceriodaphnia 7-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)
- ❑ **EPA Test Methods for Freshwater Effluent Toxicity Tests (Using Fathead Minnow Larva)—**(15 minute videotape). A training tape that teaches environmental professionals about the Fathead Minnow Larval 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)
- ❑ **Fit to Drink—**(20 minute videotape). 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)
- ❑ **Food-Service Disposables: Should I Feel Guilty?—**(12 minute videotape). The video, produced by the Food-service & Packaging Institute, Inc., national trade association of manufacturers and suppliers of single service articles for food service and packaging, examines such issues as litter, solid waste, recycling, composting and protection of the earth's ozone layer, makes for an excellent discussion opener on the theme of conservation of natural resources (trees, fresh water and energy) and the environmental trade-offs (convenience, sanitation and family health) that source reduction necessarily entails. (Foodservice & Packaging Institute, Inc.—1991)
- ❑ **Garbage: The Movie—**(25 minute videotape). 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)
- ❑ **Global Warming: Hot Times Ahead?—**(23 minute videotape). 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; effects of deforestation, planting of trees and recycling as means of slowing the build-up of greenhouse gases. (Churchill Films-1995)

- ❑ **Kentucky Public Swimming Pool and Bathing Facilities**—(38 minute videotape). 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) (Rev. 1998)
- ❑ **Plastics Recycling Today: A Growing Resource** (11:35 minute videotape) Recycling is a growing segment of our nation's solid waste management program. This video shows how plastics are handled from curbside pickup through the recycling process to end-use by consumers. This video provides a basic understanding of recycling programs and how communities, companies and others can benefit from recycling. (The Society of the Plastics Industry, Inc. 1988)
- ❑ **Putting Aside Pesticides**—(26 minute videotape). 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.)
- ❑ **Radon**—(26 minute videotape). This program looks at the possible health implications of radon pollution, methods homeowners can use to detect radon gas in their homes, and what can be done to minimize hazards once they are found.
- ❑ **RCRA-Hazardous Waste**—(19 minute videotape). 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.)
- ❑ **The New Superfund: What It is & 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:
 - ❑ **Tape 1—Changes in the Remedial Process: Clean-up Standards and State Involvement Requirements**—(62 minute videotape). 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.
 - ❑ **Tape 2—Changes in the Removal Process: Removal and Additional Program Requirements**—(48 minute videotape). The removal process is a short-term action and usually an immediate response to accidents, fires and illegally dumped hazardous substances. This program explains the changes that expand removal authority and require procedures consistent with the goals of remedial action.
 - ❑ **Tape 3—Enforcement and Federal Facilities**—(52 minute videotape). 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.
 - ❑ **Tape 4—Emergency Preparedness and Community Right-to-Know**—(48 minute videotape). 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 & hazardous chemical inventory and the toxic chemical release inventory.
 - ❑ **Tape 5—Underground Storage Tank Trust Fund and Response Program**—(21 minute videotape). Another addition to SARA is the Leaking Underground Storage Tank (LUST) Trust Fund. One half of the U.S. 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.
 - ❑ **Tape 6—Research and Development/Closing Remarks**—(33 minute videotape). An important new mandate of the new Superfund is the technical provisions for research and development to create more permanent methods in 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.

- Sink A Germ**—(10 minute videotape). A presentation on the rationale and techniques for effective handwashing in health care institutions. Uses strong imagery to educate hospital personnel that handwashing is the single most important means of preventing the spread of infection. (The Brevis Corp.—1986) (Rev. 1998)
- Waste Not: Reducing Hazardous Waste**—(35 minute videotape). 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)

OTHER

- Diet, Nutrition and Cancer**—(20 minute videotape). 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.
- Eating Defensively: Food Safety Advice for Persons with Aids**—(15 minute videotape). 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)
- Ice: The Forgotten Food**—(14 minute videotape). 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)

- Legal Aspects of the Tampering Case**—(25 minute videotape). This was presented by Mr. James T. O'Reilly, University of Cincinnati School of Law at the fall 1986 Central States Association of Food and Drug Officials Conference. He emphasizes three factors from his police and legal experience—know your case, nail your case on the perpetrator, and spread the word. He outlines specifics under each factor. This should be of the greatest interest to regulatory sanitarians, in federal, state and local agencies. (1987)
- Personal Hygiene & Sanitation for Food Processing Employees**—(15 minute videotape). Illustrates and describes the importance of good personal hygiene and sanitary practices for people working in a food processing plant. (Iowa State—1993)
- Psychiatric Aspects of Product Tampering**—(25 minute videotape). 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 to 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)
- Tampering: The Issue Examined**—(37 minute videotape). 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)

If you are interested in checking out any of our audio-visuals, please fill out this form with the box or boxes checked as to which presentations you wish to view. Mail or Fax to: IAMFES, Lending Library, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2863. (Material from the Lending Library can be checked out for two weeks only so that others can benefit from its use.)

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PLEASE LIMIT YOUR REQUEST TO FIVE VIDEOS.

Coming Events

OCTOBER

• **5-8, Better Process Control School**, Texas A & M University, College Station, TX. This school is offered by The Food Processors Institute. For additional information, contact Jennifer Jakubik, Phone: 409.845.7341; Fax: 409.845.8906; E-mail: a-wagner@tamu.edu.

• **5-9, Laboratory Methods in Food Microbiology**, South Holland, IL. For further information contact Silliker Laboratories, Phone: 800.829.7879; Fax: 708.957.8405.

• **7-8, Iowa Association of Milk, Food and Environmental Sanitarians, Inc. Annual Meeting**, at the Best Western Starlight Village, Waterloo, IA. For additional information, contact Monica Streicher at Phone: 319.933.4521 ext. 222 or Fax: 319.933.2169.

• **8-9, HACCP Verification and Validation Workshop**, Michigan State University, East Lansing, MI. The core of this program concentrates on the various verification activities included in the Sixth Principle of HACCP (National Advisory Committee on Microbiological Criteria for Foods, 1997). Any food safety professional those in industry, government and academia interested in further developing their understanding and skills in HACCP should attend. Participants should have some prior training and experience in working with HACCP. For additional information, contact FPI (AHC), Dept. 134, Washington, D.C. 20055-0134 or Phone: 202.639.5954; Fax: 202.637.8068.

• **14-16, Conference on the National Food Safety Initiative: Implications for Microbial Data Collection, Analysis, and Application**, Doubletree Hotel National Airport, Arlington, VA. This conference is organized by International Life Sciences Institute North America (ILSI, N.A.) and the ILSI, N.A. Techni-

cal Committee on Food Microbiology, in collaboration with the Centers for Disease Control and Prevention, Food and Drug Administration, **International Association of Milk, Food and Environmental Sanitarians**, National Institutes of Health, U.S. Dept. of Agriculture, and others concerned with microbial food safety. The meeting will be of interest to food protection, and public health professionals. For program and registration information, contact ILSI NFSI (National Food Safety Initiative) Microbial Data Conference, 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2863; Phone: 800.369.6337 (U.S. and Canada); 515.276.3344 (International); Fax: 515.276.8655; E-mail: nfsi@iamfes.org. Questions concerning the conference should be directed to Ms. Catherine Nnoka, Phone: 202.659.0074; Fax: 202.659.3859; E-mail: cnnoka@ilsii.org.

• **18-19, Selection and Fabrication of Stainless Steel for Sanitary Service**, Hotel Sofitel, Rosemont, IL. The International Association of Food Industry Suppliers (IAFIS) and the Nickel Development Institute (NiDI) are sponsoring a program on the properties and proper use of handling of stainless steel for equipment for the dairy, food, and beverage industries. For further information, contact Dorothy Brady, Conference Coordinator at Phone: 703.761.2600; Fax: 703.761.4334; E-mail: info@iafis.org.

• **21-23, 18th Food Microbiology Symposium and Workshop**, University of Wisconsin-River Falls, River Falls, WI. The symposium Current "Concepts in Foodborne Pathogens and Rapid Methods in Food Microbiology" will feature international speakers to discuss the latest research and developments regarding foodborne pathogens, regulatory and industry trends,

HACCP implementation, predictive microbiology, and validation of laboratory methods. The workshop, "Rapid and Automated Methods in Food Microbiology" will involve demonstrations and discussions of various tests, instruments and kits available for detection and characterization of foodborne organisms, for assessment of food quality and shelf life and rapid hygiene monitoring in food processing facilities. For further information, contact Dr. Purnendu C. Vasavada, Animal and Food Science Dept., University of Wisconsin-River Falls River Falls, WI 54022, U.S.A. or Phone: 715.425.3150; Fax: 715.425.3372; E-mail: Purnendu.C.Vasavada@uwrf.edu.

• **22-23, Introduction to Microbiological Criteria and Sampling Plans**, Ft. Worth, TX. For further information contact Silliker Laboratories, Phone: 800.829.7879; Fax: 708.957.8405.

• **26-29, Penn State Foodborne Fungi and Mycotoxins Short Course** at the Berks Campus of the Pennsylvania State University, University Park, PA. For additional information, contact The Pennsylvania State University, 306 Ag Administration Bldg., University Park, PA 16802-2601; Phone: 814.865.8301; Fax: 814.865.7050; E-mail: shortcourse@psu.edu.

NOVEMBER

• **2-6, Aseptic Better Process Control Certification School and Aseptic Symposium**, at North Carolina State University, Raleigh, NC. For further information, contact Lisa Gordon at 919.515.2956; Fax: 919.515.7124; E-mail: lisa_gordon@ncsu.edu.

• **4-6, The Dairy Practices Council® Annual Conference**, Har-

risburg East Holiday Inn, Harrisburg, PA. The DPC Annual Conference presents outstanding speakers on issues challenging the dairy industry and afternoon task force sessions are reserved for work on developing new guidelines. Participants have the opportunity to exchange information with dairy personnel from industry, regulatory agencies, and academia. For more information, contact The Dairy Practices Council*, P.O. Box 866, Barre, VT 05641-0866; Phone/Fax: 802.476.3092; E-mail: dairypc@dairypc.org; www.dairypc.org.

• **8-12, 1998 International Exposition for Food Processors**, Chicago, IL. For more information, contact Cheryl Clark at Phone: 703.684.1080; Fax: 703.548.6563; E-mail: fpmisa@clark.net.

• **8-12, Microbial Food Contamination Workshop**, The U.S. Fish and Wildlife National Conservation Training Center, Shepherdstown, WV. The objectives of the workshop is to assemble leading experts in the U.S. and Israel for the exchange of information and the development of future strategies and policies to prevent and eliminate microbial food contamination; access and record the present state of our knowledge on food contamination; and to form collaborations between the U.S. and Israeli scientists and industry to pursue innovative technologies to combat food contamination. For additional information, contact BARD Workshop, Charles L. Wilson, USDA-ARS Appalachian Fruit and Research Station, 45 Wiltshire Road, Kearneysville, WV 25430; Phone: 304.725.3451; Fax: 304.728.2340; E-mail: cwilson@asrr.arsusda.gov.

• **9-11, ASI Food Safety Consultants HACCP Workshop**, held at the Holiday Inn-Downtown Riverfront, St. Louis, MO. For further information, contact ASI Food Safety Consultants, Inc., Vorrice Strong or Christine VerPlank, Phone: 314.725.2555; 800.477.0778; Fax: 314.727.2563.

• **16-17, Membrane Applications in the Agri-Food Industry Seminar**, at the Holiday Inn South, Winnipeg, Manitoba, Canada. This course is jointly organized by the Food Development Centre, Manitoba Hydro, the National Research Council, Manitoba Food Processors Assn., Canadian Council on Electrotechnologies, and Assiniboine Community College. The purpose is to demonstrate the economic and process benefits of membrane systems using technology profiles, case study examples and pilot plant demonstrations of actual systems. For additional information, contact Markus Schmulgen, Food Development Centre, Portage la Prairie, Manitoba; Phone: 204.239.3436; 800.870.1044.

• **16-18, 1st NSF International Conference on Food Safety: HACCP—Science, Art, and Industry**, co-sponsored by IAMFES and other organizations, Hyatt Regency Albuquerque, Albuquerque, NM. For additional information, contact Wendy Raeder at Phone: 734.769.8010, ext. 205; Fax: 734.769.0109; E-mail: raeder@nsf.org.

• **22-26, 5th Latin American Congress on Food Microbiology and Hygiene, (COMBAL 98)** held in Águas de Lindoia, São Paulo, Brazil. COMBAL 98 is organized by the Brazilian representatives in the Latin American Subcommission (LAS) of ICMSF (International Commission on Microbiological Specifications for Foods) and is sponsored by the Brazilian Society for Microbiology (SBM), Brazilian Society for Food Science and Technology (SBCTA) and International Life Science Institute (ILSI, Brazil). For further information, contact COMBAL 98 Secretariat, Av. Prof. Lineu Prestes 580, 05508-900, São Paulo-SP-Brazil; Phone: 55.11.8187991; 55.11.8187999; Fax: 55.11.8154410; E-mail: combal@edu.usp.br.landgraf@usp.br.

DECEMBER

• **1-2, HACCP for Retail, Food Service & Institutional Sectors Seminar**, Guelph, Ontario. For further information, contact Guelph Food Technology Centre, 88 McGilvray St., Guelph, Ontario N1G 2W1; Phone: 519.821.1246 ext. 5028; Fax: 519.836.1281.

• **1-3, Technical Symposium & Workshop**, Hyatt Regency Crystal City, Arlington, VA. Sponsored by the Strategic Environmental Research and Development Program (SERDP) and the Environmental Security Technology Certification Program (ESTCP). Learn first hand about groundbreaking environmental research and innovative technologies developed by the Department of Defense (DoD), the Department of Energy, the Environmental Protection Agency, and their many public and private collaborators. For more information call 703.736.4548.

• **3, GMP Distribution and Warehousing Seminar**, Houston, TX. For further information, contact ASI Food Safety Consultants, Inc., Christine VerPlank, or Vorrice Strong, Phone: 800.477.0778; Fax: 314.727.2563.

• **8-9, 1998 FDA Science Forum - Biotechnology: Advances, Applications, and Regulatory Challenges**, at the Washington Convention Center, Washington, D.C. The Science Forum is co-sponsored by the FDA, the American Association of Pharmaceutical Scientists, and the FDA Chapter of Sigma Xi, The Scientific Research Society. The Science Forum will bring FDA research and review scientists together with representatives of industry, academia, government agencies, consumer groups, and the public to discuss the impact of the enormous advances in biotechnology on product development and regulation. For additional information, contact the American Association of Pharmaceutical Scientists at Phone: 703.518.8429 or E-mail: meetings@aaps.org.

• **8-11, Thermal Processing Development Workshop**, presented by The Food Processors Institute, Washington, D.C. These workshops are an excellent follow-up for those who have attended a *Better Process Control School*. This includes: Quality Assurance Managers, Quality Control Managers, Process Engineers, and Specialists in Thermal Processing. Participants will generate heat penetration data in the pilot plant of NFPA's research laboratory. Working teams will examine in detail the design of thermal processes; improve skills and understanding of basic thermal process establishment

and evaluation techniques, including heat penetration testing and process calculation; identify critical decision-making steps essential to thermal process establishment; generate data during the workshop exercises; and learn both the General and Ball Formula methods of calculation. For additional information, call Customer Service at 202.639.5954.

FEBRUARY

• **6-8, United 99, United Fresh Fruit & Vegetable Association 95th Convention & Exposition,**

San Diego Convention Center, San Diego, CA. For more information, call 703.836.3410; Fax: 703.836.7745.

MARCH

• **10, Dairy HACCP Workshop**, Madison, WI. This one-day workshop will cover design and implementation of HACCP plans in dairy plants. For additional information, contact the Program Coordinators or Dept. of Food Science, University of Wisconsin-Madison, Madison, WI 53706-1565; Phone: 608.262.3046; Fax: 608.262.6872.



Reader Service Card

DFES September '98

Expires: December 31, 1998

(International expiration: March 31, 1999)

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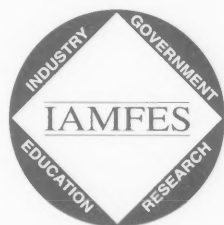
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103	118	133	148	164	178	193	208	223	238	253	268	283	298	313	328	343	358	373	388
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112	127	142	157	172	187	202	217	232	247	262	277	292	307	322	337	352	367	382	397
113	128	143	158	173	188	203	218	233	248	263	278	293	308	323	338	353	368	383	398
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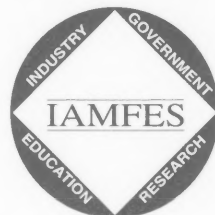
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