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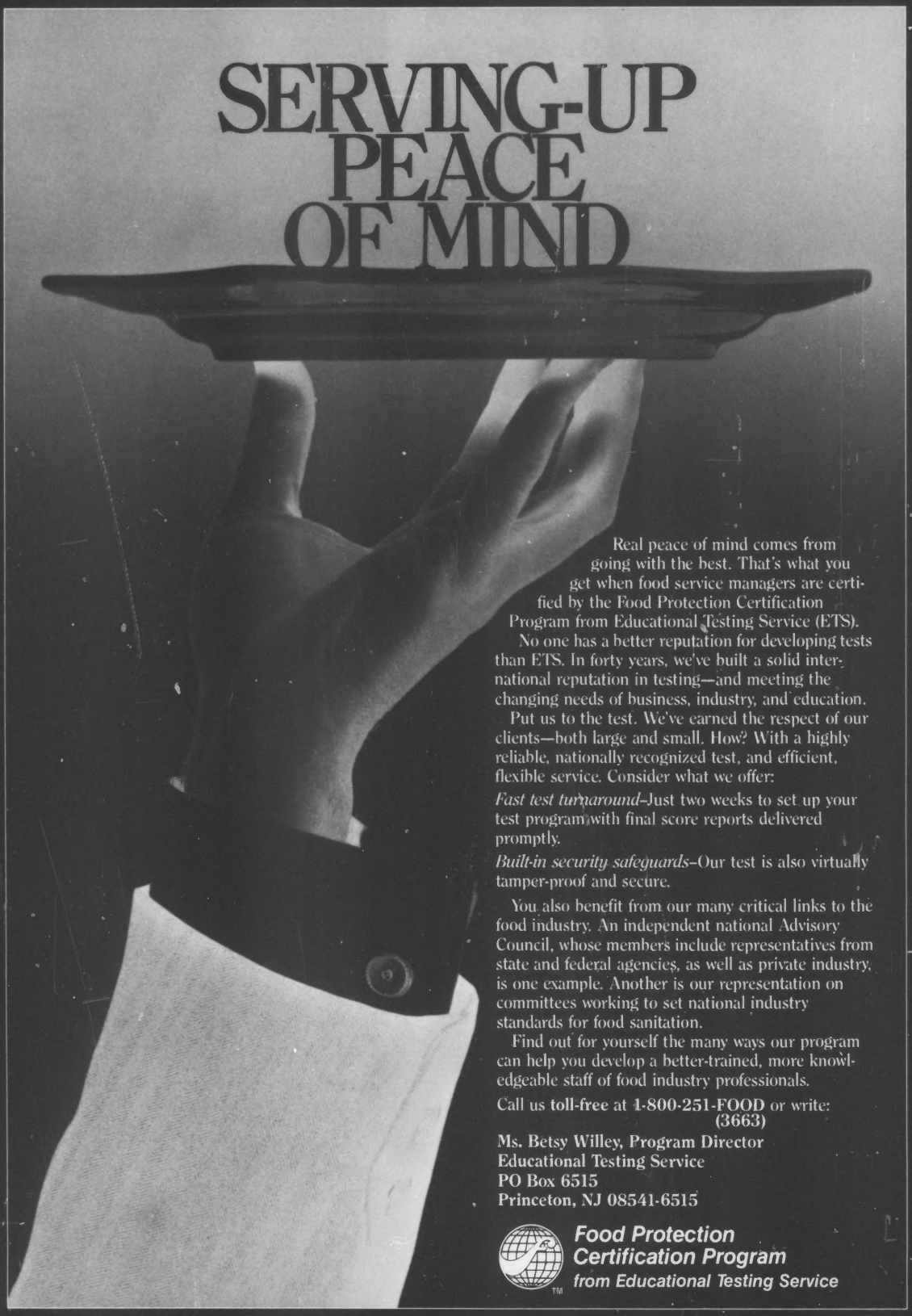

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Announcement
Developing Scientists Awards

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Awards

Five (5) awards will be presented: 1st place, $500 and a plaque; 2nd place, $200 and a certificate; 3rd place, $100 and a certificate; 4th place, $50 and a certificate; 5th place, $50 and a certificate. All of the winners will receive a 1 year membership including both *Dairy, Food and Environmental Sanitation* and the *Journal of Food Protection.*

Purpose

1. To encourage graduate students to present their original research at the IAMFES annual meeting.
2. To foster professionalism in graduate students through contact with peers and professional members of IAMFES.
3. To encourage participation by graduate students in IAMFES and the annual meeting.

Who Is Eligible

Graduate students enrolled in M.S. or Ph.D. programs at accredited universities or colleges whose research deals with problems related to environmental, food and/or dairy sanitation, protection and safety. Candidates cannot have graduated more than one (1) year prior to the deadline for submitting abstracts.

Criteria

1. A short abstract of the paper must be submitted to the IAMFES office by January 10. (Use the blue abstract forms from the October issue, if possible).
2. The author must indicate on the abstract form the desire to be considered for the competition.
3. The paper and the student must be recommended and approved for the competition by the major professor or department head.
4. The paper must represent original research done by the student and must be presented by the student.
5. An extended abstract form will be sent to all who enter the competition, and must be completed and returned by the deadline date on that form.
6. Each student may enter only one (1) paper in the competition.
7. Papers are to be presented as oral papers and should be approximately fifteen (15) minutes in length with an additional five (5) minutes allowed for questions, for a total of twenty (20) minutes.
8. The use of slides or other visual aids is encouraged.
9. The papers will be judged by an independent panel of judges.
10. Winners are presented and honored at the annual Awards Banquet. All entrants will receive complimentary tickets and are expected to be present at the Banquet.

Publishers of the *Journal of Food Protection* and *Dairy, Food and Environmental Sanitation*

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Thoughts From the President . . .

By
Bob Sanders
IAMFES President

Well here I am again on the road -- the IAMFES Executive Board met last weekend (October 25-26), a regional seminar this week and a 3-A Sanitary Standards meeting next week. The Federal government is still under its budget crunch, we are operating under a continuing resolution until Congress makes up it's mind about our funding for the coming year. I have managed to escape from Washington, although traveling at my own expense, to participate in these activities.

First, a report from the IAMFES Executive Board Meeting. All Board members were present and accounted for. Executive Manager Steve Halstead and Chairman of the Program Advisory Committee, John Bruhn, were also in attendance. A full half day was spent discussing the Annual Meeting program and planning for the 78th Annual Meeting. Some interesting innovations are being planned to make this meeting the most successful and educational IAMFES Annual Meeting to date.

A pre-meeting educational workshop is in the works. It will be conducted on the Saturday prior to the formal opening of the meeting. The proposed subject for the workshop will be **Techniques for the Investigation of Foodborne Diseases**. This workshop, offered for a nominal fee, will present the most current information and investigative techniques available. Assigning continuing education credits for this workshop is also being pursued. With Super Saver Air Fares requiring a weekend layover, many people will be able to take advantage of this educational opportunity at very little more than the normal cost of attending the Annual Meeting. More details regarding this workshop will be released at a later date.

The educational programming for the 78th Annual Meeting is being built around six symposia. Selected topics may include:

Foodborne Pathogens
Application of Computers in Food Safety
Food Service: Role of Workers in Food Safety
Water in Processing
Shelf-Life Improvement Potentials for Dairy Foods

Another innovative feature, at least for the IAMFES Annual Meeting, will be a poster session. This is being planned for Wednesday during the late morning and noon hour.

The variety and excellence of these and other presentations will surely present something for everyone. Plan now to attend and participate in this year's Annual Meeting.

Some of the other items discussed by the Executive Board were:

• Arrangements have been completed for extra back issues of the *Journal of Food Protection* and *Dairy, Food and Environmental Sanitation* to be distributed to developing countries by the United Nations through the World Health Organization and FAO.

• At the recommendation of the Audio Visual Library Committee, the Executive Board has decided to reverse itself on a previous decision to impose a user fee to all users of items from the audio visual library. All members will be able to continue receiving materials from the audio visual library at no cost except return postage for the materials. The IAMFES Foundation Fund has agreed to provide the additional funds to cover mailing and maintenance of library materials.

It is not too early to be thinking about nominating one or more of your deserving colleagues for an IAMFES award next year. Details on the awards appear in the January issue of *Dairy, Food and Environmental Sanitation*. Fill in the forms and submit their names, the Awards committees will present the awards at the Annual Meeting in Louisville, Kentucky, next July.

That's about all the news I can think of from here. I wish everyone a Happy Holiday! See you next year.

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ABOUT THE COVER . . . *Photo courtesy of the Iowa State University Photo Service, Ames, IA.*

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Dairy, Food and Environmental Sanitation, Vol. 10, No. 12, Pages 715-718 (December 1990)

Acid Degree Value - Does It Really Predict Rancid Flavor in Milk?

S. E. Duncan, G.L. Christen* and M.P. Penfield,
***Department of Food Technology and Science, Agricultural Experiment Station**
The University of Tennessee, Knoxville,
P.O. Box 1071, Knoxville, TN 37901-1071 (615)974-7147

Introduction

Milk flavor is so bland and mild that the presence of any off-flavor can easily overshadow its pleasant, slightly sweet flavor. Off-flavors directly affect consumer acceptance and enjoyment of milk. To avoid the occurrence of off-flavors in milk before it reaches the consumer, adequate testing procedures are needed. These methods must measure the flavor precursor, flavor component, or causative agent before the flavor has developed. After correlation with sensory analysis, these analytical methods can be used as predictive measures of off-flavor development.

Acid degree value (ADV) is a chemical method listed in *Standard Methods for the Examination of Dairy Products* (SMEDP) (8) as a quality measure for rancid flavor in milk and other dairy products. Rancid flavor is characterized as a soapy, bitter, unpleasant taste and is associated with high concentrations of short-chain free fatty acids (FFA). The ADV measures rancidity by de-emulsifying and separating free fat with detergent, heat, and centrifugation, and titrating the FFA in a weighed portion of fat with alcoholic KOH. Milk with an ADV of 1.5 meq FFA/100 g fat or greater is described as "extremely rancid" (8). Senyk et al. (11) suggested that raw milk with an ADV of 1.0 meq/100 g fat or greater may be rancid or well on its way to becoming rancid and should be discarded.

The relationship between ADV and sensory detection of rancid flavor is not always clear, however. Many researchers have found milk samples with ADV greater than 1.5 meq/100 g fat did not taste rancid to panelists trained to detect rancid flavor (2, 5, 7) and the method was of little value in determining intensity of rancid flavor (3, 4). Milk samples with nearly identical ADV may have different intensities of rancid flavor, ranging from "not at all rancid" to "unpalatable" and milk with vastly different ADV may have similar rancid flavor intensity (3). Milk with ADV greater than 3.5 meq FFA/100 g fat may have no rancid flavor or, in contrast, may be unpalatable; the same may be true of milk with low ADV (<1.0 meq FFA/100 g fat). Relative concentration of short-, medium-, and long-chain FFA in milk may have a direct effect on intensity of rancid flavor and on ADV.

The reason for this disparity in relationship between ADV and prediction of rancid flavor intensity is the difference in solubility of the FFA in milk. The ADV does not recover the short-chain FFA (C_4 - C_8) in the fat separation process and only partially recovers the medium-chain FFA (C_{10} - C_{16}) (2). Those fatty acids which are implicated in rancid flavor, C_4 - C_{12} (10), are hydrophilic and, therefore, remain in the aqueous phase of the milk. Thus, the ADV is measuring only those FFA which are fat soluble and remain in the fat during the separation procedure. A high ADV may reflect a change in concentration in (primarily) long-chain fat-soluble FFA but does not necessarily indicate an increase in concentration of the volatile, flavorful short-chain FFA.

The importance of the ADV as a predictor of rancid flavor in milk is dependent on consumer reaction to and perception of rancidity. The objective of this study was to determine if a notable flavor difference could be found between milk samples with extremely different ADV and if consumers could describe that difference as rancid.

Materials and Methods

Raw milk samples were collected from bulk tanks from two east Tennessee farms. The farms were chosen based on consistently low (Farm A) or high (Farm B) ADV over a two-month period. Two 4000-ml milk samples were collected from Farm A and one sample was collected from Farm B. Milk samples were homogenized (2200 psi) and pasteurized for 15 sec at 72°C in a tubular indirect heat exchanger consisting of preheating coil, pasteurizing coil and cooling coil (13). One sample from Farm A and the sample from Farm B were pasteurized immediately after homogenization. The second sample from Farm A was homogenized but pasteurization was delayed for two hours, permitting time for fat hydrolysis to occur due to lipase activity. This provided milk samples with low ADV (Farm A), naturally high ADV (Farm B), and a milk sample with induced high ADV (Farm A, induced) for sensory evaluation by consumer and trained panels. ADV were completed by standard methods (8).

The milk samples were presented to 72 consumers as a paired-difference sensory test. (Scorecard used is in Figure 1.) Three sets of samples, representing comparisons of milk with low ADV compared to milk with naturally high ADV, milk with low ADV compared to the milk with induced high ADV, and milk with naturally high ADV compared to milk with induced high ADV, were presented to each panelist. Orders of sample presentation were balanced with respect to sample

Figure 1. Consumer panel scorecard

CONSUMER PANEL: SCORECARD

You have three pairs of samples on the tray. Taste each pair in the order indicated below. Indicate whether the samples in each pair are different or not. If you find a difference, please describe it. You may swallow the sample or expectorate it into the styrofoam cup. Rinse your mouth with water between pairs.

Set 1 Samples _____ _____
Are they different? Yes _____
No _____
Describe the difference. _____
_____

Set 2 Samples _____ _____
Are they different? Yes _____
No _____
Describe the difference. _____
_____

Set 3 Samples _____ _____
Are they different? Yes _____
No _____
Describe the difference. _____
_____

within pairs and to pair within panelist. Panelists were asked to determine if there was a flavor difference between samples in each set and, if there was a difference, to describe it.

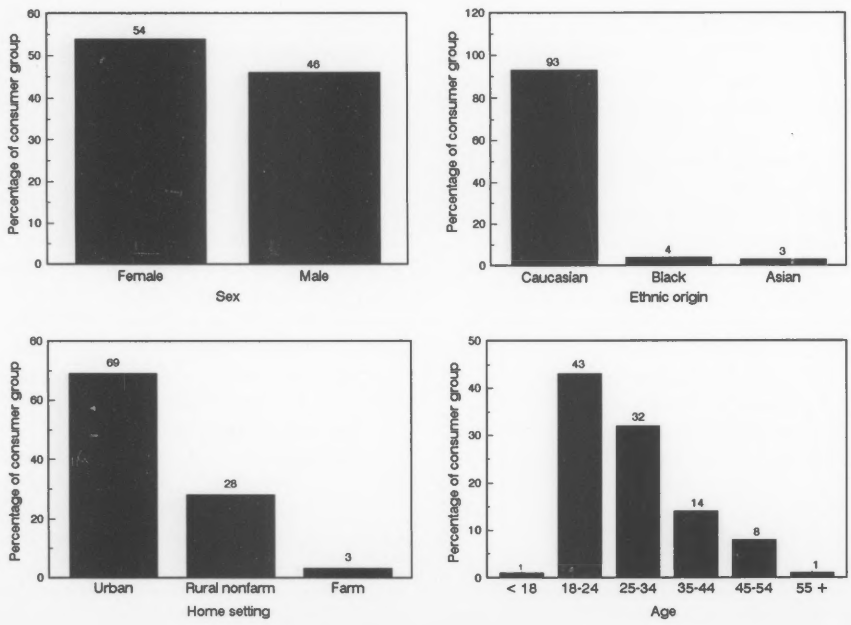
The three different samples were also presented to a trained sensory panel of 6 female graduate students and staff from the Department of Food Technology and Science at The University of Tennessee, Knoxville. This panel was trained to evaluate intensity of rancid flavor found in milk using magnitude estimation scaling. A laboratory-prepared rancid sample (LPRS), was included in this analysis. This LPRS was prepared by incubating Vitamin D milk with raw milk for 36 hr at 4°C and then batch pasteurizing the sample for 3.5 min at 65°C. This sample was included among the coded farm samples to validate the ability of the trained panelists to detect rancid flavor.

Results and Discussion

The consumers participating in this study were recruited from students, faculty, staff, and guests frequenting The University of Tennessee student center. This consumer group represents a primary target for advertising and sales of dairy products. The majority of panelists were caucasian, 18-34 years old, living in an urban setting (Figure 2). Most participants liked milk to some degree, consumed milk at least several times per week, and preferred 2% or lowfat milk (Figure 3).

The results from the consumer panel indicated that there was a difference in flavor between the milk samples with high ADV and milk with low ADV (Table 1). At least 45 (n=72) responses indicating a detectable flavor difference were needed for the difference to be statistically significant ($p<.05$) (9); forty-six consumers noted differences for each comparison. There was no detectable difference in flavor between the two milk samples with high ADV.

Although there were significant differences in flavor between the milk sample with low ADV and those with high ADV, few consumer panelists described the difference as "rancid". It is possible that consumers do not commonly apply that descriptor to milk. The comments used to describe the milk samples with high ADV were primarily negative; more positive descriptors were applied to milk with low ADV. Comments associated with milk with naturally high ADV were "stronger flavor", "bitter", "old tasting", "after-taste", and "sour"; milk with induced high ADV was characterized as "stronger flavor", "bitter", and "sour". When the two samples with high ADV were compared, the induced rancid milk received more favorable comments than the milk with naturally high ADV and was frequently described as "sweeter". Most comments described the milk sample with low ADV as "sweeter" in comparison to either sample with high ADV.



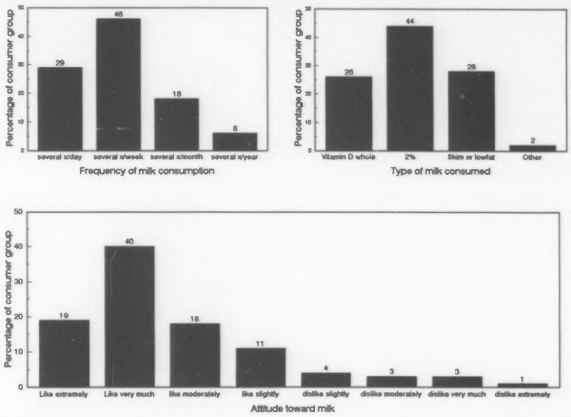


Table 1. Consumer evaluation (n=72) of milk samples with low or high (natural or induced) ADV by paired-difference method.

Comparison	Difference[1]	No difference[2]	No response	p
low ADV vs naturally high ADV milk	46	25	1	<.05
naturally high ADV vs induced high ADV milk	33	39		>.05
low ADV vs induced high ADV milk	46	26		<.05

[1]Difference: Number of positive responses to "Is there a difference" between milk samples?
[2]No Difference: Number of responses indicating there was no difference between milk samples.

The rancid flavor scores from the trained panel indicated that there was a difference in intensity of rancid flavor between the milk with low ADV, characterized as "slightly rancid," and the two milk samples with high ADV, which were "moderately rancid", on a scale ranging from "not at all rancid" to "unpalatable" (Table 2). The concept scores associated with rancid flavor intensity descriptors which were developed by the panelists (3) are also provided in Table 2.

Table 2. ADV and sensory score from trained panel for milk with low and high (natural and induced) ADV and concept scores[1] for rancid flavor intensity.

	Milk samples			
Measurement	Low ADV	Naturally high ADV	Induced high ADV	LPRS[2]
ADV	1.57	5.37	7.67	3.04
Rancid flavor intensity score	.08	.22	.18	.30
Rancid descriptor	"slightly"	"moderately"	"moderately"	"very"

[1]Concept scores for rancid flavor intensity (from ref. 3)

Flavor descriptor	Concept score
Unpalatable	.44
Very rancid	.34
Moderately rancid	.24
Slightly rancid	.12
Not at all rancid	0

[2]LPRS - Laboratory Prepared Rancid Sample

The ADV for each sample was very different but all samples would have been described as "unsatisfactory (extremely lipolyzed)" according to SMEDP (8). The LPRS included with the farm samples for the trained panel was classified as "very rancid."

The large difference in ADV would be expected to indicate a difference in flavor in the samples which were compared. However, samples with high ADV did not always receive a rancid flavor response. The LPRS was given a higher score for rancid flavor intensity by the trained panel than were the farm samples with higher ADV. This was observed consistently over a long-term study of LPRS and farm samples using the same panel (3). This poses the question "Is there a difference in rancid flavor in LPRS than in farm samples?"

Different rancid flavors were reported by Willie and Duthie (14) when 3 milk flavor judges compared LPRS prepared by different methods but with similar ADV. Two distinct descriptions of the rancid off-flavor were noted: sickening and unclean. The trained panel used in the study reported herein did not describe any differences in rancid flavor characteristics between the LPRS and farm samples, however. If there are different flavors associated with the rancid descriptor, then laboratory-prepared rancid standards currently being used to train sensory panels, including dairy products judging teams, quality control personnel, and other professionals in the dairy manufacturing industry, may not represent flavors found in farm samples. The intensity scores for rancid flavors in the farm samples were not as high as that obtained for the LPRS, indicating that rancid flavor in the farm samples were not as intense as those in the LPRS.

The relationship between ADV and rancid flavor described in SMEDP (8), is based on investigations using LPRS (12) and applications to farm and market samples have been extrapolated from those results. Additionally, the determinations of fatty acids responsible for rancid flavor (1, 6, 10) were investigated using LPRS and extrapolations made. It is important that laboratory-prepared standards used for training of laboratory personnel represent flavors present in milk obtained from farm and market samples.

Consumers can detect rancid flavor in milk but do not use the term "rancid" in describing the flavor. The negative adjectives used to describe the flavor indicate that it is an unpleasant sensation, thus indicating the importance of detection or prediction of this off-flavor. Dairy manufacturers must

have a simple, efficient method for predicting the development of rancidity.

The ADV, as currently described in SMEDP (8), does not reliably predict rancid flavor intensity in farm or LPRS although it does provide an indication of lipolysis (3). Fatty acid profiles verify that ADV does increase with increasing FFA concentration (3). It is primarily a measure of the long-chain FFA released through hydrolysis and does not measure all FFA (2). The descriptor terms associated with ADV (8) do not reliably describe the presence or intensity of rancid flavor in milk. ADV associated with descriptor terms should be re-evaluated for reference to farm samples. Sensory evaluation of milk samples is still the best method of determining if milk is rancid and ADV should primarily be used as an indication of changes in FFA concentration, an important factor in fluid milk quality and milkfat characteristics.

Acknowledgments

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America's "Safe" Food

O.P. Snyder* and D.M. Poland
***Hospitality Institute of Technology & Management, 830 Transfer Road, Suite 35, St. Paul, MN 55114**

Foodborne Illness - A National Disgrace

While the United States has the capability of producing the "safest" food in the world, there is still an enormous number of illnesses and deaths which occur each year because of foodborne illness.

Between 6 and 30 million Americans become ill each year from microorganisms in their food. An estimated 9,000 die. It has also been estimated that the cost of foodborne illness in the United States represents $4 to $14 billion a year in terms of medical expenses, lost wages, insurance costs, and liability [Roberts (1990), Roberts and Van Ravenswaay (1989), Todd (1989), Bennett et al. (1987)]. Statistics clearly show that microorganisms consumed in food and water are a significant cause of illness. In most instances the illnesses and deaths which result from these sources can be prevented.

Most American consumers assume that if the food looks fresh, the food must be safe. They do not realize that the visual appearance of food is not an indication of safety. Pathogens and toxic compounds can be present in food products despite their appearance.

The sources of the foodborne illness pathogens are ubiquitous. Food and food products will always be contaminated with low levels of pathogens. At low levels, pathogenic microorganisms cause no problems. At illness thresholds, however, they can make people ill and cause death. Pathogens in food can only be controlled when food producers, food retailers, and consumers know the potential hazards and handle food according to safe methods.

How do pathogens in food get to high levels? A major reason is that anyone who wants to raise, process, distribute, and sell food is not required to have any knowledge of foodborne illness causes or to establish a food safety program before being allowed to produce and sell food.

In many areas of the country, regulatory health inspectors are not accredited to detect and control pathogens in food operations or to safety-certify food processing procedures. Most health inspectors look only for visual indications of cleanliness.

Microbial Contamination is the Primary Offender

While there has been much talk about chemicals in food, microbiological contamination of food is the primary cause of foodborne illness and disease. This includes bacteria, parasites, viruses, fungal toxins, and protozoa. Improved testing procedures are now able to identify more pathogenic organisms in food than was possible in the past.

James L. Smith, USDA Agricultural Research Service, recently tabulated research reports of numbers of various foodborne pathogens in various types of food [Smith, 1990]. The following data indicates the presence of pathogens in food:

- 85% of 670 tested samples of fresh fish contained Anisakine nematodes.
- 47% of over 1000 tested samples of clams, mussels, and oysters were positive for enteroviruses (polio, echo, cossackie, reo, and hepatitis B).
- 95 to 100% of the tested samples of retail fresh, raw, poultry; fish; red meat; and produce (lettuce, celery, kale, etc.) as cited by Palumbo et al., (1985) and Calister and Agger (1987) contained *Aeromonas hydrophila*.
- 100% of the tested samples of raw rice and 46-63% of raw hamburger and beef samples contained *Bacillus cereus*. Five out of 8 samples of dried milk powder were also found to contain *Bacillus cereus*.
- 45-64% of the tested samples of broiler chicken carcasses and fresh turkey wings contained *Campylobacter jejuni*.
- 50% of 40 samples of corn syrup contained *Clostridium botulinum*, type B.
- 39-45% of tested samples of pork and chicken products (both raw and cooked) contained *Clostridium perfringens*.
- 1.5-3.7% of the tested retail, fresh beef, pork, and poultry samples were found to contain *Escherichia coli* 0157:H7. (This number is quite low. Complications of illness arising from this pathogen however, can be quite severe, particularly in young children.)
- 50-100% of the tested samples of raw ground beef, ground pork, ground veal, and raw chicken legs were found to contain *Listeria monocytogenes*. Heisick et al. (1989) found the presence of *Listeria* spp. in a large number of vegetables, particularly those grown in or close to the ground. For example, *Listeria* spp. was present on 26% of all of the fresh potatoes and 30% of fresh radishes tested.
- 40-100% of the tested samples of fresh poultry (chicken and turkey); 3-20% tested samples of fresh pork; and 8-33% of tested samples of raw shellfish (clams, oysters, and crabs) indicated the presence of *Salmonella* spp.
- 73% of tested samples of raw chicken; 13-33% of tested samples of raw pork; 16% of tested samples of raw beef; and 38% tested samples of raw seafood contained *Staphylococcus aureus*.
- 33-46% of tested samples of seafood taken from retail operations and processing plants indicated the presence of *Vibrio* spp. (*V. cholerae* and *V. parahaemolyticus*).
- 49% of tested samples of raw retail pork products; 48% of raw milk taken from bulk tanker trucks; and 46% of raw vegetables indicated the presence of *Yersinia enterocolitica*.

The sources of these microorganisms are being traced to feedlots, the soil in which crops are raised, and the people who handle the food.

Severity of foodborne illnesses varies enormously. They can be a mild, brief illness, primarily diarrhea and vomiting which lasts for a few hours to one or two days. However, some foodborne illnesses can lead to chronic diseases such as arthritis, central nervous system disorders, heart complications, blood poisoning, liver disorders, or kidney disease [Archer and Young, 1988]. An estimated 2 to 3% foodborne disease cases have some kind of short- to long-term recurring after-effects, according to the Food and Drug Administration.

The severity of a foodborne disease is determined by:

1. The number and virulence of the organisms involved in the incident
2. Food composition
3. Use of antacids, which lower the levels of stomach acids that kill microbes
4. Use of antibiotics, which destroy the natural microflora of the intestine
5. Human susceptibility, which varies with age, presence of other disease, pregnancy, nutrition, and immune system functioning.

New Food Habits May Cause Problems

New convenience foods, such as precooked entrees prepared for quick reheating at home or in restaurants, pose new food safety risks than can further increase the foodborne illness problem.. For instance, vacuum packaging hinders the growth of spoilage microorganisms but may permit the production of botulism toxin at temperatures common in many commercial and home refrigerators.

Some precooked foods may receive only minimal reheating. This technique eliminates the traditional last line of defense (i.e., thorough cooking immediately before eating). The consumer of today has the misconception that minimally cooked food is more healthful. Nouvelle cuisine in restaurants emphasizes minimally cooked food. The widespread use of microwave ovens also contributes to the foodborne illness problem because food cooked or reheated in these units is not heated uniformly, which allows bacteria and parasites to survive. Because of the lack of food safety education of food industry personnel, coupled with the contamination of the food, the food can become hazardous.

There are also problems with fresh seafood, which is currently exempt from mandatory federal inspection. As suppliers search for inexpensive sources of food, more foods are imported. This increases the risk because foreign processors can have less control than American food processors.

This paper provides a brief summary of the major foodborne illness pathogens that are causes of morbidity and mortality in the United States at this time, their sources, and illness symptoms. Some of the critical handling problems that must be controlled in order to decrease the incidence of foodborne illness in America are listed.

Infective Bacterial Pathogens

***Salmonella* spp.**

There are over 2,000 types of *Salmonella*. All are pathogenic to humans. This microorganism is often found on raw poultry products and may also be present on other raw meat products. It can be transmitted to other food products by cross-contamination, improper food handling, and poor sanitation. Human carriers are also sources of this pathogen.

Symptoms of the illness include: abdominal cramps, diarrhea, fever, and chills. The illness develops 8 to 72 hours after ingestion of food containing the microorganisms [Benenson, 1985]. Ingestion of greater than 10,000 *Salmonella* cells in a meal is usually necessary to cause illness in healthy people. However, as few as 4 to 5 cells per 100 grams of food can cause illness when present in foods containing higher amounts of fat such as cheese and chocolate candy. Fat in these foods provides a protective barrier around the microbial cells and prevents their disintegration by stomach acid during digestion [D'Aoust, 1985, 1989].

It is estimated that there is an annual incidence of almost 3 million cases of salmonellosis in the U.S. each year, which may result in as many as 2,000 deaths per year. Severe complications from salmonellosis include: reactive arthritis, cardiac inflammation, intracranial and other nervous system involvement, and osteomyelitis. The annual cost of illness in the U.S. is estimated to be about 1 billion dollars [Todd, 1989; Roberts, 1990]. (This estimate is based on reported cases, cost of medical expenses, loss of income due to inability to work, and the long term effects of the infection.)

Salmonella spp. multiply at temperatures ranging from 41°F to 114°F (5° to 45.6°C) [Matches and Liston, 1968; Angelotti et al, 1961]. At 97°F (36°C), a population of *Salmonella* can double every 25 minutes.

Because of the seriousness of illness caused by *Salmonella*, the heat destruction times and temperatures for this pathogen are used as a basis for food pasteurization. The Hospitality Institute of Technology and Management standard (derived from USDA Standards) for retail food *Salmonella* pasteurization is based on the assumption that there is a population of 10 cells per gram of food. The goal is to reduce the population to 1 cell per 100 grams of food or 1,000:1 (a 3D reduction). The times at various temperatures necessary to accomplish this reduction in beef are given in Table 1.

Table 1. Time-Temperature Standards for Heat Inactivation of *Salmonella* spp.
(Time necessary to reduce a cell population by 1,000 to 1).

Temperature	Time
130°F (54.4°C)	51.1 minutes
140°F (60.0°C)	5.1 minutes
150°F (65.6°C)	33.0 seconds
160°F (71.1°C)	3.3 seconds

Some critical problems in today's food system that lead to salmonellosis are:

1. The government sets no microbial standards or pasteurization specifications that can be used to control the presence of this microorganism in raw food in retail food operations. Meat animals and poultry are often infected as a result of the environment in which they are raised and the way in which they are slaughtered. Since they often appear to be disease-free, they contaminate other carcasses through cross-contamination during slaughtering procedures. *Salmonellae* are present at low levels within the yolks of eggs produced by diseased flocks of chickens. They are found in fish and seafood taken from contaminated water.

cont. on p. 722

2. During transport and distribution, temperatures are often above 41°F (5° C), allowing *Salmonella* to multiply in food products. (Government standards allow eggs to reach 60°F (15.6°C) during distribution. U.S.D.A. grading of eggs does not detect *Salmonella* in egg yolks; hence these eggs can become extremely hazardous products).
3. Food may not be heated sufficiently to destroy *Salmonella*. The bimetallic stem thermometers, specified by the government for use in measuring food temperatures, do not measure temperatures accurately in small volumes of food. Cooks can only guess when food is cooked adequately. Hence, *Salmonella* spp. survive to cause illness.
4. There is post-cooking cross-contamination of cooked food when it is cut on contaminated cutting boards or with knives used to prepare raw products contaminated with *Salmonella*.
5. In spite of regulations forbidding people to work when they are ill, people who are ill or carriers of *Salmonella* spp. continue to work in food operations. (Regulations will probably never control this problem.) These individuals shed the microorganism in their feces and spread *Salmonella* to the food they prepare or touch. This occurs when they do not properly wash their fingertips and under their fingernails after defecating.

Escherichia coli

Animal and human feces and untreated water are the sources of *E. coli* contamination in food. Any food product (meat, vegetables, and dairy products) can become contaminated. There are 4 virulent strains of *E. coli*; 3 of the 4 virulent strains cause mild diarrhea, cramps, and fluid loss.

E. coli 0157:H7, the fourth and most virulent strain, is of current concern because of its effects: bloody diarrhea, severe abdominal pain, and cramps. Hemolytic uremic syndrome, a possible complication of this illness, is the leading cause of kidney failure in children. In the past few years, under-cooked ground beef products have been implicated in transference of *E. coli* 0157:H7 [Doyle and Schoeni, 1984; Doyle and Padhye, 1989]. Dupont et al (1971) determined on the basis of a human study that ingestion of 10^6 to 10^8 cells of pathogenic strains of *E. coli* were needed to cause illness in healthy individuals. However, it is estimated that a much lower number of microorganisms are necessary to cause illness in young children, the elderly and immune compromised people.

There is an estimated annual incidence of over 200,000 cases of enteric (intestinal) *E. coli* in the U.S., with about 400 fatalities [Bennett et al., 1987].

The temperature range for growth of *E. coli* is 36.5°F to 114°F (2.5° to 45°C) [Mitscherlich and Marth, 1984]. *E. coli* are less resistant to heat than are *Salmonella* spp. Heating foods to temperatures that destroy *Salmonella* are sufficient to inactivate any *E. coli* which may be present.

Some critical problems in today's food system which are responsible for illnesses caused by *E. coli* include:

1. Animal feedlot practices which allow some animals to become colonized.
2. The spreading of the organisms during slaughtering, processing, food preparation, and poor personal hygiene.
3. Improper sewage treatment and disposal; use of improperly treated animal and human wastes to fertilize crops.
4. Allowing food products to remain above 36°F (2.2° C), which enables this microorganism to multiply during distribution and service.
5. Infected people who contaminate food products because they do not wash their hands and fingertips correctly after using the toilet.

Campylobacter jejuni

C. jejuni is present in 30% of raw pork, 80 to 100% of raw poultry, and 10% of all raw, unpasteurized milk and dairy products. It is found on raw vegetables fertilized with animal or human fecal material.

Symptoms of illness caused by *C. jejuni* include: diarrhea (which may be quite severe and bloody), fever, headache, nausea, and severe abdominal pain. The illness may linger for 1 to 2 weeks, and there may be a relapse when recovery seems imminent. This illness is more severe in adults than in children, and can sometimes lead to a form of reactive arthritis [Doyle, 1988]. Symptoms of the illness are similar to other foodborne illnesses caused by *Salmonella* spp., *Shigella* spp. and *Escherichia coli*.

Ingestion of food containing as few as 10 to 500 microorganisms can cause illness in healthy people.

There is an annual estimated incidence of 2,100,000 cases of *Campylobacter* resulting in 2,100 deaths. The annual estimated cost of campylobacteriosis is over 1 billion dollars [Bennett et al., 1987, Roberts et al., 1990].

The temperature range for growth as cited by Stern (1989) ranges from 77° to 109.4°F (25°-43°C). Doyle (1988) states that *C. jejuni* will not grow below 86°F (30°C). Doyle et al. (1981) studied *C. fetus* subsp. *jejuni* and reported its growth range as 90°—113°F (32°-45°C) It is more easily destroyed by heat than *Salmonella* spp.

Some critical problems in today's food system that lead to campylobacteriosis are:

1. Government reluctance to set microbial standards on raw food. It should be assumed that raw meat and poultry are contaminated with enough microorganisms to make people sick if they touch their mouths after handling raw chicken. There is environmental contamination from animal wastes, and *C. jejuni* is spread during slaughtering, processing, and food preparation.
2. Unsanitary food handling procedures in retail food operations facilitate cross-contamination between raw and cooked food products.
3. Food may not be heated sufficiently to destroy *Campylobacter* because bimetallic stem thermometers do not measure the temperature of foods (e.g., chicken) accurately.
4. Cross-contamination of food by foodservice personnel when they do not wash their hands and fingertips properly after touching raw food.

Listeria monocytogenes

L. monocytogenes is found everywhere in the environment and can survive for years in soil, plants, and water. It is often carried by animals and people. It has been recovered from both raw and treated sewage.

Incubation time for the illness to develop is 1 day to a few weeks after ingestion. The first indications of this illness are

mild "flu-like" symptoms, which include fever, chills, headache, backache, and sometimes abdominal pain and diarrhea. Following this stage, virulent forms may multiply in the intestinal tract, be absorbed in the blood, and transported to other vital organs. Pregnant women may experience abortions and stillbirths. Infants born with listeriosis may die [Lovett, 1989; Marth, 1988]. Immuno-compromised individuals may also die because of complications.

At this time the infective dose is unknown. Canadian researchers estimate the infective dose to be in the range of 100 to 1,000 microorganisms.

The estimated annual incidence of this illness in the U.S. is 25,000, with as many as 1,000 fatalities [Todd, 1989].

L. monocytogenes grows at temperatures between 35° to 113°F (2° to 45°C) [Mitscherlich and Marth, 1984].

Some critical problems in today's food system that lead to illness caused by *Listeria monocytogenes* are:

1. Environmental contamination from infected animal wastes and other sources. (Vegetables become contaminated when they are fertilized with animal and human wastes.)
2. Unsanitary food production and storage practices. Many food production facilities are not properly cleaned and sanitized. This leads to cross-contamination of products.
3. The pathogen is spread during slaughtering.
4. *Listeria monocytogenes* multiplies at temperatures of 35°F (1.7°C) and above. Therefore, it is a constant threat in refrigerated food.

Yersinia enterocolitica

Y. enterocolitica is present in foods of animal origin. Only some virulent strains of this microorganism cause illness. Most strains may be consumed in foods without effect. Virulent strains have been found in pork, shellfish, and raw milk. These strains have also been found in other meats, vegetables, and water from unsafe sources [Schiermann, 1989].

Virulent strains of *Y. enterocolitica* must multiply to a population of $>10^7$ per gram of food to become a hazard [Moustafa et al., 1983].

Symptoms of the illness include: severe abdominal pain, fever, nausea, vomiting, and diarrhea. The severe abdominal pain caused by this microorganism has been misdiagnosed as appendicitis, and unnecessary appendectomies have been performed as a result. Other complications of yersiniosis sometimes occur. These include: arthritis, endocarditis, septicemia, and meningitis [Schiermann, 1989; Doyle, 1988].

Growth temperatures for *Y. enterocolitica* range from 32° to 111° F (0° to 44°C) [Hanna et al 1977; Sutherland and Varnham, 1977]. Generation times for this microorganism in ground beef stored at 32°F (0°C) is about 2 days. This microorganism is more easily destroyed by heat than *Salmonella*.

The estimated annual incidence of *Y. enterocolitica* is 5,000 to 20,000 cases with 2 to 3 fatalities [Bennett et al., 1977; Todd, 1989].

The largest incident in the U.S. occurred in 1982 in Tennessee, Arkansas, and Mississippi, when thousands of people became ill from cartons of pasteurized milk packed in crates contaminated with pig feces [Schiermann, 1989].

Some critical problems in today's food system that lead to outbreaks of yersiniosis are:

1. Environmental contamination from animal wastes and other sources leads to infection of animals, and then to cross-contamination at slaughter.
2. Poor food sanitation practices. For example, contaminated food and food containers cross-contaminate pasteurized foods. *Y. enterocolitica* multiplies at 32°F (0°C) It grows well in refrigerated foods. It causes illness when these products are consumed without being cooked or reheated to temperatures that destroy this pathogen.

***Shigella* spp.**

There are 4 known species of *Shigella*; they all cause dysentery in humans. The most severe illness is caused by *S. dysenteriae*. People are the source of these microorganisms. Reported illness outbreaks have been traced to asymptomatic carriers or people who are recovering from the illness. The illness is spread through fecal-oral transmission. Reported incidents have involved daycare centers, institutions, seafood, and vegetables contaminated with raw sewage, and foodservice workers who are carriers (shedders of these microorganisms) [Flowers, 1988; Wachsmuth, 1989].

As few as 10 to 100 microorganisms can cause illness [Morris, 1986, as cited by Flowers, 1988]. The incubation period for shigellosis is 12 hours to 4 days after ingestion of the microorganism. Symptoms can be a mild diarrhea with no fever to a severe form of illness (frequent diarrhea, which may include blood and mucus). Individuals may also experience fever, abdominal cramps and severe fluid losses. Severity of this illness depends on the type of *Shigella* spp. Young children and infants are most severely affected. They may have high fevers which may cause convulsions. The symptoms last for about 4 days in mild cases. Severe cases can continue for 10 to 14 days [Smith, 1987; Wachsmuch, 1989]. During the acute stages of the illness, large numbers of the microorganism are passed in the feces. Infected individuals can easily infect others if they do not wash their fingertips and hands after going to the toilet. They can remain as carriers of *Shigella* for months or longer after their symptoms have disappeared.

There is an estimated incidence of over 300,000 cases of shigellosis each year in the U.S. resulting in 600 deaths [Bennett et al., 1987].

The temperature range for growth of *Shigella* spp. is 45°F to 115°F (7.0° to 46°C) [Mitscherlich and Marth, 1984].

Some critical problems in today's food system that lead to outbreaks of shigellosis are:

1. Use of human waste (both intentional and unintentional) to fertilize crops, particularly vegetables.
2. Field workers who do not wash fecal material from their hands and fingertips when harvesting fruits and vegetables.
3. Improper disposal of human waste products that result in contamination of water supplies (e.g., well water contaminated with sewage from a leaking septic tank).
4. Food workers who are ill or are carriers of *Shigella* and who contaminate food after using the toilet when they fail to wash fecal material from their hands and fingertips. The very low infective level of *Shigella* makes it imperative to wash fingertips with soap, water, and a fingernail brush, if fecal contamination is to be reduced to a safe level.

***Vibrios* spp.**

Three types of pathogenic *Vibrio* spp. (*V. cholerae*, *V. vulnificus*, and *V. parahaemolyticus*) have been found in some seafood. These microorganisms are found in rivers, lakes, and other large bodies of water. They grow extremely well on plankton in sewage-polluted waters, particularly during warmer months of the year or in warm climates. The plankton are consumed by fish and shellfish; the *Vibrios* spp. then become a part of their intestinal contents. *Vibrios* spp. also contaminate the outer surface of fish and shellfish [Anon. 1989].

Symptoms of the illnesses caused by these *Vibrios* include: explosive and watery diarrhea, abdominal cramps, vomiting, headache, and dehydration. *Vibrio vulnificus* causes the most severe symptoms. It may be transported by the blood in humans to affect other organs and parts of the body. Severe skin infections may develop; amputations of limbs may be required [Madden and McCardell, 1989; Oliver, 1989; and Twedt, 1989].

About 13,000 cases of *V. parahaemolyticus/cholerae* occur in the U. S. annualy, resulting in 1 to 2 deaths. There is an estimated annual incidence of 10,000 to 30,000 cases of *V. vulnificus* with an annual fatality ratio of 30%, or 300 to 900 deaths [Todd, 1989].

Vibrios spp. grow at temperatures from 41°F to 111°F (5° to 44°C) and can tolerate up to 9 percent salt [Beuchat,, 1982]. The microorganisms can double in number every 8-9 minutes at 98.6°F (37°C) [Twedt 1982].

Some critical problems in today's food system that lead to *Vibrio* infections are:

1. Government seafood control programs are unreliable. Some seafood is harvested from sewage polluted waters by unscrupulous fisherman.
2. Temperature control during wholesale distribution is unreliable. During this time, there is microbial multiplication and cross-contamination of other products.
3. There is growth and cross-contamination of seafood products in retail display cases and in foodservice facilities at approved "safe" government temperatures of 45°F (7°C).
4. Foodservice operators do not have accurate temperature measuring devices to assure that correct temperatures are reached when seafood products are cooked.

America's "Safe" Food continued in January issue of *Dairy, Food and Environmental Sanitation.*

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Pest Occurrence and Prevention in the Foodstuffs Container Manufacturing Industry

Joseph D. Foulk, Ph.D., R.S., R.P.E.
Director - Field Operations, Food Safety Associates, Edmonds, WA

Introduction

The manufacture of food and beverage cans, glass bottles, polyethylene jugs and fiber cartons and similar packaging products is a growth industry valued at more than 20 billion dollars. Estimated 1990 shipment of beer and soft drink containers alone (approx. 58% of total containers) is nearly 90 billion units (US Department of Commerce, 1990).

At many stages in production and storage of containers, sanitary integrity is given the same level of priority as engineering quality assurance. This paper describes common pests in manufacturing plants and warehouses and lists practical suggestions for their prevention and control. It is not intended as a literature review article, but some references are included. The presence of a minute brown fungus beetle (Family Lathridiidae) in stored, palletized beverage cans is reported in print for the first time.

Container Manufacturing Operations

Foodstuffs container plants, like most food processing plants, are usually straight-line or flow-through systems. Production proceeds from the receipt and storage of large rolls of metal coil, fiber, etc., to forming or assembly or other manufacturing processes. Finished products are packaged onto palletboards and stored in warehouses prior to shipment to customers. Customers also warehouse palletized containers, sometimes up to a year or more.

Activity at plants is usually round-the-clock. Major corporations operate multi-unit operations located throughout the U.S. or world, and production may be staggered among several lines for periodic maintenance, to effect change-overs to different sizes of containers or for line expansion.

Warehousing of finished products is usually separated from other plant sections, but pallets with stacks of 44 inch by 56 inch square fiber slipsheets (either new or returned from customers' plants) frequently are staged close to palletizers in production zones. Any leased warehouses remote from the plant should be inspected prior to acceptance by Quality Assurance (Q.A.), by an unbiased sanitation consultant or by a specially-trained pest control technician.

Sanitation Integrity

This is obviously important; first, to meet customers' purchase specifications which require that products and palletboards on which they are shipped are undamaged and free of dust, splinters, or rodent excreta pellets (or urine) or birdlime upon receipt. Secondly, bottles and cans must be retained in good condition once they arrive at a food or beverage customer's plant to avoid criticism from federal and state Food & Drug regulatory agencies during unannounced compliance audits.

Also, any containers *rejected* for sanitary reasons must either be scrapped and/or subjected to re-working—both of which are expensive. Industry gossip about a "bad container" shipment can haunt a manufacturer for years.

Rodents

Much has been written on rodent exclusion and control in food warehouses and other buildings (March and Howard, 1974, 1976, 1981; Scott, 1990; and Timm, 1983).

The time to determine "Go/No Go" use of a leased warehouse is immediately following the pre-acceptance or qualification inspection. Evidence of past or existing infestation by rodents is integral in making such decisions. The presence of commensal rodents harboring near, entering, or living inside a warehouse containing pallets of cans, bottles or packaging supplies is just intolerable. Eradicating rodents from warehouses that have been occupied without first ensuring the structures are rodent-free and rodent-proof *before* introducing pallets of containers is difficult and usually expensive.

Commercial pest control service vendors frequently differ on control approaches based on their past, usually traumatic, experiences with rodents. The suggestions and recommendations in this paper are based on more than twenty years' Real World experience by the author in dealing with the *sanitation* aspects of pest prevention.

Rodenticides

1. Single or multiple-dose rodenticides should not be used *inside* plants or warehouses to avoid even the remote risk of spillage and product contamination.

2. Newer rodenticides such as brodifacoum (TALON®), bromadiolone (MAKI®), bromethalin (VENGEANCE®), and chlorophacinone (ROZOL®) are examples of current materials of choice.

3. Warfarin resistant rodent populations are now present in many metropolitan areas and this anti-coagulant is no longer recommended.

4. Paraffin or wax-base bait block formulations are weather resistant and are preferable to meal type formulations in exterior programs.

5. *All* rodenticides should be contained within bait stations. If plant premises are not secured behind a perimeter fence tamper resistant stations should be used.

6. Stations' lids should be secured using "single use" plastic ties or small locks, and bear a Service Tag showing dates and PCOs' initials, the pesticide name of the rodenticide, its concentration and an emergency phone number. For example: "Brodifacoum (TALON®) 0.005%. Phone (A/C) *number*."

Although such tags are not required by law in all states their use reflects concern for and awareness of safety and professionalism.

7. Under no circumstances should any liquid anti-coagulant baits such a pivalyl (PIVAL) be used in any foodstuffs container manufacturing or storage buildings. The risk of spillage of liquid baits is too great. Zinc phosphide tracking powders, even contained within stations, pose the same risk and are not recommended.

8. Bait stations should be spaced no further than 50-60 feet apart at the property perimeter, or along the bases of exterior walls of any building.

Trap devices and use

9. Automatic or multiple catch traps are standard tools today for mouse control inside buildings. Spacing for these mousetraps (adult rats are too large to enter) may vary, but an arbitrary distance of 30-40 feet is recommended.

NOTE: Unfortunately, there are no trap separation guidelines which are ideal for every unit. Where two or three mice may be caught during any service interval additional traps may be needed. But charges for service time required to check many rodent control units in tight, clean facilities with no rodent "history" is not cost effective.

KETCH-ALL® traps only need to be wound 6 or 7 times (since they will *hold* only this many mice), should be set at floor-wall junctures and supplied with Service Tags stuck *beneath* their lids. Sliding lids can be lubricated using bar soap rather than lubricating oil, which may repel mice.

10. Glue boards or sticky traps are also effective but pose some problems. These are usually set along floor-wall junctures within a small box or dust-protective shelter. Inspect them weekly, and remove rodents promptly during summer to avoid malodors and to prevent flies from breeding in decomposing carcasses. Glue boards also entrap crawling insects and provide any inspector with evidence of ants, cockroaches or spiders. Thus, they serve as useful monitoring devices.

11. The effective use of both rat and mouse-sized snap traps requires intelligent placement and frequent servicing. Do not use peanut butter, meats or fish as baits. These soon turn rancid and attract ants. Instead, use pieces of nutmeats, swollen raisins, or soft, anise-flavored pectin gum drops. Bait rat traps with fruits and vegetables such as apples, carrots, potatoes or turnips.

Neither traps nor bait stations require washing. Commensal rodents are accustomed to the smell of humans since they are adapted to living in close association with Man.

Record-keeping

12. All exterior rodent bait stations and interior automatic traps should be numbered and plotted on a simple map and retained in the Q.A./Sanitation File.

13. Also, retain in this file any PC vendor contracts, copies of the vendor's insurance, and chronological and legible Service Records including any pesticide usage. List the active ingredient name of the pesticide (brand name optional), concentration, estimated amount, site(s) of application, reason for use and a Sample (Specimen) Label and Material Safety Data Sheets for each material used.

"Pesticides" include a large variety of biologically-active chemicals, but in the pest control context these include insecticides, rodenticides, herbicides and bird repellents or control materials.

Birds

If birds, birdlime, old or new nest material, or dead birds (or bats) are seen inside a warehouse during a qualification inspection the unit should not be used for storage of foodstuffs containers. It is just that simple. Virtually *any* feathers or birdlime on palletized finished products shipped to food and beverage customers, even those which are shrink-wrapped or shrouded, frequently will result in rejection. The presence of bird evidence is a biological indicator of lack of concern and suggests that the facility does not meet "food-grade" quality standards.

Birds (and bats) are not easy to effectively exclude. There are numerous technical (and occasionally political) problems

involved in bird control which make this a difficult and potentially expensive chore.

Exclusion practices

Birds rarely actually enter container warehouses. There is no spilled food or grain to attract them. However, they will nest beneath eaves and on the undersides of truck or rail dock overhangs.

Wire hardware cloth screens (rather than plastic netting), or porcupine wire affixed to beams, will permanently prevent roosting and nesting. These physical methods of exclusion require little maintenance and are preferable to the use of "hot foot" chemical repellents or other avicides.

Avicides

The use of chemicals which act as behavioral disruptors, sterilants or toxicants, e.g., 4-aminopyridine (AVITROL®), 20,25-diazacholesterol hydrochloride (ORNITROL®) fenthion (RID-A-BIRD®) and poly isobutylene (ROOST NO MORE®), is rarely necessary in foodstuffs container manufacturing facilities.

Alarm devices such as flashing lights, papier mache owls or hawks, rubber snakes and ultra-sonic repeller devices are of temporary or questionable effectiveness and these are not recommended, either.

Insects and Spiders

Contamination by insects is potentially a more serious problem than contamination by rodents or birds. Insects most commonly enter manufacturing plants or warehouses from the exterior rather than from breeding sites within. Exceptions include small fruit flies (*Drosophila* spp.), German cockroaches and some ants—all usually associated with lunchrooms or locker rooms.

Incidentally, the modern term "pest management" does *not* apply in the foodstuffs container manufacturing industry. The presence of *any* live insects or rodents or parts thereof in these containers can result in contamination of finished goods and result in customer rejection. Pests cannot be "managed" here: they must be prevented, or excluded or controlled as best possible.

Most manufacturing Q.A. personnel, who may be responsible for sanitation, are engineers or were trained in the physical, not biological sciences. Pests are complex living systems and the environmental and seasonal variables encountered in dealing with them can be frustrating. The life cycles of insects are especially affected by these variables. For instance, psocids are rarely so common on fiber slipsheets in warehouses in the less humid western states, while tremendous numbers of field crickets which emerge periodically in the deserts and Central Valley of California are unknown in eastern states.

Common insects in container operations

In the broadcast sense insofar as control techniques are concerned there are *flying* forms and *crawling* forms. Some do both at different stages of their life cycle.

A. Flying insects

These include flies, moths, many beetles, bees and wasps, etc., and even adult American cockroaches (a.k.a. "palmetto bugs" in the South). These will enter through open, unscreened doors or windows. Some are sufficiently strong to enter buildings through doors even though these are protected by air curtains or hanging flex-strip poly curtains.

B. Crawling insects

1. Cockroaches can be found in or around food and beverage vending machines or in employee locker rooms, lavatories or lunchrooms. Good housekeeping, the reduction of cracks and crevices using silicone or foam sealants, and occasional low volume application of residual insecticides approved for use in food plants *will* prevent their establishment.

German cockroaches are frequently brought into breweries and other beverage plants in returnable bottles and on their cases. Cockroaches also can crawl into new glass bottles in insanitary warehouses where these might be stored.

2. Spiders (not insects) can be present in stacks of palletboards, in vertical wall joints, and elsewhere, but only because small flies or gnats are available as prey. Physical removal of webbing (rags on brooms wielded by employees wearing long-sleeved shirts) as well as the judicious use of mist sprays of pyrethroids such as resmethrin are acceptable and effective spider controls today.

3. Psocids (booklice) can be present on dusty stacks of fiber slipsheets which are used to separate tiers of palletized cans. These are important "can plant" pests. They are almost impossible to see and can be scraped accidentally into cans when employees at palletizers pull slipsheets in place across open cans to form tiers.

Psocids are primarily a problem during summer in the humid central, eastern and southern states but they can occur in the West, too. They are approximately 1/8th inch long, light colored, and nearly invisible when viewed against buff or light-colored cardboard. Single strand "floating" webbing extending from pallets of slipsheets indicates their presence. Or, they can be detected by holding a flashlight almost parallel to slipsheets' surfaces and looking for the shadows cast when they move (Foulk, 1990).

Rotation of slipsheet storage and better dust control in paper container manufacturing plants are important in controlling psocid populations. Mist spraying warehouses and occasional space fumigations are both "point in time" treatments, and confer no protection against reinfestation of old, dusty storage.

"Beverage Can Beetles"

Collection and observations

Minute brown fungus beetles, belonging to the insect order Coleoptera and family Lathridiidae, were recovered by the author from the interior of 12 and 16 ounce aluminum beverage cans stored in warehouses during 1978 to 1984. They were found during the course of sanitation inspections performed for an erstwhile major U.S. brewing firm with multi-plant operations.

Small (1-3 mm) adult beetles were collected from *within* cans during warmer months of the year from more than 20 different warehouses located in OR, CA, TX, FL, NJ, PA, MO, IL and WI.

Specimens were collected *only* from exterior rows of cans which were slightly exposed by incomplete coverage by slipsheets (Figure 1), from such exposed cans at all levels of 3-high pallet stacks and from locations throughout warehouses—not just near dock doors.

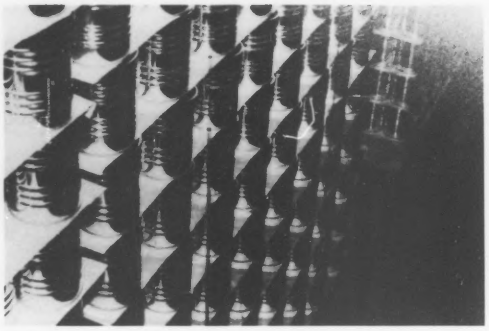

Figure 1. *Palletized metal cans showing exposure of outer row from beneath tier-separating slipsheets.*

Beetles were recovered from cans manufactured by several major supplier firms and intended for malt beverages and for soft drinks. A typical can warehouse may contain a total of 20-50+ *million* individual cans on hundreds of palletboards. And the number of cans removed, examined and then returned undamaged during the course of individual warehouse inspections rarely exceeded 100 total. Once beetles began to be detected, slightly exposed cans were inspected preferentially.

Beetles observed during our inspections were never seen on flat surfaces of slipsheets between cans, at dry (or damp) floor-wall warehouse perimeters (hands and knees; good flashlight and large hand lens for assistance) or elsewhere. Attempts on four occasions to recover them from material vacuumed from palletboards or from damp floor-wall junctures in infested warehouses were unsuccessful.

Both live and dead beetles were found in cans inspected during summer; only dead adults were seen in cans inspected during the winter months. Usually, one or two beetles were present on the interior bottom of can, but seven adults were recovered from a single 12 oz. can in a warehouse in Peoria, IL during July, 1987. Beetles appeared to be unable to climb sides of can interiors.

These beetles most likely fly into warehouses during the spring and summer months through open doors. Some lathridiids can fly, but we never observed flights from cans which were gently pulled from pallets for inspection.

Beetles were determined by systematists to belong to the genera *Cartodere, Corticaria, Dienerella* and *Eufallia* but their gender was not determined. Figure 2 is a scanning electron micrograph (SEM) of *D. filum* (Aube').

Lathridiids have previously been found breeding in damp plaster and fungi and slime molds (Ebeling, 1975; Kingsolver and Andrews, 1986) and have even been found in an air-conditioning system (Carlton, 1988).

Figure 2. *Dorsum of the adult brown fungus beetle* Dienerella filum *(Aube'). Magnification 75X. (SEM courtesy of C. Carlton, University of Arkansas.)*

Possible cause of occurrence

Many insects attract mates by producing sex pheromones. Aggregation pheromones will attract both genders of some insect species as will odors of some foodstuffs. W. Burkholder (1985, 1990, etc.) of the University of Wisconsin, Madison, WI has published extensively on stored product pest insect pheromone research. Based on the observations described above, and additional findings within the past 2 years, I believe that adult lathridiids are attracted to odors of one or more components of the dried epoxy polymer beverage can coatings, and that they fly into and become trapped within coated cans that are slightly exposed beyond the tier-separating slipsheets.

Beetles were *never* found in cans which were completely covered by slipsheets. Several pallets with "beetle positive" cans on the periphery were broken down to look for this.

The majority of beverage cans are manufactured from coated aluminum and all those we inspected were coated. Non-beverage food cans, with a different type of interior coating, were inspected on three occasions. No beetles were found.

Importance

Aside from the presence of small insects inside stored foodstuffs containers—which constitutes a violation of section 402(a)(3) of the federal Food, Drug and Cosmetic Act—the *real* problem is this. When a beetle in a can dies its body fluids leak from mouth, anus and spiracles (breathing pores along the lateral aspect of most insects' abdomen). These fluids dry and "glue" the chitinous exoskeleton of the insect to the can interior. It is standard operating procedure to pass beverage cans (and most other food cans) through a cold water rinser or air cleaning device immediately upstream of any filler, *but not all* beetles are removed from cans because of the adhesive effect of the body fluids. In filled cans from which beetles might not have been dislodged during cleaning the liquid product eventually dissolves the "glue" and the beetle carcasses float free.

Prevention of the problem

The only effective way to prevent this insect contamination problem is to cover all cans by near perfect registration of tiers and placement of fiber slipsheets during the palletization process. Palletized cans intended for long-term storage should be shrink-wrapped whenever economically feasible.

Insect Exclusion and Control

The following practical suggestions are intended to assist in keeping insect populations at an absolute minimum. Most are common-sense items, but good pest prevention in container plants and warehouses requires frequent monitoring, and diligent and conscientious efforts by line employees, supervisors and individual departments.

Top management plays a key role in recognizing the necessity of maintaining pest-free operations and in budgeting for program support. I believe that costs of sanitation programs should be charged to Operations or Production groups rather than to Maintenance or even Quality Assurance.

A. Sanitation and structural aspects

1. Maintain exterior premises including driveways, rail yards, pallet storage sheds, and scrap and waste dumpsters in neat and sanitary condition.

2. Don't prop nor leave elevated unscreened doors open.

3. Keep linear floor drains within buildings (or at the exterior bases of loading docks), elevator pits and sump pumps clean and free-flowing or dry. Mosquitoes, moth flies, and other insects can and will breed in these otherwise.

4. Reinforce 18-22 mesh insect screening for doors using wire hardware cloth to protect against tears.

5. Maintain flexible gasketing on personnel and roll-up door bases. Mice can enter through 1/4 inch gaps. Try for 1/8th inch maximum in southern states to also exclude crickets and cockroaches which will penetrate lighted door sill cracks at night. Also, seal or screen all pipe chases through walls.

6. Install air curtains so they switch ON when a roll-up door is first elevated—not after the door is wide open. And shim air curtains so the air blast is down and OUT. Operate air curtains 24 hours a day during summer above any open, unscreened dock doors. Non-supplier research literature on air curtain effectiveness is sparse. Morgan (1971) published on fly control using air curtains, however.

7. Be certain that the *sides* of hydraulic floor plates at loading docks are gasketed or supplied with pest and dust-excluding brushes.

8. Ensure that pressure louvers on fans operate properly.

9. Restrict all eating and drinking to lunchrooms, and retain lunch scrap trash containers (including empty soft drink cans intended for recycling) within lunchrooms rather than in production or warehouse areas.

10. Stacks or lots of palletboards returned from customers should be inspected, culled for damage and food or ingredient residues, rodent excreta pellets, etc. *outside* any plant or warehouse. In the South, especially, insect pests can be introduced into can plants on dirty pallets. Some firms in this region routinely fumigate (methyl bromide) or spray pallets contained within a truck trailer maintained on the premises as a fumigation vault.

B. Lighting

1. High pressure sodium vapor ceiling lights are preferable to mercury vapor ones. Mercury vapor contains large amounts of ultraviolet energy which will attract insects. This also competes with insect electrocution light traps (Imholte, 1984; Gilbert, 1985).

2. *Do not install ILTs in solvent or compound rooms, or directly above manufacturing or packaging lines or palletizers or their accumulator tables.* Offset lights so insects won't be attracted above these sensitive, open container areas. Nor should they be located above personnel or dock doors outside the plant because they will attract insects towards the plant at night.

C. Insect electrocution traps (ILTs)

These insect "zappers" are excellent control devices when used in conjunction with good sanitation and exclusion techniques *and* when they are maintained properly. Gilbert (1985) and Pursley (1987) provide good reviews on the use of these devices.

1. Individual industrial size traps and trap systems are expensive and require skill in installation. Quotations and proposals are usually best made by technical sales representatives of major trap manufacturers rather than by distributors or vendors of multi-product pest control supplies.

2. In warehouses, multi-bulb units suspended from the ceiling out of the path of forklifted pallets provide a large circumference of attraction. Unfortunately, many flying insects are found at heights below 10 - 12 feet. Wall-mounted units at the ends of storage aisles may be needed in addition to traps hung at greater height.

3. ILTs are designed and intended for control of flying insect *inside* structures. Do not place light traps outside plants or at warehouse dock areas. Here, they will merely attract insects toward the plant and are counterproductive.

4. Traps with "skirted" catchpans usually are better for collecting the bodies of electrocuted large insects which may bounce from grids. Traps fitted with cloth catchtrays are not suitable for industrial use.

5. Depending on geographic location and the effectiveness of other exclusion devices, catchtrays should be cleaned carefully and frequently during the "insect season." Also, remember to clean the catchtray *housing*. Otherwise, "warehouse" or "carpet beetle" larvae (Family Dermestidae: *Trogoderma* and related genera) may attack the dried insect carcasses. Lightweight, portable rechargeable vacuums are ideal tools for this.

6. ILT lamps or bulbs should be replaced annually during Spring to maximize trap effectiveness.

D. Insecticide applications

1. Exterior applications of several EPA-approved and registered residual insecticides may be made periodically or on an as-needed basis for prevention and control of crawling insects, spiders, sowbugs, etc.

2. Restricted Use pesticides may only be applied by licensed PCOs, Certified Applicators, or personnel under their direct supervision. General Use materials are usually designed for "home & garden" use and most are of questionable value for industrial use.

3. Only limited "crack and crevice" and/or "spot" applications of materials labeled for use "within food-handling establishments" should be used in foodstuffs container manufacturing operations for direct control of crawling insects.

To minimize risks of product contamination (especially metal cans whose coatings are highly susceptible to odors), low volume treatments of 0.1-0.3% pyrethrins or pyrethroids as water-base sprays should be made *only* in production or warehouse areas to control crawling insect pests when they are sighted—and not on a routine schedule.

4. Thermal fogs or mist sprays using compressed air or pressurized aerosols are short-lived, non-residual treatments designed to kill *flying* insects and some exposed stages of stored product insects not commonly found in container plants or warehouses. Thermal fogs using oil as a carrier should not be used in container facilities.

Ultra low volume (ULV) or ultra low dosage (ULD) applications of mist sprays do not penetrate stacks of slipsheets nor do they approach the true fumigant action resulting from use of toxic gases such as methyl bromide or phosphine. Dichlorvos (VAPONA®) has a low vapor pressure which does "penetrate" cracks and crevices better than pyrethrins. This material poses too great a hazard, I believe, to warrant its continued use even when all safety procedures are followed.

5. Fixed-in-place, "automatic" mist-spraying systems—usually supplied by elevated reservoirs of insecticides—are possible sources of nozzle drips, leaks or spills from their reservoirs, require careful maintenance and can pose a greater hazard than the benefits they confer.

Materials used as mist sprays in foodstuffs container plants and warehouses should be restricted to pyrethrins or pyrethroids (synthetic pyrethrins). These insecticide treatments should be made only as a last resort rather than a primary method of insect control.

It is neither necessary nor in the best interests of any foodstuffs container manufacturing facility to apply insecticidal space treatments routinely or on any arbitrary schedule. "Weekend foggings"—without *cause*—are unwarranted and not cost effective.

6. Sample (Specimen) Labels, current Material Safety Data Sheets for every insecticide used, and pesticide use should be maintained in the Q.A./Sanitation File.

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2. Mention of a trademark of proprietary product does not constitute a guarantee or warranty of the product by the author nor FOOD SAFETY ASSOCIATES nor does it imply its approval to the exclusion of other products that may also be suitable.

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Use of Recording Thermometers on Farm Cleaning-In-Place Return Lines: A Field Study

John C. Bruhn[1], Larry Collar[2], Carol Collar[3], Tom Shultz[4] and John Porter[5]

Abstract

A field study was conducted to evaluate the use of a recording thermometer attached to a CIP return line and designed to monitor the time and temperature of a dairy farm CIP cleaning cycle. The observations showed there was value in improving the milk pipeline cleaning and sanitizing functions at a dairy farm.

The quality of raw milk depends on many factors of production at the farm. The quality of raw milk must be sufficiently high to ensure that processors can convert the raw product into high-quality dairy products. Efforts to maintain raw milk quality must begin at the dairy farm and must continue until the point of sale. The quality of raw milk cannot be improved through processing, so dairy farms must provide high-quality raw milk from the start.

The dairy industry, including the dairy farmer and handler, regulatory agencies, and allied industry associations, work rigorously to monitor the farm and herd conditions that can affect raw milk quality and safety. Various tests have been developed to monitor quality. Improper use of antibiotics to treat mastitis and other herd problems can be detected by a variety of tests that measure specific (or families of) antibiotics in the milk. Various bacterial plate counts are used to monitor the cleanliness of the milking process (from cleaning animals to the sanitizing of milk contact surfaces) and herd health. In California, recording thermometers are required by law on raw milk holding tanks to ensure the milk is kept refrigerated. Thus, it is possible to establish whether or not raw milk was held at the correct temperature at all times, not just at the time of pickup (as is the case with nonrecording, "dial" thermometers).

California raw milk has remarkably good standard plate counts (SPC). Dairy cooperatives that handle a majority of the 19 billion pounds of milk produced annually report an SPC average of 8000 organisms/mL compared with the state legal maximum of 50,000/mL. In California, a laboratory pasteurize count (LPC) and coliform counts are also required, and these routinely average less than 100 organisms/mL as compared with a 750/mL legal maximum. Raw milk quality in terms of bacterial counts looks good in California. But, is it really?

With the cooperation of dairy farmers, field representatives, regulatory officials, and University of California Cooperative Extension county staff, we initiated a survey of cleaning and sanitizing practices on dairy farms. We wanted to test the assumption that the relatively low bacterial counts meant that dairy farm staffs were doing a more-than-adequate job of cleaning and sanitizing milk contact surfaces.

We personally evaluated 25 dairy farms, recording frequency of cleaning and sanitizing, cleaning and sanitizing temperatures, and other relevant information. The surveys were completed between January and April 1988 cool to warm months in this part of California. All data were gathered firsthand, and accurate times and temperatures were recorded for the cleaning and sanitizing functions. These data were then compared to the State of California regulations requiring a complete cleaning and sanitation schedule after each milking and the maintenance of a minimum temperature of 115°F during cleaning.

Our findings are shown in Table 1. All farms either rinsed before cleaning or rinsed after the morning milking only. The 25 farms studied rinsed until the water ran clear, usually three minutes.

Table 1. On-farm cleaning and sanitizing practices in 25 dairy farms located in the Sacramento and San Joaquin Valleys of California.

Treatment	Temperature/time of treatment			
	Average	Minimum	Maximum	Std. dev.(±)
Rinse				
Starting temp. (°F)	81	64	130	24.0
Ending temp. (°F)	77	64	110	18.2
Circulation time (min)	2.8	2	4.5	0.75
Detergent				
Starting temp. (°F)	158	143	180	12.4
Ending temp. (°F)	115	92	138	12.3
Circulation time (min)	9.2	1.2	16.5	4.4
Chlorinated Detergent				
Starting temp. (°F)	158	140	176	14.8
Ending temp. (°F)	124	112	132	9.1
Circulation time (min)	8.2	6.5	10	1.8
Acid/Sanitizer				
Circulation time (min)	3.6	1	11	3.4

[1]Cooperative Extension, Department of Food Science & Technology, University of California, Davis 95616-8598
[2]Dairyman's Cooperative Creamery Association, Tulare, CA 93274-5432
[3]University of California Cooperative Extension, Hanford, CA 93230
[4]University of California Cooperative Extension, Visalia, CA 93291
[5]Los Angeles County Health Department, Tulare, CA 93274

Not shown in this table is the frequency of cleaning. Most farmers did not clean and sanitize after each milking, but instead rinsed after the morning milking and cleaned and sanitized after the second milking. Thus, for 16 of our 25 farms, the milk lines and equipment were not cleaned after each milking, allowing the possibility of bacterial growth. However, the bacterial counts from these farms provided no evidence of abnormally high counts due to this practice.

The average starting temperatures for the detergent cleaning cycles were adequate, but the average ending temperature was just at the State legal minimum of 115°. The SD of 12.3F for the final temperature indicated that the average cleaning temperature used by many farms was inadequate. Circulation times were just adequate, but again the large SD of 4.4 for detergent only suggests that a number of farms have inadequate cleaning times. The farms using a chlorinated detergent had a similar profile for the cleaning function. The sanitation of the milk lines and other milk contact surfaces was accomplished by using an acid rinse or a chloric-based sanitizing agent. Average circulation times were just adequate with several farms, circulating for around a minute, probably inadequate for proper sanitation.

With average cleaning conditions being just adequate, how can the bacterial counts be kept so low - less than 10,000/mL - in the farms studied? Several explanations are possible. First, the recording thermometers on raw-milk holding tanks demonstrated that the milk was maintained continuously at proper refrigerated temperatures (less than 40°F) and that during the second milking, the temperature of the comingled milk was rapidly cooled to proper temperatures. Thus, on those farms where only a rinse is done after the first milking, any bacterial growth that occurred between milkings is arrested in the rinsed-only line by the cold storage temperatures. Further, times between milking were between two to six hours, thus reducing the chance that significant bacterial growth could occur. And, with the large volumes of milk coming from these herds (which averaged 650 cows/herd and 21,000 lbs. of milk/cow in 1989), the growth that took place in the line between milkings could have been diluted. In herds with fewer (50-100) cows, and lower production per cow, this dilution effect would be less and therefore elevated SPC might be evident.

We concluded, therefore, that the tools being used to monitor the required cleaning and sanitizing functions (SPC, LPC, coliform count) could be inadequate. Thus, we decided to evaluate the use of a recording thermometer to record all cleaning and sanitizing activities.

Strip chart recording thermometers which time-date stamped the paper were installed at separate times on 10 dairy farms that had high LPCs, suggesting a cleaning/sanitizing problem. All such farms had persistently high LPCs, usually ranging from 200 to 600/mL and occasionally exceeding the legal limit of 750/mL. Considerable effort was made by regulatory personnel, processor field staff, and farm personnel to identify the source or sources of the problem on each farm. Milk hoses were changed, liners replaced, and the cleaning/sanitizing procedures observed. No problem was detected with any of these. Each farm agreed to have a recording thermometer installed.

Installation of the recording thermometers was performed by the engineering staff of the local dairy cooperative. The temperature-sensing spud was installed within 12 inches of the CIP outlet pipe, which discharged the water into the wash basin. Initially the spud was installed in a hole drilled through the metal pipe so that it would be in direct contact with the water. Later, we learned that the spud could be attached to the outer surface of the metal pipe with no appreciable loss in accuracy. In all installations, the recording thermometer was turned on when the air injectors were activated. Air injected into the fluid flowing through a pipeline is necessary to create turbulence, which is essential for adequate cleaning.

The results were startling. In each case, the recording thermometer revealed an inadequate cleaning/sanitizing procedure, including some of the deficiencies previously noted (Table 1). In some farms, the cleaning did not occur after every milking; in some, too low a cleaning temperature was used; in others, too short a cleaning time was used, sometimes only 2-3 minutes when no one was looking. All deficiencies were corrected by various measures and the problems were eliminated.

At one such farm, for example, we informed the owner, who then instructed the personnel assigned to cleanup to increase the cleaning time to 10 minutes. They did, and the LPC problem vanished. We then informed the owner of this triumph, and he in turn congratulated the cleanup people. Soon after the congratulations had been extended to the cleanup people, the LPC problem reappeared. We examined the recording thermometer, which had not been removed (unbeknownst to the cleanup people), and the source of the LPC problem was revealed: The workers had returned to their short cleaning time! Needless to say, the distressed owner discussed the situation with the workers, who now follow the prescribed procedures.

Arguments Supporting the Installation of On-Farm CIP Recording Thermometers

1. **Public Health Safety**. Installation of a CIP recording thermometer can help assure that the systems are being cleaned properly. Pathogens from mastitis infections or from external contamination are present on all farms. Recording CIP thermometers would document whether or not the system was being properly cleaned each time and would therefore indicate whether unclean milk contact surfaces could be a source of pathogens. In improperly cleaned systems, pathogens present in the milk lines can multiply between milkings and contaminate subsequent lots of milk. This would constitute a public-health safety concern.

2. **Quality**. Evidence suggests that bacteriological quality would be improved through the lowering of the number of bacteria in raw milk. Recording thermometers allow monitoring of the cleaning and sanitizing program and avoidance of chronic or persistent bacteriological problems due to improper or inadequate cleaning and sanitation.

3. **Management Tool**. Recording thermometers would permit dairy-farm owners to monitor the extent to which prescribed cleaning and sanitizing procedures are followed by their employees.

Processor Benefits

Recording thermometers:

1. Allow processors to produce better quality dairy products and lessens the chance that milk and dairy foods will develop bacteria-induced off flavors upon refrigerated storage.
2. Assure a safe, pathogen-free raw-milk supply.

Consumer Benefits

Recording thermometers add quality assurance procedures at the farm that will maintain, and in some instances improve, the safety, quality, and shelf life of the processed milks and dairy foods.

Economic Benefits

Recording thermometers would reduce the number of farm calls and troubleshooting visits by field staff, by handler/cooperative personnel, by sanitarians, and by other allied personnel because bacterial problems due to improper cleaning and sanitizing would be significantly reduced. Time that becomes available can be spent on other, more productive tasks.

Disadvantages of Recording Thermometers

1. Initially there would be an installation charge of an unknown cost, probably in the range of from $600 to $1,600 per instrument.
2. There would be added cost for cleaning and sanitizing chemicals on farms that are not currently following prescribed procedures.
3. There would be some occasions in which the heating capacity of water heaters/boilers is too small to maintain the cleaning water at proper temperatures, thus requiring the purchase of additional water-heating capacity.

Conclusion

We are convinced that a recording thermometer attached to the farm CIP return line is an essential and appropriate tool for determining the adequacy of a cleaning/sanitizing program. Bacterial counts cannot always reveal a deficiency; on personal visits to a dairy farm one could see atypical procedures. Just as a recording thermometer actively gives a record of the temperature history of the raw milk in the holding tank, so monitoring the temperatures on a CIP line gives direct records of how well and frequently the line was cleaned. We evaluated recording thermometers that give accurate time/temperature relationships in the cleaning and sanitizing steps. Our next step is to evaluate the added use of conductivity to give information on chemical use, as well. This will be reported later. Nevertheless, our industry that prides itself on the quality and safety of its products, should not ignore the use of tools, like these recording thermometers, that give continuous and accurate records, instead of mere "guesses."

P. C. Vasaveda

UW-RF Faculty Member Named to National Academy

Food Science Professor P.C. Vasavada has been elected as a fellow to the American Academy of Microbiology.

Vasavada's selection makes him the only UW-River Falls faculty member to be a member of the prestigious national academy.

Selection to the academy is by nomination from fellows who seek to recognize outstanding competence and distinction in their area of specialization. The principal criteria for election to fellowship is excellence and originality in a chosen career area.

Dean Gary Rohde said he was pleased with Vasavada's selection. "It speaks well for Dr. Vasavada and the food science program to have someone recognizes by the microbiology academy. P.C. has done an outstanding job in organizing our annual food microbiology symposium that has allowed him to work with microbiologists from around the United States. That experience has enabled him to ensure the betterment of the dairy industry and his working relationships through extension in Wisconsin and the region."

"It brings visibility to the University and recognizes Dr. Vasavada for his academic distinction," Rohde said.

Established in 1955, the academy was organized to promote professional recognition and to foster the highest scientific and ethical standards among microbiologists. The academy is affiliated with the American Society for Microbiology.

The Academy promotes an array of programs of professional recognition, pursues increased visibility of

the microbiology profession, and prepares position documents on issues impacting the profession.

Vasavada joined UW-RF in 1977 as an assistant professor. He received a bachelor's and master's in microbiology in India, a master's in microbiology from the University of Southwest Louisiana at Lafeyette, and a doctorate in food science and dairy technology from the University of Georgia at Athens.

Vasavada teaches undergraduate courses in food science and has performed extension activities in planning, conducting and presenting programs on dairy and food microbiology, food safety, cheese technology and milk quality to industry groups.

He initiated and has coordinated for the past 10 years, the University's International Food Microbiology Symposium. Vasavada also has served on the Wisconsin Dairy Task Force committee to coordinate actions on policies and other matters relating to the dairy industry.

Professionally, he has been active in the American Dairy Science Association, Institute of Food Technologists, International of Milk, Food and Environmental Sanitarians, and state professional associations.

Currently, he is conducting a three-year study funded by the Wisconsin Milk Marketing Board, on the use of continuous microwaving to supplement the pasteurization processing in killing virulent bacterial strains found in milk. Vasavada recently returned from a year-long sabbatical in Australia where he continued that research and gave several presentations to educational and industry groups on his research, and research and development trends in the dairy and food processing industry in the United States, and issues in food science and technology education.

While in Australia, Vasavada helped organize a workshop on rapid methods and automation in dairy food microbiology.

Vasavada was honored in 1988 as the "Laboratorian of the Year" by the Wisconsin Laboratory Association. He also received a certificate of merit from the International Association of Milk, Food and Environmental Sanitarians.

For more information contact the News Bureau, University of Wisconsin-River Falls, South Hall, River Falls, WI 54022 (715)425-3771.

For Food Processors, Microorganisms are Main Safety Concern

Consider the ordinary tin can. It's been a reliable food package for 100 years, even when not made of tin. But it doesn't incite much loyalty among consumers, who willingly abandon it for more microwave-friendly packages of cardboard and plastic.

But food scientist Irving Pflug, who has studied food and pharmaceutical sterilization problems at the University of Minnesota for over 20 years, is willing to be its defender. "The can is rigid, strong and economical," he notes. "It can be used in canned food production lines that operate at very high speeds."

Pflug's research for the University's Agricultural Experiment Station in canning food safety is one aspect of a career involved in many different product sterilization issues. He has worked on sterilizing foods, pharmaceuticals and even a space lab. When he first arrived at the University, he worked on a project to sterilize the laboratories of the Viking Landers that NASA sent to Mars in the early '70s. For Pflug, the sterilization problems for the space program were straightforward: it was a simple matter of placing the Landers in very big cans, then heating them.

Pflug has found that sterilization issues are similar, whether for NASA Landers or for human medical implants, such as cardiac pacemakers, or for chicken soup and ready-to-eat meals. Sterilization needs to reduce the probability of microorganism survival to near zero -- to one in a million or one in a billion, depending on the microorganism.

For shelf-stable foods, understanding what that means to level of risk is critical. Risk perception research indicates that the public perceives food safety risks differently than do experts. Risk is related to probabilities, and probability statistics are poorly understood by the public.

While consumers are most concerned with pesticide residues, antibiotics, hormones, nitrites, additives and preservatives, food professionals have long recognized that pathogenic microorganisms pose the most serious hazard in America's food supply.

"The public views the same probability -- for example, one chance in a billion -- differently for a can of food and for a lottery ticket," says Pflug. "For the can of food, we seem to want even the small number of one in a billion to mean zero, whereas for a lottery ticket, the hope at least, is that one in a billion equals one."

Pflug is very interested in programs that help the public understand risk. He says, "When you buy frozen food, it's not sterile -- it's just teeming with microorganisms. But that doesn't matter, because, while food is frozen, the microorganisms aren't going to grow."

Not so with food the consumer keeps at room temperature . One viable microorganism is all it takes to spoil the product.

Pflug has worked with the food processing industry on canning problems, specifically with low-acid foods, both liquid and solid.

First of all, the product must be made safe from a public health standpoint. Pflug explains: "That means eliminating all the *C. botulinum* spores in all cans of food. That organism produces the toxin which causes botulism.

"Then, you begin to worry about organisms that will simply spoil the product. The group that we worry about there primarily is what we call the 'mesophilic spore-forming organisms.' These are resistant organisms that will grow at room temperatures.

"Then, there is a third set of organisms, which are

heat loving. The mesophilic spore-forming organisms are more resistant than *C. botulinum*. And the heat-loving organisms are another order of magnitude more resistant than the mesophilic organisms." To kill those organisms without overprocessing the food has been the canning industry's challenge.

Many of today's new products are really just old products dressed up in new packages, Pflug says. With some modifications, they use basic canning and sterilization technology.

Take the microwavable container. Those plastic containers of soup, baked beans and chicken tetrazzini that are so conveniently heated in a microwave oven are really just more "canned" foods, Pflug says.

"But," he adds, "there are new problems with this kind of package. More things can go wrong with plastic. As plastic is gas permeable, for example, all plastic packages have to be sandwiches -- with one layer to give it mechanical strength, another to add higher resistance to gas transmission. Metals are both strong and impermeable to gas."

Meanwhile, the can has had some technological improvements of its own. The older metal cans were made of three pieces -- a top lid, a bottom lid and the body, which was a flat piece of metal folded around and soldered. "Today," says Pflug, "most three-piece cans have a welded side seam, and we have two-piece drawn cans which are even more reliably sealed."

So, it seems technological innovation in packaging and the growing interest in recyclable packages may contribute to making Pflug's sterilization research even somewhat trendy.

For more information contact Carl Walker (612)624-3708 or Jennifer Obst (612)625-2741.

Klamfoth Elected A.D.P.I. Director

Mr. David C. Klamfoth, Carnation Company, Glendale, California, was elected to the Board of Directors of the American Dairy Products Institute on September 27; his term will expire in 1993.

Klamfoth, a dairy graduate of the Ohio State University, Columbus, OH, has been with the Carnation Company for 25 years. He currently serves as Technical Director - Carnation Products Division. Mr. Klamfoth also serves on the Board of Directors of the California Creamery Operators Association.

The American Dairy Products Institute is the national trade association of the processed dairy products industry. It represents firms associated with the production and marketing of evaporated and dry milks, and whey products, as well as firms that provide sales and services to the industry and firms that utilize processed dairy products.

The American Dairy Products Institute is headquartered in Chicago, Illinois; its Executive Director is Dr. Warren S. Clark, Jr.

For more information contact the American Dairy Products Institute, 130 North Franklin Street, Chicago, IL 60606; (312)782-4888/782-5455.

HAPPY HOLIDAYS from the AMES OFFICE STAFF!!!

The Ames office staff of the International Association of Milk, Food and Environmental Sanitarians wish you Happy Holidays! Pictured from left to right: Joel Rybolt, Advertising Account Executive, Julie Heim, Publications/Meeting Coordinator; Chris Ricke, Publications Specialist; Dolores Taylor, Bookkeeper; Margie Marble, Assistant Executive Manager/Editor of Dairy, Food and Environmental Sanitation; Lynn Henry, Assistant to the Bookkeeper; Scott Wells, Advertising Manager/Exhibit Coordinator; Amy Kleve, Editorial Assistant; Steve Halstead, Executive Manager, and Dee Buske, Affiliate Liaison. Not pictured, Lori Whitmer, Advertising Account Executive, Wendy Verschoor, Assistant to the Advertising Manager, and Vicki Link, Receptionist.

FDA Looks at the Future

Constituents and Managers Agree

Last Fall FDA asked its constituents and its own managers for suggestions on where FDA needs to do more or less to prepare for the future. Together there were almost 1000 suggestions - 47 percent of the suggestions were made by both groups; 38 percent of the suggestions came exclusively from inside managers; and FDA constituents' unique suggestions were 15 percent of the total proposal.

Labels, Labels, Labels

Consumers and Trade Associations agree that labeling was their top priority for FDA action. Consumers want better nutrition labeling. Cholesterol and fat content head the list. Typical comments were: "Cholesterol advertising is an example of misleading advertising. Eliminate it." They also want standardized definitions for terms such as low fat, lite, natural and organic. One said "Improvement to food labeling, using the US RA as a universal language."

Trade Associations echoed the call for more labeling. Typical comments were "FDA should insist on uniform national food labels" and "Establish and enforce product labeling and nutritional contents."

Speed Up New Product Approval

FDA has the national responsibility for the regulation of drugs intended for human use. One of FDA's highest priorities is to speed up the treatment for life-threatening diseases.

Health Professionals, Policy Board Alumni, and Trade Associations suggested that FDA put more resources into new product approval. They all urge FDA to try new ways to speed up product review, e.g., "Cut the red tape," and "FDA should conduct pre-market approval activities very differently. Simplify, streamline, and shorten process."

Keep the Information Coming!!!

Small Business, Trade Associations, Health Professionals, Policy Board Alumni, and Consumers all applaud the importance of information and education.

Two of the groups, Trade Associations and Small Business, want "more" information and help on how to improve the quality of their applications and how to better comply with FDA regulations. "More industry contact and involvement is needed," and "Promote an educational effort."

The other groups want information on matters such as recalls and new product innovations. "More focus on getting new technologies sooner," and "Help the industry to police itself" were two submitted suggestions.

Highest Priority on Inspection and Testing ... Especially Imports

States, Health Professionals and Consumers all agree with FDA managers on the importance of reemphasizing inspections and testing, particularly for imports: "Increase the inspection of food and drug products coming from other countries," "More inspections of imported foods for pesticide residues," "Tighten and increase inspections of foreign food manufactures."

Everybody Wants More

Research, Pre-market Approval, Inspection and Product Testing, Information and Education, Product Labeling Activities were all identified as areas deserving more resources. How to do this within budget restrictions is the focus of FDA planning and evaluation this year.

"I think the FDA does a great job, informing the public about things that are important to their health and well being."

Few Want FDA to Do Less

FDA has the responsibility for assuring consumers that foods and cosmetics are safe and that drugs, biologics, medical devices and radiological products are safe and effective. Of the almost 1,000 comments, less than 30 wanted FDA to "Do Less." For example, one consumer stated that "reassessment of previously approved products should get lower priority." However, the vast majority of comments indicated that FDA should do more to strengthen its pre-market review and post-market surveillance.

For more information contact the Food and Drug Administration, 5600 Fishers Lane, Rockville, MD 20857, (301)443-1544.

National Restaurant Association Chief Calls NAS Restaurant Labelling Recommendation "Preposterous"; Voices Group's Opposition

The president of the National Restaurant Association today announced his group's opposition to the just-released recommendation by the National Academy of Sciences (NAS), an advisory organization to the federal government, that fast food restaurants be required to display nutrition information on walls or on packaging and that fullservice restaurants be required to provide detailed nutrient information on all menu items.

"As restaurant operators, we firmly believe our customers have a right to know what nutrients are in the foods they eat," said Michael E. Hurst, the association's president and chairman of the board. "Our concern is not with providing such information. Rather, it is with how the information is conveyed."

Hurst cited several ways in which the foodservice industry has voluntarily responded to patrons who seek ingredient or nutrition information, including the use of printed materials, toll-free hotlines or interactive computers. According to a 1989 association survey of chain operators (representing 39,000 units nationwide), over three quarters of respondents offer nutritional information to patrons who request it.

"Restauranteurs have taken the initiative in responding to patrons who want nutrition information," Hurst said. "Most important, the industry has done this in the absence of any government mandate."

According to Hurst, the NAS recommendations are "impractical" and ineffective. Such requirements would create an operational nightmare.

"Consider the recommendation that fast food companies provide nutrition information on packaging," Hurst said. "Fast food containers are used for multiple purposes. The same cup, for example, may be used to serve soft drinks, a variety of fruit juices, iced tea, coffee, milk and milk shakes. If the container were required to carry ingredient information, a different cup with different labels would be necessary for each beverage, in every store, to accurately reflect the nutrition breakdown."

According to Hurst, posting nutrition information on wall posters is equally impractical. "Imagine the amount of wall space, even for a limited menu restaurant, that such information would need to cover. Particularly for small units, posting information on walls is almost impossible," the foodservice leader said.

In response to the NAS recommendation that fullservice restaurants be required to keep detailed, computerized nutrient analyses on all food items, Hurst said, "In an independent restaurant, our supply lines are simply too irregular. We buy what is fresh, what is in season, what is available. If we can obtain tomatoes, we put them in. If the quality is bad, we leave them out. To comply with NAS's suggestion, we would have to do a computer analysis of each menu item each day, and that would be far too costly and far too time consuming."

A far superior way to satisfy consumer concerns about nutrition, Hurst said, is to educate waitstaff as to the nutrient values of menu items and to honor special requests. "If a customer asks for a low-sodium entree, or a low-cholesterol entree, we'll prepare it for him," Hurst said.

According to Hurst, both the Food and Drug Administration (FDA) and the United States Department of Agriculture (USDA) previously examined the question of mandatory labeling in restaurants -- only to dismiss the issue. In 1987, the chief Senate sponsor of fast food labeling legislation, Senator John Chafee (R-RI), decided not to pursue passage of his bill after noting that most large companies were already providing this information to interested patrons.

Additionally, three current food labeling bills circulating in Congress specifically exempt restaurants from labeling requirements. And in 1979 and again in 1987, both the FDA and the USDA rejected proposals to require fast food labeling, judging the proposals to be impractical and financially burdensome.

"That this issue should still be around, after repeated study and subsequent rejection, is preposterous," Hurst said. "Time and time again, regulators have weighted the costs of any labeling requirements, both to businesses, and, through higher product costs, to the consumer, against the alleged benefits which a relatively small percentage of the population may or may not use. Based on this cost-benefit analysis, both FDA and USDA were unable to justify any labeling requirements.

"Left on its own, the foodservice industry has demonstrated that it can and will respond to market demand for nutrition information," Hurst concluded. "Any government action on the NAS recommendations is unfeasible and unnecessary."

For more information contact Anne Papa Curtis, Manager, Media Relations at (202)331-5938 or Jeffrey Prince, Senior Director at (202)331-5935.

Dan Tippmann

Engineering Manager Named

Dan Tippmann has been named Engineering Manager of Rite Coil, Inc. The announcement was made by Vice President/General Manager Bill Brown.

Established in 1987, Rite Coil, Inc., is the only manufacturer of circular evaporator coils in the United States. The coil offers a low profile, durability, and cleanability. Rite Coil's engineers can design systems utilizing their coils to adapt to the building construction and particular process of the end user. This may necessitate using fiberglass penhouses and air chutes which are also supplied by Rite Coil, Inc.

Tippmann majored in Mechanical Engineering with emphasis on Thermal Sciences at Indiana/Purdue University, Fort Wayne, Indiana. He most recently served as national service manager for Water Furnace International. Tippmann states his goals for his new position are to "document the existing product line via drawings, maximize existing products, and develop new products."

Tippmann and his wife, Vicky, are natives of Fort Wayne, Indiana, where they currently reside with their five year old daughter, Angela. When not at work, Tippmann enjoys vintage motorcycle restoration and family activities.

For more information contact Rebecca Goffinet at (219)482-2519.

Ecolab Inc. and Henkel Announce Worldwide Business Relationship

Ecolab Inc. (NYSE:ECL) and HENKEL KGaA, Dusseldorf, West Germany, announced that on September 11, 1990, they agreed to form a joint venture of their respective European cleaning and sanitizing businesses. In addition, Ecolab will acquire Henkel's cleaning and sanitizing businesses in 18 other countries outside of Europe and expects to acquire Henkel's interest in its cleaning and sanitizing businesses in several other countries.

As previously announced, on December 11, 1989, Ecolab issued $110 million of its Series A Convertible Preferred Stock to Henkel as an initial step in this endeavor. As a result of subsequent negotiations, Ecolab

and Henkel have agreed to combine their European cleaning and sanitizing businesses in a joint venture with each partner having a 50 percent economic interest. Henkel will serve as managing partner. The joint venture will have its own manufacturing facilities, its own R&D activity for technical service and product development and will be autonomous from its parents. The joint venture's administrative headquarters will be located in Dusseldorf.

Regulatory approvals are required in various jurisdictions before the agreements can be consummated. It is anticipated that the closing will occur the beginning of 1991.

As a result of the formation of the Henkel-Ecolab joint venture and Ecolab's purchase of Henkel's cleaning and sanitizing businesses in other countries, Henkel will receive 5.6 million shares of Ecolab's common stock and approximately $74 million, subject to adjustment. Henkel will receive an additional $110 million, reflecting its investment in the Ecolab Series A Convertible Preferred Stock, which will be retired concurrently with the closing.

Upon consummation of the transaction, Henkel's resulting equity ownership in Ecolab will represent approximately 19 percent of Ecolab's then outstanding common shares. Henkel's ownership of these shares will be subject to an agreement containing restrictions pertaining to, among other things, maximum share holding, transfer and voting rights. Henkel will be permitted to purchase Ecolab shares in the open market which, including the shares to be received in the transaction, could increase its total position up to a maximum of 26 percent of Ecolab's outstanding common shares. Over time Henkel will have the ability to own up to 30 percent. Henkel will have representation on Ecolab's Board of Directors proportionate to its Ecolab stock ownership.

Pierson M. Grieve, Ecolab chairman and chief executive officer, commented, "It is with great excitement and anticipation that we announce our agreement with Henkel which culminates ten months of extensive study, analyses, negotiations, planning and organization."

"The primary change will occur in Europe with the creation of Henkel-Ecolab, owned jointly by both partners. Initially, this business will have approximately $750 million in revenues, solid earnings and cash flow, and employ some 3,500 personnel. Even more important, the joint venture will have the size and breadth of product offerings to permit it to compete vigorously and successfully in the unified European market of 1992."

"In addition, Ecolab's purchase of most of Henkel's remaining worldwide cleaning and sanitizing operations will initially increase Ecolab's revenues by over $50 million in Asia and Latin America and give us new positions in countries where we have not had a presence."

Pierson M. Grieve concluded, "While there will be start-up costs in 1991, we believe the growth of these businesses and the potential synergies will offset them and that there should be no dilution of Ecolab's 1991 per share earnings. Of greater importance, we expect that future years will benefit from increased earnings."

Dr. Helmut Sihler, president and chief executive officer of Henkel, stated, "The anticipated successful completion of this transaction is a major step in the development of both companies' marketing opportunities in the European market of 1992. We are pleased to be working with Ecolab in this endeavor."

Ecolab is a leading worldwide developer and marketer of premium cleaning, sanitizing and maintenance services for the hospitality, institutional and residential markets. For the year ended December 31, 1989, Ecolab reported sales of $1.3 billion and earnings of $34.2 million, after preferred dividends, or $1.25 per share, excluding a one-time charge of $31.5 million, or $(1.15) per share. Earnings in 1989 were $2.7 million, or $0.10 per share. Ecolab's shares are traded on the New York Stock Exchange and the Pacific Stock Exchange under the symbol ECL.

Henkel is the world's largest manufacturer of oleochemicals made from natural fats and oils, offers the largest range of adhesives and is a leading producer of metal treatment products. Henkel ranks among the top companies in Europe for detergents and cleaning agents, institutional hygiene and industrial cleaning, personal care and cosmetic products. Sales in 1989 were DM11.6 billion, or $6.2 billion; net earnings were DM404 million, or $217.2 million.

For more information contact Bruce J. Bentcover at (612)293-2848.

NFI Technical Conference to Focus on Waste and Waste Disposal

The National Fisheries Institute (NFI) announced that waste utilization and disposal will be the focus of the third annual NFI Technical Conference. The three-day program, to be held at the New Orleans Hilton January 8-10, 1991, will concentrate on five subjects in particular:

- solid wastes
- effluents
- waste recovery
- waste utilization
- packaging disposal

Minimization of waste through more efficient processing and institution of recovery programs have become of increasing importance to the entire food industry, due to the need to improve margins and in response to more stringent environmental requirements. These issues will be covered by leading officials from the Environmental Protection Agency (EPA), state agencies, and support industries.

Among the discussions anticipated are the means to improve efficient and cost-effective use of fish and seafood by-products. Currently, the most common use of seafood "waste" is in animal feeds.

NFI Vice President of Science and Technology and Program Chairman Roy Martin expects this to be a conference of great significance for industry members. "Growing national concern about waste disposal is forcing us -- like many other industries -- to take a hard look at waste generation and use at all levels. This conference will provide an opportunity to exchange ideas and techniques not only to reduce waste, but also to make better use of fish and seafood 'waste products.'" NFI Executive Vice President Lee Weddig concurred, "We, as an industry, also need to be prepared to address one other aspect of waste disposal -- packaging materials. More and more communities are opposing the use of packaging materials, many of which evolved in response to food safety concerns. Now, we have to anticipate that packaging standards must still be met, while also meeting environmental requirements. This will be a real challenge for the entire food industry."

For more information on the conference and registration, please contact the National Fisheries Institute, 1525 Wilson Boulevard, Suite 500, Arlington, VA 22209, or call (703)524-8883.

The Future of the Food Industry Discussed in New Proceedings Report

Since 1979, six Eastern Food Science and Technology Conferences have been held in alternate years. The objective of each conference is to bring together food scientists and technologists from the eastern United States for the purpose of exchanging information on current topics.

Now published, *Changing Food Technology 3: Selected Papers from the Sixth Eastern Food Science & Technology Conference*, contains thirteen reports covering new developments in food processing and packaging technologies, computer technology and information management, food market research and development, health and nutrition, and future trends in food science and technology.

The selected reports in this new volume all focus on the future of food science and technology and provide a valuable assessment of the food industry. They were prepared by leading food industry specialists and contain information value to those in the food industry, from food science and R&D through management and marketing.

Changing Food Technology 3--Food Technology: A View of the Future. Selected Papers from the Sixth Eastern Food Science & Technology Conference, October 1-4, 1989, Hershey, PA. Editor: Allen J. Freed, 1990, ISBN: 0-87762-800-9, 144 pages, 6 x 9, softcover, $45.00. Available from Technomic Publishing Company, Inc., 851 New Holland Avenue, Box 3535, Lancaster, PA 17604, U.S.A. Telephone: (800)233-9936, FAX: (717)295-4538. A detailed brochure describing this book is available from the publisher upon request.

In Memory of Vernon R. Cupps

The Ames Office has been notified that Vernon R. Cupps, Neosho, MO, passed away in 1990.

Mr. Cupps was a Honorary Life Member of IAMFES and will be greatly missed by the association and in the industry.

Updates . . .

"The European Meat Industry in the 1990's: Advanced Technologies, Product Quality and Consumer Acceptability"

An International symposium to be held at Utrecht, The Netherlands, January 8-10, 1991.

Organized by: The Department of the Science of Food of Animal Origin, Faculty of Veterinary Medicine, The University of Utrecht, The Netherlands (Contacts: Dr. F.J.M. Smulders, Prof.Dr. J.G. van Logtestijn)
Purpose of the Symposium: Bringing together experts from Industry, Industry Organizations, Universities, Scientific Institutions and Governmental bodies to discuss the impact of the introduction of advanced technologies on the European Meat Industry, the consequences for the quality and safety of meat and meat products, the anticipated reactions of the consumer and the strategies to be devised for the next decade.
Register for the three day symposium by contacting the Symposium secretariate c/o Mrs. Liesbeth de Waal, tel INT 31/30/535367, telefax INT/31/30/531407 (c/o Department of the Science of Food of Animal Origin, P.O. Box 80.175, 3508 TD Utrecht, The Netherlands).

100 Years of Dairy Manufacturing Short Courses

1990 marks the 100th anniversary of the University of Wisconsin's Short Course for manufacturing dairy products.

In the past 100 years, over 7,200 students have been trained in the various dairy manufacturing short courses offered at UW-Madison, and more than 240 faculty and staff members were involved in teaching these short courses.

The Short Course has been adapting to changes in the dairy industry for one hundred years, and will continue to do so, according to Bill Wendorff, UW-Madison extension dairy manufacturing specialist.

The University's Department of Agriculture was first approached in the 1870s by leaders of Wisconsin's new dairy industry who wanted help in solving quality problems with dairy products. In 1883 the Agricultural Experiment Station was established with a grant from the state, with W.A. Henry as Professor of Agriculture. Stephen Babcock was appointed as chemist.

When Babcock introduced his test for milkfat in 1890, he was immediately overwhelmed by requests for its use and application. He offered to give instruction in performing the test and applying the results. The two students who immediately signed up were the start of the "Dairy School."

In January 1891, 70 men signed up for the 12-week Dairy School. The curriculum consisted of: milk constitution, milk testing, butter and cheese making.

In 1900 the new technology of milk pasteurization advocated by bacteriologist H.L. Russell was added to the course. Faculty from other departments of the college taught courses in physical structures, mechanics, breeding, dairy cattle feeding and dairy bacteriology. These courses helped meet the needs of the fast-growing industry.

In the 1960s, the dairy course was restarted by extension dairy specialist Myron Dean. This led to the Cheesemaker's Short Course. Dean organized a series of short courses that were held at four locations in the state in 1967. In 1968, Bob Bradley started a Dairy Analysis Short Course that was held at five locations. The courses were popular, but due to budget restrictions, by the end of the 1970s they were no longer offered at locations outside Madison.

In 1981, the Cheesemakers Course was offered through the Statewide Extension Educational Network (SEEN). From the UW-Madison campus the course was transmitted to 23 sites throughout Wisconsin. The students were able to ask questions of instructors and discuss information with students at other locations.

Bradley developed two more short courses in the 1980s. The CIP (Clean-in-Place) course, originally offered to state inspectors and survey officers, was phased into the Pasteurization Short Course. This course trained students in the thermal processing of milk. In 1988 Bradley developed the Ice Cream Maker's Short Course for students involved in the manufacture of ice cream and other frozen novelties.

The three main courses today are cheesemaking, pasteurization and ice-cream making, says Wendorff. He predicts that two more courses for dairy field reps and milk analysis will be added in the next four years.

Portions of the courses are presently taught by research scientists from the Center for Dairy Research. As new technology is developed, it is incorporated into the courses, according to Wendorff.

This year, Wendorff introduced a video on cheesemaking that is used mainly as a review for people taking the state cheesemakers exam. Wendorff and his colleagues are just getting started in the video area -- their next production will be a video for training seasonal employees in the cheesemaking industry.

A dinner program celebrating the centennial of the Dairy Manufacturing Short Courses was held September 27 at the Inntowner Hotel, Madison. For more information, contact Bill Wendorff, (608)263-2015.

N.M.C.
NATIONAL MASTITIS COUNCIL

Susceptibility to Infection Varies During the Dry Period

Mammary glands are highly susceptible to new infections during the early dry period and near calving. Increased incidence of infection during the dry period results in an elevated number of infected quarters at calving and is responsible for the high level of intramammary infections during lactation in many herds. Without dry cow therapy, approximately 8 to 12% of quarters in herds with average infection levels will become infected during the dry period. Such infections cause inflammation and affect mammary cell differentiation prior to calving, resulting in decreased milk production during lactation.

The elevated rate of new infections during the early dry period may be due to one or several of the following: 1) flushing of colonized bacteria in the teat canal during milking is terminated; 2) udder sanitation and teat dipping are discontinued; 3) the teat canal becomes dilated and shortened due to milk cessation which allows organisms to enter the udder; 4) phagocytes are involved in removing milk components instead of bacteria; and 5) reduced activity of lymphocytes.

Conversely, the rate of new infections during the mid dry period is very low. Mammary gland resistance during this time may be attributed to: 1) formation of a keratin plug in the teat canal which prevents mastitis pathogens from entering the udder; and 2) antibacterial factors such as lactoferrin and immunoglobulin are present in the udder and provide protection against invading pathogens.

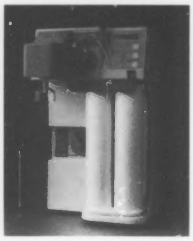
Susceptibility to infection again increases near calving. This may be due to: 1) increased fluid volume and dilation of the teat canal; 2) decreased lactoferrin concentrations; 3) reduced leukocyte numbers and phagocytic ability; and 4) utilization of milk components for bacterial growth.

Although not effective against all species of bacteria, dry cow treatment with antibiotics is the most effective method of reducing the rate of new intramammary infections during the early dry period. However, antibiotic therapy at drying off is not effective in preventing infections at calving. Therefore, clean, dry environmental conditions are necessary to reduce infections at this time.

This article is one in a continuing series made available by the National Mastitis Council. For additional information, contact the NMC, 1840 Wilson Boulevard, Arlington, VA 22201; (703)243-8268.

1840 Wilson Blvd.
Arlington, VA 22201
703-243-8268

Industry Products



New System Produces Ultrapure Water Direct From Tap Feed

The Millipore Alpha-Q™ Water System produces up to 0.5 L/min of ultrapure water (18 megohm-cm; 10 ppb TOC) direct from the tap without pretreatment. This dedicated, single-user system produces water suitable for use in applications such as HPLC, ion chromatography (IC), and atomic absorption spectrophotometry (AAS).

The self-contained QPAK$_1$™ Purification Pack is simple to change, eliminating the need to change multiple bowls and individual cartridges. An automatic sanitization cycle and built-in sanitization port make maintenance of the ultrafiltration (UF) cartridge easy. During periods of no demand, automatic intermittent recirculation keeps water quality high to ensure a rapid rise to quality.

Millipore Corporation - Bedford, MA

Please circle No. 241 on your Reader Service Card

Walker Enclosed Starter Processors offer Automatic pH Starter Control Throughout Culture Fermentation Cycles

To maintain high culture quality from start to finish, Walker Stainless Equipment Company has engineered an efficient automatic pH starter control system for cheesemakers. This optional customized system for Walker enclosed bulk starter processors, can operate several processors simultaneously.

Bacteria-inoculated starter media generates lactic acid. When acid buildup drops the pH value, the system automatically agitates the media to create good mixing of the product and injects liquid to provide strict control.

Walker's automatic starter control system for tracking and controlling cultures is complete. It includes a PLC controller, NEMA stainless steel enclosure, pH controller and probe assembly, chart recorder/controller, high/low level alarm signal and an ammonia pump. Before shipment, Walker final-quality-checks all programming, the assembly, and checks the system. Start-up assistance is also available.

Walker starter-processors are offered in completely sealed flat or cone bottom designs. Stainless steel heat transfer surface covers the bottom and sidewalls with optional 3 or 4 separately controllable zones. This permits maximum efficiency and control of partial batches. Next generation multiple tank data acquisition systems are available and made to customer specifications. Rated starter-processor capacities range from 100 to 2,000 gallons.

Walker Stainless Equipment Co., Inc. - New Lisbon, WI

Please circle No. 242 on your Reader Service Card

Dispenser Mechanism for Flowable Particulate Materials

U.S. & International Pat. Assigned to Frank X. Asphar

"This invention relates to a dispenser for dry flowable particulate materials of the type normally packaged in bags or boxes, which can be easily opened for initial use but, once opened, pose problems in terms of storage and reuse."

Salient User Benefits and Features

1. Renders repeated access to bulk packaged dry staples simple and clean, without transfer from their original packaging.
   No need to tear open then reseal bags or box flaps after each use.
2. Provides spillproof method to dispense automatically measured amounts. Cuts off flow after each full measure.
3. Gives sanitary, moisture proof protection; keeps out insects and rodents.
4. Provides secure, tight sealing cover over the dispensing port.
5. No need to lift heavy, bulky bags to pour out contents.
6. Transparent protective enclosure leaves original packaging, labeling exposed for ready identification in use.
7. Portable, wheeled mobile container for bulky, heavy bags or sacks makes handling more convenient, saves transporting effort in use.

Frank X. Asphar - Mount Vernon, NY

Please circle No. 243 on your Reader Service Card

New COX Digital Probe Provides Accurate Temperature Readings From Any Angle

COX Recorders has introduced a new pocket digital pulp thermometer with a unique swivel head. Designed to make temperature monitoring easier in tight quarters or difficult situations, the entire probe head swivels 180° so that the readout is always easy to see.

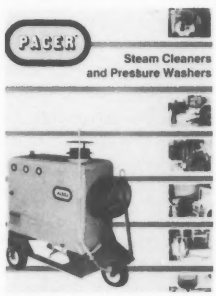
"We think this new design will increase temperature surveillance of perishable goods because it's so simple to use," said James L. Cox, President.

An accessory lock secures the display head in position so it stores flat and conveniently in a shirt pocket. A protective sheath with a pocket clip is included.

The COX Digital Probe uses the latest digital technology and is accurate from 0° to + 160°F. It operates on a single camera-type battery and is always in the "ON" position, ready for use. In order to conserve battery power, the temperature display provides an automatic update every 15 seconds. An instant update button provides an immediate temperature reading. Battery life under normal use is 12-18 months. Units are available in both Fahrenheit and Celsius.

COX Recorders - Long Beach, CA

Please circle No. 244 on your Reader Service Card



Heavy Duty Industrial Steam Cleaner/Pressure Washer

Pacer Cleaning Equipment offers a high efficiency line of steam cleaner/hot pressure washers which get the job done quicker than most other types of similar equipment.

They offer models to 550 GPH steam and 1100 GPH hot cleaning solution, plus 600 psi operating pressure, with superheat temperatures to 325°F ... within sixty seconds... softening/melting hardened dirt/grease, which can then easily be flushed away. Units are offered gas and oil fired, or a fireless unit which uses your plant steam.

Pacer's rugged 'ASME code' design is engineered to meet optimum performance with a minimum of maintenance. All of the models are designed for medium to heavy duty use with your cleaning/sanitizing or phosphatizing chemicals for economical cleaning or stripping of paint, wax, grease, oil, rust, dirt, etc. from machinery, equipment, building surfaces and piece parts.

Pacer Cleaning Equipment - Glenview, IL

Please circle No. 245 on your Reader Service Card

STAPHase® III System Coagulase Test and Germ Tube Test

Three tests in one product!

The STAPHase® III System from Analytab Products provides slide and tube coagulase tests for the determination of *Staphylococcus aureus* as well as a test for germ tube production by yeast.

To perform the coagulase tests, add 2 drops of sterile distilled water to the macrocupule. Next, inoculate the suspect colonies with a loop or wooden applicator stick, emulsify and observe for clumping. Greater than 95% of *S. aureus* will be positive in 15 seconds. For those colonies which do not agglutinate, the strips can be placed in the incubation trays with a little water and placed in a 35-37°C incubator for up to 5 hours, to perform the coagulase test. Following incubation, the tests are read by rocking the incubation trays. If inoculum flows easily, the coagulase test is negative. In a positive coagulase test, the inoculum will not flow.

To perform the germ tube test, add 8-10 drops of sterile distilled water to the macrocupule. Inoculate and emulsify the suspect yeast colonies. Following four hours at 35-37°C, germ tube production can be detected by placing one drop of suspension on a microscope slide with a cover slip and observing at 400X.

STAPHase® III system contains 50 test determinations along with incubation trays and a package insert.

API-Analytab Products - Plainview, NY

Please circle No. 246
on your Reader Service Card

New Moyno®Pipeliner Now Available from Robbins & Myers, Inc.

Robbins & Myers, Inc., a pioneer in the development of progressing cavity pump technology, has announced the availability of its new Moyno® Pipeliner for conditioning waste water.

The Moyno Pipeliner provides a simple, yet effective processing conditioner design to solve the problems associated with handling solids in waste water treatment. The Moyno Pipeliner creates smaller particles and provides more homogeneous sludge conditioning for more effective dewatering. Features include:

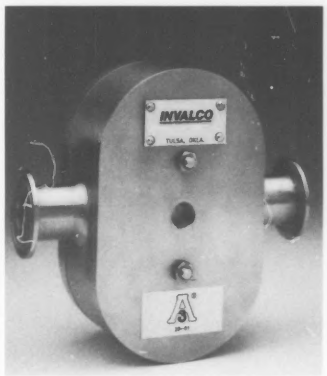
- Effective sludge conditioning produces consistent, small particle size.
- Compensating cutters remain in contact during the life of the cutter.
- Shear plate acts as a screen to filter damaging materials and large particle sizes.
- Simple design prevents costly jamming and requires little maintenance.

The Moyno Pipeliner is fully compatible with any Moyno progressing cavity pump for a complete, top-performing pumping/conditioning system.

The Moyno progressing cavity pump design offers longer life, especially in abrasive applications, and a low-shear pumping action which gives consistent, smooth, metered flow that is free from pulsations and variations in velocity and volume. Unlike piston or diaphragm pumps, Moyno pumps have no valves to stick or wear out. They are available in a variety of construction materials and are readily adaptable to a range of applications.

Robbins & Myers, Inc. - Springfield, OH

Please circle No. 247
on your Reader Service Card



INVALCO Sanitary Positive Displacement Meters

INVALCO, Inc. now markets sanitary positive displacement meters, according to Mark Smyth, sales manager. "Addition of the sanitary PD meter completes our sanitary metering line," said Smyth. "The PD meter is a perfect complement to our turbine flowmeter and magmeter. These devices, along with our sanitary level controls, are all manufactured in accordance with 3A standards."

The INVALCO PD meter can handle liquids with viscosities of up to 1,000,000 centipoise. Its impellers are made of engineered thermoplastic and offer superior chemical, impact and abrasion resistance. Made for line sizes 1/4" to 4", the INVALCO PD meter can handle process temperatures to 400 degrees and operating pressures to 3,000 psig. The meter is accurate to ± 0.05% of flow rate with a turndown ratio up to 1,000:1.

INVALCO, Inc. - Tulsa, OK

Please circle No. 248
on your Reader Service Card

Anchor introduces Excel 4-HS™ with EDGE™ Production Technology

Anchor, a Division of Boehringer Ingelheim, Inc. announces the introduction of Excel 4-HS™ an all killed IBR-BVD-PI3-BRSV-HS cattle vaccine/bacterin made with the unique EDGE BioGrowth™ System production technology.

Excel 4-HS™ is the second in an advanced line of white bovine vaccines using an advanced production system developed by Anchor called the EDGE BioGrowth™ System. The EDGE™ System produces virus vaccines with unsurpassed purity and potency and without the addition of chemical color indicators for pH testing. EDGE™ stands for *E*lectronically *D*efined *G*rowth *E*nvironment and is a system for growing viral antigens in vaccine production.

The result is a white vaccine instead of the traditional pink viral vaccines.

In addition, Excel 4-HS™ makes use of the MATRIX adjuvant system that physically places the antigens within the structure of the adjuvant. The antigens in Excel 4-HS™ are killed with Anchor's PRESERVE IMMUNE system, which kills each antigen without effecting the antigenicity of the vaccine.

Excel 4-HS™ is the extra protection combination. Excel 4-HS™ adds *Haemophilus somnus* to an all killed IBR-BVD-PI3-BRSV combination to provide dairy and beef cattle of all ages, including pregnant cattle and veal calves, broad protection against five major bovine diseases.

Excel 4-HS™ provides excellent efficacy as proven in direct challenge trials with BRSV, BVD, and IBR fractions of the vaccine.

New Excel 4-HS™ vaccine is available through Anchor Animal Health Suppliers.

Boehringer Ingelheim Animal Health, Inc. - St. Joseph, MO

Please circle No. 249
on your Reader Service Card

Rapid Check of Hygiene Status

Hygiene levels of critical areas in the food-processing and catering industries can be checked quickly and simply using a portable, self-contained instrument from Wales.

The sturdy BIOTRACE HYGIENE MONITOR weighs 2.2 lb. Designed for assessing the hygienic status of surfaces of food-preparation areas, food-processing equipment and the per-

sonal hygiene of food operatives, the unit also monitors microbial populations present in cooling-tower and other process water and biofilms.

Samples, introduced into a chamber at the top of the unit, can detect the presence of adenosine triphosphate (ATP), the energy source within all living cells. ATP reacts with the enzyme luciferase (extracted from fireflies) to produce light, and ultrasensitive photodiodes within the instrument detect this light to give a measurement of the quantity of ATP, and hence the contamination, in the sample. This method provides results in minutes.

The Monitor makes possible hazard assessment of critical control points in real time; it allows positive control of cleaning schedules, hence more effective cleaning and a reduction of cross contamination. It is easy to use even by personnel with no previous experience. The unit's rechargeable battery gives power for a full working day.

Biotrace Ltd. - Bridgend, Wales

Please circle No. 250
on your Reader Service Card

The Baker Company Announces StediVOLT

The Baker Company, Inc. announces a new voltage compensating speed controller, StediVOLT, to be included in all Baker Company biological safety cabinets. Concerned by the potentially hazardous effects of voltage fluctuations on the proper operation of containment cabinets, Baker has devised a way of greatly reducing the possibility of cabinet failure. Without compensating for possible voltage fluctuations, an unbalanced airflow may result, allowing dirty room air to enter the containment cabinet, causing product contamination, or allowing some of the cabinet air to escape into the room through the front sash, compromising personnel protection.

StediVOLT, a voltage compensating speed controller designed in-line between the incoming line voltage and the blower motor, reduces the risk of performance degradation, and possible product loss, due to line voltage fluctuations. While StediVOLT is an integral part of all new Baker biological safety cabinets, it is also available as a retrofit for cabinets already in use. Safety and value are designed into every Baker product, maximizing personnel and product safety while delivering years of operation at peak performance.

With over 30 years experience, The Baker Company is a pioneer in the design and manufacture of high quality laminar flow clean benches and biological safety cabinets, building safety and value into every product.

The Baker Company - Sanford, ME

Please circle No. 251
on your Reader Service Card

Niro Atomizer Introduces Niro Soavi Homogenizers and High Pressure Pumps

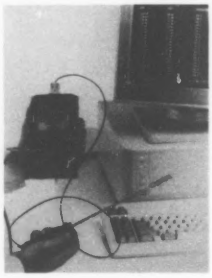
Niro Atomizer A/S, Copenhagen announces the purchase of Soavi B. & Figli, SpA of Parma, Italy. This will add a broad line of high pressure pumps and homogenizers to complement Niro's spray dryer, evaporator and membrane filtration systems.

Niro Atomizer Food and Dairy, Inc., Hudson, Wisconsin, will act as the exclusive North American agent for Niro Soavi equipment and will support a staff of factory trained installation and service personnel and a fully stocked inventory of spare parts.

Applications for the high pressure pumps and homogenizers in the pharmaceutical and biotech industries include: antibiotics, cell rupture, cosmetics, single cell slurries, colloidal suspensions, etc. Capacities range from 30 liters/hour to 100,000 liters/hour at pressures up to 1000 bar.

Niro Atomizer Food & Dairy, Inc. - Hudson, WI

Please circle No. 252
on your Reader Service Card



Thermometer Talks to Computer

A microprocessor thermometer system allowing ongoing logging of temperatures is now available from Atkins Technical.

The 496 model interfaces with any IBM® compatible personal computer through an RS232 port in the thermometer and with a cable that is supplied with the instrument. Using the software supplied with the instrument, users can set the intervals at which temperatures are recorded.

The thermometer features bright red one-half inch LED digits and an accuracy level of +/- 0.1 percent of +/-1C°. This accuracy level is unusually high for an instrument that is used in both freezers and high temperature ovens.

With this system, quality assurance, laboratory and industrial maintenance technicians can easily record temperatures for monitoring and logging. The temperature log becomes a permanent record with which the user can perform various computer analyses using the most popular spreadsheet and analysis programs.

Atkins Technical Inc. - Gainesville, FL

Please circle No. 253
on your Reader Service Card

New Food-Grade Air Compressor Fluid Outperforms Petroleum Fluids; Costs Less Than Synthetics

Keystone Industrial Lubricants introduces Nevastane 20, a new air compressor fluid that meets U.S.D.A. H-1 requirements for use in meat, poultry, beverage, dairy and prepared food plants, as well as pharmaceutical, hospital and medical facilities.

A semi-synthetic, 20AW (SAE 20) fluid, Nevastane 20's natural detergency keeps bearings and other parts clean. It is highly stable and effective at high temperatures, is ashless (no carbon build-up), non-foaming and resists moisture as well as breakdown, due to its superior viscosity and other special qualities.

A low pour point (-50°F) makes starting and pumping easier, while other features deliver reduced friction, improved heat transfer, longer sump life and extended intervals between relubrication, for noticeable savings in equipment wear and lubricant expense.

Its 400% gain in performance over ordinary petroleum fluids vastly exceeds its minor additional cost, while offering service life and performance comparable to far more costly synthetics (Polyalphaolefins).

Suitable for rotary screw and sliding vane compressors (stationary and portable), Nevastane 20 is widely used by air compressor manufacturers; a selection guide for use with all popular compressor models is included in printed specifications.

In addition to compressors, Nevastane 20 is ideal for bearings, chains and other equipment where needs exist for better lubricant performance and extended lubrication life (longer relube intervals), with reduced lubrication expense.

Keystone Industrial Lubricants - King of Prussia, PA

Please circle No. 254
on your Reader Service Card

*New **Staphylococcus aureus** Assay from GENE-TRAK Systems*

A new, colorimetric DNA probe assay for *Staphylococcus aureus* is now available from GENE-TRAK Systems. The Colorimetric GENE-TRAK® *Staphylococcus aureus* Assay allows rapid detection of *Staphylococcus aureus* in processed food samples. The assay is the sixth test introduced as part of a series of highly sensitive, easy-to-use tests for the rapid detection of food pathogens. The GENE-TRAK Systems' Colorimetric product line also includes tests for *Salmonella, Listeria, Escherichia coli, Campylobacter,* and *Yersinia enterocolitica.*

The new GENE-TRAK Assay allows detection of *Staphylococcus aureus* within 48 hours, compared to four days for conventional microbiological methods. This significant time sav-

ings is important because *Staphylococcus aureus* is frequently isolated from high-protein, processed foods such as ready-to-eat salads, meats, and seafood. The new assay detects biochemically atypical, as well as normal strains of *Staphylococcus aureus*.

GENE-TRAK Systems - Framingham, MA

Please circle No. 255 on your Reader Service Card

Measure Barrier Oxygen Permeation at Very-Low Levels With or Without Precise Relative Humidity, With the New Ox-Tran 300 Series

With new sensor capabilities, very-low oxygen transmission rate (0_2TR) testing of films and packages can now be performed, at precise relative humidities. The new OX-TRAN 300 Series from MOCON incorporates an extremely sensitive, patent-pending, self humidifying sensor which provides extended dry testing capabilities. The "H" version of the OX-TRAN Series allows for testing 0_2TR at *precise relative humidities* while at levels 20 times more sensitive than previous systems. Computer-controlled two test station testing with a repeatability of ± 0.005 cc/m^2/day and a resolution of 0.001 cc/m^2/day. These new state-of-the-art OX-TRAN systems are the choice for testing today's sophisticated barrier materials.

The OX-TRAN 300 Series has a variety of options and accessories available for specific applications. Options for 0_2TR testing of flat films, filled and unfilled packages, with or without temperature control are available.

Quality and service are backed by an established, award-winning company, with over twenty years experience designing permeation measurement systems.

Modern Controls, Inc. - Minneapolis, MN

Please circle No. 256 on your Reader Service Card

Food and Environmental Hazards to Health

Foodborne Hepatitis A - Alaska, Florida, North Carolina, Washington

From 1983 through 1989, the incidence of hepatitis A in the United States increased 58% (from 9.2 to 14.5 cases per 100,000 population). Based on analysis of hepatitis A cases reported to CDC's national Viral Hepatitis Surveillance Program in 1988, 7.3% of hepatitis A cases were associated with foodborne or waterborne outbreaks. This report summarizes recent foodborne-related outbreaks of hepatitis A in Alaska, Florida, North Carolina, and Washington.

Alaska

Between June 18 and July 20, 1988, 32 serologically confirmed hepatitis A cases among persons who resided in or had visited Peters Creek, Alaska (population 4000), were reported to the Alaska Department of Health and Social Services. Patients ranged in age from 1 to 54 years (median: 13 years). Between July 8 and August 14, 23 additional (secondary) cases occurred among household contacts of the original patients.

To examine potential sources of infection, the Alaska Department of Health and Social Services conducted a case-control study of the first 14 reported patients and 22 asymptomatic household members. All 14 patients and seven (32%) household members had consumed an ice-slush beverage purchased from a local convenience market between May 23 and June 10 (odds ratio [OR] cannot be calculated; 95% confidence interval [CI]=3.4-infinity). No other food-consumption or exposure category (including social events, restaurants, grocery stores, or international travel) was statistically associated with illness. The 18 other patients had also consumed the ice-slush beverage.

The ice-slush beverage mixture was prepared daily with tap water from a bathroom sink using utensils stored beside a toilet. All five employees of the market denied having hepatitis symptoms; four of these were tested and were negative for IgM antibody to hepatitis A virus (IgM anti-HAV). The fifth employee, who was one of the two persons who prepared the ice-slush beverage, refused to be tested. However, a household contact of this employee had had serologically confirmed hepatitis A in early June and reported that the employee had been jaundiced concurrently with her illness.

Florida

In August 1988, the Alabama Department of Public Health noted an increase in cases of serologically confirmed hepatitis A in persons living in several areas of the state. Within 6 weeks before onset of illness, most affected persons had eaten raw oysters harvested from coastal waters of Bay County, Florida. The Florida Department of Health and Rehabilitative Services (FDHRS) contacted state health departments in neighboring and other states about hepatitis A cases in July or August 1988 in persons who had attended events serving seafood within 10-50 days of becoming ill. The 61 persons who were identified resided in five states: Alabama (23 persons), Florida (18), Georgia (18), Hawaii (one), and Tennessee (one). Patients ranged in age from 8 to 60 years (median: 31 years); all were white, and 49 (80%) were male. Fifty-nine (97%) had eaten raw oysters; one, raw scallops; and one, baked oysters. All the oysters and scallops were traced to the same growing area of Bay County coastal waters. The median incubation period between consumption of raw oysters and onset of illness was 29 days (range: 16-48 days).

To further study oyster consumption as a potential risk factor for hepatitis A, the FDHRS conducted a case-control study using uninfected eating companions of the patients as controls. Fifty-three patients who had serologically confirmed hepatitis A and 64 controls were interviewed by telephone; 51 (96%) of the patients and 33 (52%) of the controls had eaten raw oysters (OR = 24; 95% CI = 5.4-252.6). Consumption of other seafoods (i.e., clams, mussels, and shrimp) was not statistically associated with illness.

The implicated oysters apparently had been illegally harvested from outside approved coastal waters of Bay County. Sources of human fecal contamination were identified near oyster beds unapproved for harvesting and included boats with inappropriate sewage disposal systems and a local sewage treatment plant with discharges containing high levels of fecal coliforms.

North Carolina

Beginning September 30, 1988, hepatitis A cases among employees of businesses located in east Greensboro were reported to county health departments in central North Carolina. Only day-shift employees became ill. Preliminary investigation suggested a common exposure to one nearby restaurant (restaurant A), which served as many as 400 meals per day to regular clientele. A total of 32 outbreak-associated cases was eventually reported.

The North Carolina Department of Human Resources conducted a case-control study to assess a possible association between illness and exposure to restaurant A. Twenty-seven patients and 50 controls (randomly selected from co-workers) were interviewed about exposures to different restaurants since August 15. Patients were more likely than controls to have eaten at restaurants A (OR = 4.1; 95% CI = 1.3-14.4). No other restaurant was statistically associated with illness.

Based on additional information obtained from 16 patients and 20 controls who reported eating lunch at restaurant A 2-6 weeks before the outbreak, only consumption of iced tea (OR = 8.1; 95% CI = 0.8-387.8) or hamburgers (OR = 11.4; 95% CI = 1.1-551.3) was associated with illness. However, 15 (94%) of the ill persons drank iced tea, whereas only six (38%) of the ill persons reported eating hamburgers.

All foodhandlers at the restaurant were tested for IgM anti-HAV; one employee who was IgM anti-HAV positive, denied symptoms of and risk factors for hepatitis A. However, this employee was a suspected intravenous (IV)-drug

user and had job tasks that included preparation of fountain drinks and sandwiches.

Immune globuline (IG) was given to all foodhandlers at the restaurant. Because primary/secondary-case status and infectiousness of the IgM anti-HAV-positive foodhandler were unknown and because her hygiene and foodhandling practices were questionable, the local health department recommended administration of IG to all patrons who had eaten at the restaurant within 2 weeks before the association between hepatitis A and the restaurant had been determined. More than 1000 IG doses were given. The restaurant voluntarily closed for 24 days, and no persons with hepatitis A were identified with onset after November 8.

Washington

In May 1989, the Seattle-King County Department of Public Health (SKCDPH) received reports of and investigated 213 cases of hepatitis A - a threefold increase over the average of 68 cases reported in each of the first 4 months of 1989. Onsets of illness clustered during April 28 - May 5. One hundred seventeen (55%) of the patients had eaten at one outlet of a Seattle-area restaurant chain (chain A). One of the patients was a recent employee and three were current employees of three of the chain's restaurants. Interviews with past and present chain A employees did not identify any worker with illness during the period of likely exposure for most patients (2-6 weeks before onset of illness). All other current workers in the three restaurants were tested for IgM anti-HAV. None were positive, and all were given IG. Because two of the ill employees had poor hygiene and had worked while ill with diarrhea, the SKCDPH recommended IG for patrons who had eaten at two of the restaurants from May 3 - 6.

The SKCDPH conducted a case-control study to further examine the potential role of chain A restaurants in the outbreak. Sixteen patients were randomly selected and re-interviewed by telephone; 16 age-group - and sex-matched controls were obtained by increasing each patient's telephone number by one. Exposure to 11 multi-outlet restaurant chains (including chain A) was ascertained for patients during the 2-6 weeks before onset and for controls during April 14 - May 12. Mean total of any restaurant visits was higher among patients (7.7) than among controls (4.3). In addition, patients (89%) were more likely than controls (25%) to have eaten at restaurants from chain A (OR = 11.0; 95% CI = 2.2-56.0); differences in exposure to the 10 other multi-outlet restaurants were not statistically significant.

Follow-up investigation did not detect deficiencies in sanitation practices or history of recent hepatitis among employees of chain A's distributors of foodstuffs, paper goods, and related supplies. The cause of the outbreak remains undetermined.

Editorial Note: The outbreaks reported here illustrate two principal modes of transmission associated with foodborne hepatitis A outbreaks: 1) contamination of food during preparation by a foodhandler infected with hepatitis A virus and 2) contamination of food, such as shellfish, before it reaches the food service establishment.

Contamination of food during preparation by a hepatitis A-infected foodhandler is the most common mode of transmission in foodborne outbreaks. The Alaska and North Carolina outbreaks are atypical in that ice or drinks as vehicles are rare; usually the vehicles are sandwiches or green salads that are not cooked or are improperly handled after cooking. The outbreak in North Carolina is also consistent with a nationwide phenomenon of increased reports of hepatitis A among IV-drug users, who can become sources of foodborne outbreaks if they are also foodhandlers.

Contamination of food with virus before the food reaches the service establishment is less common. Shellfish filter large quantities of water during feeding and in the process can concentrate microorganisms, including enterically transmitted viruses such as hepatitis A. Transmission to humans occurs when contaminated shellfish are consumed raw or undercooked. Hepatitis A outbreaks attributed to consumption of contaminated shellfish have been reported intermittently in the United States and abroad; in 1988, an outbreak associated with clams involved more than 250,000 cases in Shanghai, People's Republic of China. The Florida outbreak reported here is the largest attributed to shellfish in the United States since 1973 and the largest ever reported in Florida. Outbreaks due to pre-retail contamination of products other than shellfish have rarely been reported. In 1988, a multifocal outbreak linked to lettuce possibly contaminated before local distribution occurred in Louisville, Kentucky.

Measures to prevent foodborne hepatitis A outbreaks include training of foodhandlers regarding proper hygiene and foodhandling practices, investigation of foodhandlers who have symptoms of hepatitis or are otherwise ill, prompt reporting by health-care providers to local health departments of patients with suspected foodborne hepatitis A, and prompt investigation by health departments of possible sources of infection. Consistent maintenance of good handwashing and other personal hygiene measures by foodhandlers is important because the source patient in foodborne outbreaks is often asymptomatic (as apparently occurred in North Carolina and Alaska). Prevention of hepatitis A outbreaks associated with shellfish relies on surveillance of water beds where shellfish are harvested to ensure that there is no evidence of fecal contamination. Transmission and infection from shellfish also can be prevented by thorough cooking and proper storage and handling before and after cooking.

When a foodhandler is diagnosed with hepatitis A, IG is usually recommended for other foodhandlers at the same establishment. IG is generally not recommended for patrons because common-source transmission is infrequent; however, it may be considered if the infected person handles high-risk foods, has poor hygiene, or has diarrhea during the early stages of illness and if patrons can be identified and treated within 2 weeks after exposure. Once a foodborne hepatitis outbreak has occurred, it is usually too late to prevent further cases because the 2-week period after exposure during which IG is effective has already passed. The increasing number of hepatitis A cases nationwide underscores the importance of focusing on foodhandlers with hepatitis A and decisions regarding IG administration to food service patrons.

MMWR 4/13/90

PS Forum For Professional Sanitarians

(This column continues from last month with lessons learned at the Buffalo Ranch Cafe.)

During the early 70's new environmental health programs were initiated by federal and state agencies. Resources were provided to create new agencies at the national and state level to "manage" a multitude of new environmental problems.

It seemed that a new program was being implemented on a monthly basis. Few new resources were being provided to local health agencies to implement the new "program of the month."

It was difficult for Sanitarians to find the time to devote to training water pollution control operators; establishing sampling stations for water and air quality; monitoring marine toilet installations; and even training food service managers. A frequent question among Sanitarians at the Buffalo Ranch Cafe was "How could all these programs be accomplished?"

Rex Netherton offered the best solution. Rex said that we had to know what our local public health needs were. Then to ask the question: "Is it better to treat 100% of the sewage 50% effectively or to treat 50% of it 100% effectively?"

Rex went on to say that "some of these new programs may need to be fully implemented while others may only need to be partially implemented." Our District Sanitarian, Glen Early, added to Rex's observation: "Just be sure to keep the public in public health when you identify health needs." These words of wisdom were not fully appreciated for a number of years.

Today, the same trends continue with new programs being initiated faster than many state and local agencies can find resources for implementation. At the same time, federal budgets are being reduced and are having to be replaced with state and local funding. Some readers may find that many of the lessons learned at the Buffalo Ranch Cafe can still be applied.

OFF THE CLIPBOARD: The Executive Board will be facing a difficult issue with the IAMFES name change. Let the board know if the only job responsibility you have is related to food. Industry members will likely become involved with a wider range of environmental issues (solid waste, hazardous materials, water quality, energy conservation, disaster preparedness, to name a few). Good luck to the Board on this one - the future of the organization depends on it.

- Last August the USDA banned the use of certain types of elastic used in processing foods, smoked meats, and poultry products. Preliminary tests conducted by USDA indicates that some types of elastic being used reacted with nitrites in the meat to create unacceptable levels of dibutylnitrosamine (a carcinogen).

- We recently had the chance to glimpse a view of the future in manager training and certification. The Food Marketing Institute has developed a computer-based training program. The FMI program enables employees to study at their own pace without instructors. The program prepares the student for the Educational Testing Service (ETS) examination. If you have a number of individuals (50+) to train, this program is a must. Contact Kee Systems (Jackie Schworm), Columbia, MD 21046, (301)880-0880 for information on cost and how to obtain this program.

- Some states and local health departments are finding it difficult to incorporate new technologies. A prime example is prohibiting the use of the new generation of soft serve machines with a heat treatment capability. The technology has been approved by NSF and FDA. Perhaps the health authorities that have banned these units have experienced large scale disease outbreaks related to soft serve machines? Policies on new technologies must be based on sound scientific and public health principles.

- Due to Operation Desert Shield and a pending move this will be the last PS Column. Before we get to the end of this clipboard I need thank a few individuals and clean out the in-basket:

- A big thanks to Art Banks, Charles Otto and others with FDA's Retail Food Branch. This is a group of hard working professionals that are understaffed and underpaid. We often forget that the Retail Food Branch is a "*cooperative*" program.

- We need to recognize the numerous contributions that industry associations and trade groups are making to improve food safety. Kudos for the leadership and contributions from organizations like the National Restaurant Association, Food Marketing Institute, and the National-American Wholesale Grocers' Association. In particular, I would like to recognize the contributions that the NRA has made to food sanitation education and training.

- The IAMFES editorial staff has been a tremendous help. Special thanks to Margie Marble for providing guidance and the opportunity for a monthly column.

- A very special thanks to all members that have read this column and have shared their professional views with other members.

Homer C. Emery, RS
Chair, FDA Interpretations Committee

Answers to the October Field Inspection Quiz: (1) D; (2) D; (3) D; (4) D; (5) D.

Letter to the Editor

Dear Editor:

It was extremely disappointing to encounter the inaccurate and unsubstantiated attacks on the foodservice industry advanced by Mr. Homer C. Emery, RS, in the September 1990 issue of *Dairy, Food and Environmental Sanitation*. Mr. Emery's charges that our industry is ignorant of and lackadaisical about the AIDS issue and other aspects of disease transmission simply neglects the facts; for more than 5 years, the foodservice industry has indeed assumed the leadership in educating operators and employees. We have produced and distributed numerous booklets, brochures and videotapes documenting the facts about AIDS transmission. In addition to our membership, we advised all state health departments of the availability of these materials, and included notices in our "UPDATE" newsletter sent gratis to some 2,800 regulatory officials.

Nor have we been lax in the broader area of educating operators and employees about other diseases. Our Educational Foundation has trained and certified almost 250,000 persons in principles of food sanitation. An FDA official recently remarked that industry has moved faster than regulators in the area of training. In short, foodservice operators know the facts.

Foodservice operators also know about ignorance and misconceptions among the general public, because it has threatened their economic survival. Our support of the Chapman Amendment was based purely on economic concerns. We did not ask to displace HIV-positive employees; we asked for the freedom to respond in the face of public ignorance to protect all employees' jobs, including those of persons with AIDS.

We agree with Mr. Emery's observation that public ignorance and misconception has persisted despite the best efforts of the public health community to change those attitudes.

However, we do not agree that the foodservice industry should take on this public education task. The persistent opinions that have resisted the Surgeon General are not likely to succumb to such self-serving banalities as a condom machine in the restroom, as Mr. Emery suggested.

The foodservice industry cannot be the singular vehicle for changing public health opinion, any more than we can be the singular vehicle for correcting prior contamination and abuse in the food chain. We will, of course, continue to do our part, and we hope that this brief response may help to re-establish some of the professionalism that Mr. Emery's column usually promotes.

Sincerely,
William P. Fisher, Ph.D.
Executive Vice President
National Restaurant Association

Response to the Letter to the Editor:

My comments on the HIV/AIDS issue were not targeted toward the National Restaurant Association, nor was the NRA specifically mentioned in the column. It is interesting to note that the NRA does admit that their lobbying efforts concerning HIV/AIDS were based on political and economical reasons rather than based on current scientific and public health information. At least they are honest in this respect.

I was not aware of NRA's contributions to HIV/AIDS training materials. I highly recommend that all state and local health agencies obtain and use these educational materials. If they are of the same high quality as other NRA materials they will be superb.

The main intent of the HIV/AIDS column was to remind readers that we are in the middle of a devastating epidemic. A secondary purpose was to generate interest for improving poor handwashing practices that exist throughout the nation and in particular the foodservice industry. As long as poor handwashing practices remain an industry standard we all have a long way to go.

Homer C. Emery, Ph.D., R.S.

Affiliate News

Linda Stratton, President, Wyoming Public Health Sanitarians, is pictured with John Misock, Wyoming Department of Agriculture

Wyoming Public Health Sanitarians Association Annual Conference

The Wyoming Public Health Sanitarians Association (WPHSA) had their Annual Educational Conference, September 11-14, in Casper, Wyoming at the Hilton Inn. The conference chairman was Ed Starkey and co-chairman Bud Anderson. Some of the topics included: Legal Aspects of Inspection, Labeling Changes, Household Hazardous Wastes and Acceptance of Vacuum Packaging.

The association's members consist of State Dept. of Agriculture, State Health Dept., and city/county inspectors, throughout Wyoming. We also have members from Colorado and Utah. The association strives to promote public health in Wyoming by education and increased recognition of the Sanitarian as a professional.

Elections of the Executive Board were held at the business meeting. Elected for a two year term were Linda Stratton - President, Terry Carlile - Secretary, and Ed Starkey - Treasurer, and Sandi Palmer is the Past President.

At the awards banquet Debbie Bonini received the Outstanding Sanitarian Award for her outstanding achievements as a sanitarian. Dick Peterson received the Arthur Williamson award which is the highest award given by WPHSA for his outstanding work in the environmental health field.

WPHSA has formed a Goals and Objectives committee this year. This committee will be working hard with the other committees to educate the public, including the school system as well as the employees of inspected establishments. WPHSA has four programs a year: Pool Course, Food Seminar, Annual Educational Conference for WPHSA members, and a new program in 1990 the Day Care Seminar. All of these have been a success in past years and now we are intending to have several smaller scale seminars on food safety throughout Wyoming this year.

Upcoming IAMFES Affiliate Meetings

1991

JANUARY

•**30, Connecticut Association of Dairy & Food Sanitarians, Inc., Annual Conference**, will be held at the Hawthorne Inn, Berlin, CT. For more information contact Don Shields at (203)566-3279.

APRIL

•**3-5, Missouri Milk, Food and Environmental Health Associations's Annual Conference** will be held at the Ramada Inn, Columbia, MO. For more information contact Richard Janulewicz at (816)781-1600.

MAY

•**14-16, Pennsylvania Association of Dairy Sanitarians and Dairy Laboratory Analysts Annual Conference** at the Keller Conference Center, Penn State University, University Park, PA. For more information, contact Sid Barnard, 8 Borland Lab, University Park, PA 16802, (814)863-3915.

1990-91 officers for PA Association of Dairy Sanitarians and Dairy Laboratory Analysts are (l to r) Donald Yanek, Vice President; Patricia McKenty, Treasurer; James De Tolla, President; and Donald Lerch, President-Elect.

1990 Pennsylvania Association of Sanitarians and Dairy Laboratory Analysts' Conference

About 250 attendees were present for three days of presentations by more than 40 speakers.

The program was varied, informative and worthwhile. The evening tour of the University Creamery and ice cream evaluation was well accepted by the more than 100 persons who came.

The annual banquet featured awards presentations followed by music by the Sweet Adelines quartet and The Four M's. Bert Erdman, regional PDA sanitarian from Lykens, was given the Distinguished Service plaque. The Sanitarians

(l to r) Myron McKinley, Administrator of Chicago Federal Order about to be presented with a Penn State Nittany Lion by Sid Barnard and Lew Terrill, affiliate president, for his dedication to the dairy industry and support of education and research programs.

Howard Atkinson (l), Co-Chairperson, Awards Committee, PA Association of Dairy Sanitarians and Dairy Laboratory Analysts presented Bert Erdman (r), Regional Sanitarian, PDA, with Distinguished Service Award.

Award was given to Joseph Himmelstine and the Dairy Laboratory Award to Douglas Friend. The International Sanitarians (IAMFES) provided Awards of Merit to four nominees. These were presented to Linda Knotwell, Allen Murray, Virginia McArthur and W. Thomas Moore. A Nittany Lion statuette was given to Myron McKinley, Chicago Federal Order Administrator, for his dedication and support of educational and research programs. He presented a talk on the program and was banquet master of ceremonies.

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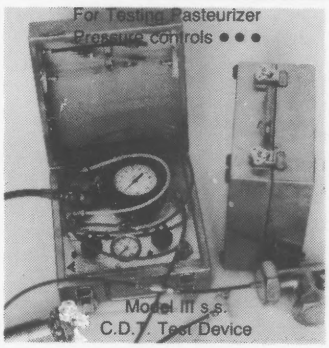

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AUTHORS INDEX

SUBJECT INDEX

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Coming Events

1991

January

•**6-10, National Soft Serve & Fast Food Association Convention and Showcase** to be held at the Twin Towers Hotel & Convention Center, Orlando, FL. The Convention will run from January 6-10 with the showcase taking place on January 9. For more information on exhibiting in or attending the showcase and convention, call 1-800-346-PROS.

•**7-10, Better Process Control School.** For more information contact Ralph L. Price, Ph.D., University of Arizona, Department of Nutrition and Food Science, 308 Shantz Building, Tucson, AZ 85721, (602)621-1728.

•**7-16, 41st Annual University of Maryland Ice Cream Short Course.** For more information contact Dr. James T. Marshall, Department of Animal Sciences, University of Maryland, College Park, MD 20742, (301)405-1375.

•**10-11, Food Microbiology**, to be held in New Brunswick, NJ. For more information contact the Office of Continuing Professional Education, Cook College, Rutgers University, P.O. Box 231, New Brunswick, NJ 08903 or call (908)932-9271.

•**21-22, Emerging Issues in Food Science and Technology** is the theme for the Fourth Annual Southern California Food Industry Conference to be held on the campus of Chapman College in Orange, CA. For more information contact Walt Clark, Chapman College, (714)997-6869 or Patrick Cochran, International Multi Foods, (714)782-7822.

•**29-February 1, Better Process Control School.** For more information contact Mark Daeschel, Ph.D., Oregon State University, Dept. of Food Science & Technology, 100 Wiegand Hall, Corvallis, OR 97331, (503)754-3463.

•**30, Connecticut Association of Dairy & Food Sanitarians, Inc., Annual Conference** will be held at the Hawthorne Inn, Berlin, CT. For more information contact Don Shields at (203)566-3279.

February

•**13-14, Dairy and Food Industry Conference**, The Ohio State University, Department of Food Science & Technology, 2121 Fyffe Road, Columbus, OH 43210-1097. For more information contact Dr. John Lindamood (614)292-7765.

•**20-22, National Research & Development Conference on the Control of Hazardous Material**, sponsored by the Hazardous Materials Control Research Institute, to be held at the Disneyland Hotel, Anaheim, CA (301)589-0182.

March

•**4-7, Better Process Control School.** For more information contact William Schafer, Ph.D., University of Minnesota, Department of Food Science and Nutrition, 1334 Eckles Avenue, Room 265, St. Paul, MN 55108, (612)624-4793.

•**6-7, CDR Cheese Research and Technology Conference** will be held at the Holiday Inn West Towne, Madison, WI. Sponsored by the Center for Dairy Research, University of Wisconsin-Madison. For additional information, call Sarah Quinones, at (608)262-2217.

•**10-13, IEFP '91**, sponsored by the Food Processing Machinery & Supplies Association, to be held at the McCormick Place, Chicago, IL. For information contact FPM&SA at (703)684-1080.

•**11-14, Better Process Control School.** For more information contact Robert Price, Ph.D., University of California, Department of Food Science, 250 Cruess Hall, Davis, CA 95616, (916)752-2194.

•**13, Indiana Dairy Industry Conference**, sponsored by the Food Science Department at Purdue University. For more information contact James V. Chambers, Purdue University, (317)494-8279.

•**18-20, Better Process Control School.** For more information contact Jack Matches, Ph.D., University of Washington, HF-10, Institute for Food Science and Technology, Seattle, WA 98195, (206)545-1941.

•**18-21, Better Process Control School.** For more information contact Jorg Augustin, Ph.D., University of Idaho, Food Research Center, Moscow, ID 83843, (208)885-6456.

•**18-22, Molds and Mycotoxins in Foods,** sponsored by the American Association of Cereal Chemists, will be held in Lincoln, NE. For more information contact the American Association of Cereal Chemists, Short Course Program, 3340 Pilot Knob Road, St. Paul, MN 55121 or call (612)454-7250.

•**25-28, Better Process Control School.** For more information contact Winston Bash, Ph.D., Ohio State University, Food Industries Center, 140 Howlett Hall, 2001 Fyffe Court, Columbus, OH 43210, (614)292-7004.

•**25-28, Better Process Control School.** For more information contact Walter L. Clark, Ph.D., Chapman College, Food Science & Nutrition Department, 333 North Glassell, Orange, CA 92666, (714)997-6869.

•**25-29, Better Process Control School.** For more information contact Robert C. Wiley, Ph.D., University of Maryland, Food Science Program, Holzapfel Hall, 1122A, College Park, MD 20742-5611, (301)454-2829.

•**25-29, Mid-West Workshop in Milk and Food Sanitation**, The Ohio State University, Department of Food Science & Technology, 2121 Fyffe Road, Columbus, OH 43210-1097. For more information contact Dr. David Dzurec (614)292-7723.

•**26-28, Western Dairy and Food Industry Conference** to be held at the University of California-Davis. For more information contact John Bruhn and Shirley Rexroat, Department of Food Science & Technology (916)752-2191.

April

•**2-3, Getting Started with HACCP**, sponsored by the American Association of Cereal Chemists, will be held in Chicago, IL. For more information contact the American Association of Cereal Chemists, Short Course Program, 3340 Pilot Knob Road, St. Paul, MN 55121 or call (612)454-7250.

•**2-5, Better Process Control School**. For more information contact C.E. Johnson, Ph.D., University of Wisconsin, Department of Food Science, Babcock Hall, 1605 Linden Lane, Madison, WI 53706, (608)263-2013.

•**3-5, Missouri Milk, Food and Environmental Health Association's Annual Conference** will be held at the Ramada Inn, Columbia, MO. For more information contact Richard Janulewicz at (816)781-1600.

•**10, 41st Annual University of Maryland Ice Cream Conference.** For more information contact Dr. James T. Marshall, Department of Animal Sciences, University of Maryland, College Park, MD 20742, (301)405-1375.

•**15-18, Better Process Control School**. For more information contact James V. Chambers, Ph.D., Purdue University, Food Science Department, Smith Hall, W. Lafayette, IN 47907, (317)494-8279.

•**17-19, Shelf Life of Foods**, to be held in New Brunswick, NJ. For more information contact the Office of Continuing Professional Education, Cook College, Rutgers University, P.O. Box 231, New Brunswick, NJ 08903 or call (908)932-9271.

•**29-May 2, Better Process Control School**. For more information contact Gerald D. Kuhn, Ph.D., Pennsylvania State University, Department of Food Science, 116 Borland Building, University Park, PA 16802-7501, (814)863-2965.

May

•**4-9, 1991 Food Structure Meeting** will be held at the Hyatt Regency Hotel in Bethesda, MD. For more information contact Dr. Om Johari, Scanning Microscopy International, P.O. Box 66507, Chicago, IL 60666-0507, or call (708)529-6677.

•**13-16, Better Process Control School**. For more information contact D.L. Downing, Ph.D., Cornell University-NYSAES, Department of Food Science and Technology, Geneva, NY 14456, (315)787-2273.

•**13-16, Purdue Aseptic Processing and Packaging Workshop**, sponsored by the Food Science Department at Purdue University. For more information contact James V. Chambers, Purdue University, (317)494-8279.

•**14-16, Pennsylvania Association of Dairy Sanitarians and Dairy Laboratory Analysts Annual Conference** at the Keller Conference Center, Penn State University, University Park, PA. For more information, contact Sid Barnard, 8 Borland Lab, University Park, PA 16802, (814)863-3915.

•**13-17, Better Process Control School**. For more information contact Aurora S. Hodgson, Ph.D., University of Hawaii at Manoa, Department of Food Science & Human Nutrition, 1920 Edmondson Road, Honolulu, HI 96822, (808)948-6564.

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On My Mind . . .

By
Steven K. Halstead
IAMFES
Executive Manager

. . . is the "Groc rant"

I just made that name up. It comes from grocery (GROC) and restaurant (RANT).

A turf battle is developing which concerns me. My concern is not with who will win the battle but rather the public's access to a safe food supply.

Is food that is to be eaten in a grocery store different than food that is to be eaten in a restaurant? Is it less susceptible to foodborne diseases than food that is to be eaten in a restaurant?

At the Michigan affiliate meeting, a faculty member from Michigan State made an outstanding presentation on the blurring of the line between grocery store and restaurant. As he so graphically pointed out, what with in-store bakeries, delis, cut fruits, kabobs, marinated meats, live seafood, etc. the line is becoming more and more fuzzy.

But who inspects?

Traditionally, health departments have inspected restaurants and the ag department has inspected the grocery stores. And this is probably all right.

There is a certain body of knowledge that is involved in restaurant inspection that is different and separate from that of grocery inspection. For example, grocery inspectors haven't had to worry about the ambient temperature of a can of peas, while the restaurant inspector hasn't had to be concerned with problems of weights and measures.

The emerging grocery store (I had started to say "the modern grocery store" but I quickly realized that with the rate that the business is changing, a "modern" grocery is out of date the day it opens. Well, surely, the next day) blurs these traditional distinctions. Now, in the name of convenience, we see not only frozen foods, but also full-fledged eat in/carry out meals. Our local grocery will prepare an entire Thanksgiving dinner - turkey, dressing, salads - down to the pumpkin pie - you just have to tell them how many guests (and your credit card number).

Is food that is to be eaten in a grocery store different than food that is to be eaten in a restaurant? Is it less susceptible to foodborne diseases than food that is to be eaten in a restaurant?

Food prepared in a restaurant is subject to the same standards regardless of where it is to be eaten - in or out. Are not those people who buy prepared food in grocery stores expecting the same standards? Don't they deserve it?

My point is not so much who does the inspecting as it is that the same sanitation standards apply. I really have no preference, although I suppose that the argument could be made that since the health department has been applying the restaurant standards for years, they should continue.

On the other hand, if the health departments are short handed now, adding grocery prepared food outlets to their work load will only exacerbate the problem.

My biggest concern is that the consumer will get caught in the middle. The worst case scenario being that the ag department fights with the health department until the day that the inevitable happens - a large scale outbreak with much illness and perhaps deaths. At which point, the legislative steps in and writes the rules.

Anyone want to predict how those rules will come out?

My biggest concern is that the consumer will get caught in the middle.

The solution? Let's put aside the turfsmanship and do what's necessary to provide the consumer with a safe food supply. Easily said, but ...!

Do I have a sense of political reality, or what?

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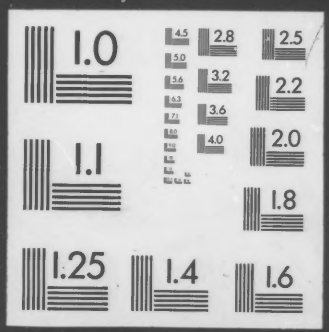
1.0
1.1
1.25
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