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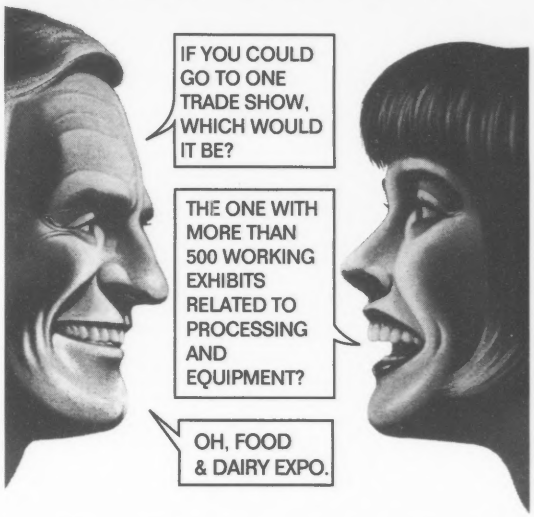


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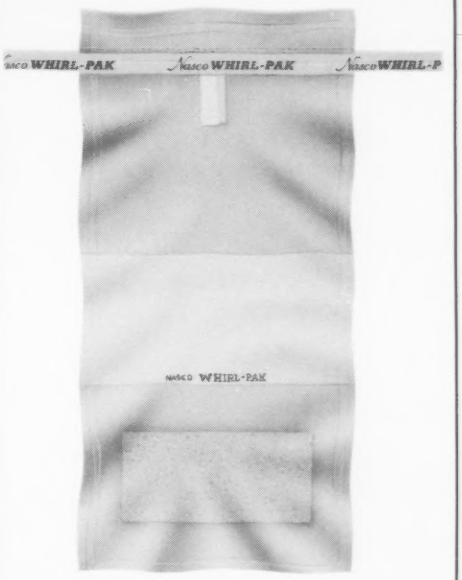


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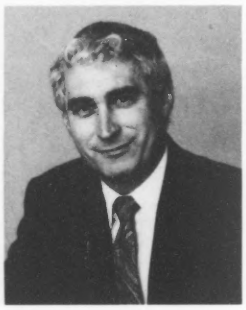


By
Michael P. Doyle
IAMFES President

## *Escherichia coli* O157:H7 Strikes Again

A major outbreak of foodborne illness causing more than 300 cases of mild to grossly bloody diarrhea, several cases of kidney failure, and at least one death in the western United States has caught the nation's attention. The culprit was enterohemorrhagic *E. coli* O157:H7 (ECO157) and the vehicle was undercooked ground beef sandwiches. Similar outbreaks have occurred previously, as early as 1982. Based on what was subsequently learned from these outbreaks, this recent outbreak could have been avoided had appropriate cooking procedures been employed.

The implicated restaurant chain admittedly cooked patties to an internal temperature of 140°F. We have learned through thermal inactivation studies that one to two minutes (depending on the fat content of the ground beef) of holding time at 140°F is needed to reduce the population of ECO157 10-fold. If the population of ECO157 in ground beef is between 1,000 to 10,000 cells/g, which is at the high range of the ECO157 populations determined by Canadian investigators in beef samples obtained from outbreaks there, then patties must be held for four to eight minutes at 140°F to reduce the ECO157 population to 0.1 to 1 cells/g. Clearly, cooking patties to an internal temperature of 140°F without an extended holding time is not sufficient to render hamburger patties safe from ECO157.

This outbreak reemphasizes the fact that we food hygienists, being directly or indirectly involved in the production, processing, preparation, or serving of food, not only need to be well versed about current food safety issues but also must be aware of the best scientific information available to address these issues. Had the restaurants involved in this outbreak used the best scientific information available to establish their cooking procedures, this outbreak would not have occurred. Anyone wanting more information about the effect of cooking temperatures and times on killing ECO157 is encouraged to refer to the *Journal of Food Protection*, volume 54, pages 762-766, October 1991.

# On My Mind . . .

*By*
*Steven K. Halstead, CAE*
*IAMFES*
*Executive Manager*

... is *E. coli* O157:H7.

Having just returned from Seattle where we were looking at possible sites for a future meeting, it is hard not to think about *E. coli*. Everywhere you turn in Seattle, you see something in the news about the *E. coli* outbreak and the role of the Jack In The Box restaurant chain in the outbreak. If it wasn't in the newspaper, it was on the radio or TV or you would hear people talking about it.

I have been amazed at the media's reaction to this. We know that foodborne illness is a daily occurrence, which is not to detract from the tragic loss of life in this outbreak, but still, people get sick from improperly prepared food all the time. From the way the media has treated this outbreak, you would think that this was the first time anyone ever got food poisoning.

I suppose this is because, as they teach in journalism 101: "Dog bites person: No news. Person bites dog: News." That is to say, the unexpected is news; the expected is not. Millions of people daily eat perfectly safe food at any one of a number of fast food outlets and the media says nothing. When three to four hundred people get sick, then you read about nothing except that until the next crisis comes along.

With all of the finger pointing and blaming going on, I have been pleased to see that the King County/Seattle Health Department and the Washington State Department of Health have been relatively unscathed. It seems that the new U.S. Secretary of Agriculture, Michael Espy, jumped right in and immediately singled out the USDA for blame. It is hard to understand why he wanted the blame, unless he had some particular reason for accepting it.

We know that it is virtually impossible for any inspectors to do the level of microbiological inspection that is required here. As Michael Doyle, President of IAMFES, explained at a recent meeting of the Georgia Affiliate, "In the end, the problem was that the hamburgers simply were not cooked properly."

Somehow, the public needs to be aware of the fact that the only way to have safe food is a thorough cooking. Ultimately, the consumer must take this responsibility. Sadly, I have seen very little in the media that either recognizes this fact or does anything to teach this aspect of food safety.

Several questions come to mind as to what the role of IAMFES and you, our members, might be. It is very tempting for us to use this outbreak as a springboard for efforts to increase our membership. We could make a mailing to people pointing out the numerous articles that have been published by IAMFES on this topic and letting these potential members know that had they been members of IAMFES, they may very well have been much better informed about foodborne outbreaks than they were.

It is very tempting for us to hawk copies of our booklet, "Procedures to Investigate Foodborne Illnesses." This booklet, written by our Communicable Diseases Affecting Man Task Force, is the bible in investigating foodborne illnesses. I would be very, very surprised if this booklet were not used at some point in this outbreak.

All this temptation leaves us with many questions: "What should be the role of IAMFES in this?" "Have we done an adequate job in informing the public about the dangers of microbiological pathogens?" "Do we have a mandate to inform the public of these dangers?" "Have our members done their job in informing the public?" "Whose job is it to inform the public?"

As you can see from the preliminary program for our 1993 Annual Meeting, (see March, 1993 *Dairy, Food & Environmental Sanitation* page 184), a great deal of time will be spent in discussing *E. coli* and other pathogens. I have no doubt but what this recent outbreak will be highlighted in many of those talks. I would, however, call your attention to the General Session to be held on Tuesday afternoon. This session will deal with the topic, "Food Safety in the News: What Needs to be Done". Although the program isn't final yet, we are trying to involve various forms of media. One of our goals in putting on this program is to inform our members just what it is the media expects from us by way of food safety information. Where do they turn for their information, and what role can we as food protection professionals play in that? And, just as importantly, how do they expect us to fulfill this role?

As we watch the development of this case, I hope that you will plan to join me at the General Session on Tuesday to learn more about what our role might be in educating the public about food safety.

*Dairy, Food and Environmental Sanitation, Vol. 13, No. 3, Pages 152-156 (March 1993)*


# Food Hygiene in Japan — Japanese Food Hygiene Regulations and Food Poisoning Incidents

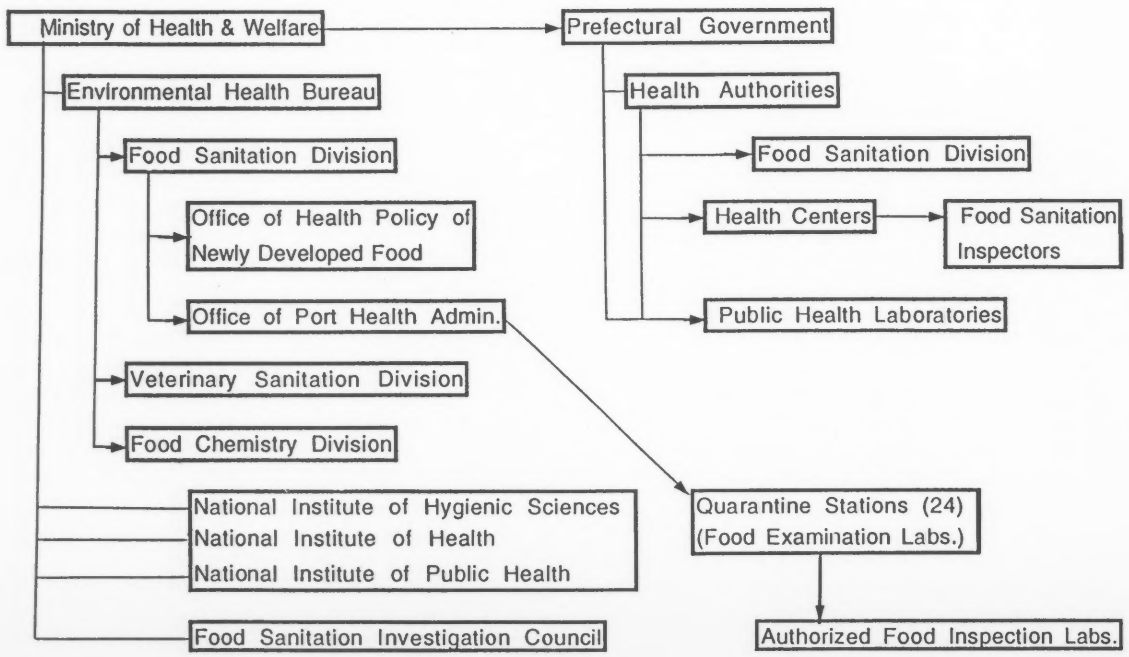
**Nobumasa (Nobi) Tanaka, Ph.D. President, US-Japan Science Consulting Services, Inc., 72 Paxwood Road, Delmar, NY 12054-2925**

To those who deal with a foreign country, it is imperative to know the regulation and other relevant facts in that country regarding the subjects they are concerned. When language barriers exist, however, one can get very frustrated trying to obtain needed information. Japan is one such country in which trading of foods is quite important, yet language and other barriers may seem formidable. Since I presented a paper entitled, "Food Regulations and Microbial Standards in Japan" at the 79th annual meeting of the IAMFES in Toronto last July, I have felt a need to put the subject on paper. Presented in this article are Japanese governmental organizations regarding food hygiene, incidence of food poisoning and food hygiene regulations, plus some information regarding food importation into Japan. Of course, it is impossible to describe everything there is regarding these matters in a limited space, hence only a few examples are outlined here. Most of the data used have been published by the Ministry of Health and Welfare, and much have been printed in various publications from Japan Food Hygiene Association.

**Japanese government system for food hygiene concern**

Fig. 1 describes the outline of food sanitation administration (1,2,9). The ministry of Health and Welfare (MHW) is in charge of public health matters. Environmental Health Bureau of the MHW, in which several divisions are placed, does most of the work concerning national and international food hygiene problems. Several national institutes including Institute of Public Health, National Institute of Health and Nutrition, and National Institute of Health are involved in public health, as well as National Institute of Hygienic Sciences which is the official testing and research institute for food hygiene matters. The MHW plans and drafts food sanitation regulation and administers the regulation, and for

**Figure 1. Japanese governmental organizations regarding food hygiene.**



such work, it consults with Food Sanitation Investigation Council. Important offices in the Environmental Health Bureau include Food Sanitation Division, in which Office of Health Policy for Newly Developed Food and Office of Port Health Administration are placed, Veterinary Sanitation Division and Food Chemistry Division. At local levels, public health bureaus of prefectural governments and of selected "special" cities inspect food sanitation and give licenses to food service establishments. The public health bureaus supervise local health stations or health centers and research institutes. These local health centers perform the front line work of various public health matters such as the prevention of infectious diseases, maternal and child health care, as well as food sanitation inspections and guidance for domestic purposes. There is one such health center for approximately each 100,000 population, and more than 850 health centers are placed throughout Japan (9). Number of inspected materials amounted to 34.5 million in 1990 involving a total of 643,000 inspection staff (8). These centers are also involved in health education, holding 300,000 meetings a year for this purpose (8).

For food importation, Office of Port Health Administration is in charge of overseeing their wholesomeness. Twenty-four quarantine stations under the Office form the front line of food sanitation inspection for imported foods. Each quarantine station has its own laboratory. Inspectors working at these stations, however, are too few to handle all the work involved, hence a large portion of the actual work of food sanitation inspection including microbiological, chemical and physical examinations are done by MHW-authorized private or semi-private laboratories. Approximately 60 such laboratories are authorized (1,8) to perform food sanitation examinations in lieu of governmental laboratories.

## Food Poisoning Incidents in Japan

The number of food poisoning outbreaks, cases and deaths in 1955, 1960, 1965, 1970 and 1975 to 1991 are shown in Table 1 (5). The general trend is that outbreaks and deaths are decreasing, the latter particularly drastically since the 1960's. Number of cases, however, is staying relatively constant, especially in recent years, indicating that the average number of cases per outbreak is becoming larger as mass food distribution systems are more highly developed. The current number of food poisoning incidents is quite small, with the number of deaths due to microbiological causes being almost nil in the last several years. A few deaths have been caused by naturally present toxins in plant and animal sources, with most of them being poisonous mushrooms and puffer fish or *fugu*. Among bacteriological food poisoning agents, it appears that incidence due to *Salmonella* is on the rise, and problems due to *S. enteritidis* (2,5,9,10) seem especially on the increase. Tables 2 and 3 show number of outbreaks, and cases (Table 3-1) and deaths (Table 3-2), respectively, from 1987 to 1991 according to etiological agents (2,5,9,10). Number of cases due to pathogenic *Escherichia coli* also seem to be increasing (2,5). Unique to Japan, *Vibrio parahaemolyticus* has been, and still is, one of the leading causes of food poisoning (2,5,9). These statistics are, of course, compiled from reported cases only,

**Table 1. Food Poisoning Incidents, Cases and Deaths in Japan.**

| Year | Incidents | Cases | Deaths |
|---|---|---|---|
| 1955 | 3277 | 63745 | 554 |
| 1960 | 1877 | 37253 | 218 |
| 1965 | 1208 | 29018 | 139 |
| 1970 | 1133 | 32516 | 63 |
| 1975 | 1783 | 45277 | 52 |
| 1976 | 831 | 20933 | 26 |
| 1977 | 1276 | 33188 | 30 |
| 1978 | 1271 | 30547 | 40 |
| 1979 | 1168 | 30161 | 22 |
| 1980 | 1001 | 32737 | 23 |
| 1981 | 1108 | 30027 | 13 |
| 1982 | 923 | 35536 | 12 |
| 1983 | 1095 | 37023 | 13 |
| 1984 | 1047 | 33084 | 21 |
| 1985 | 1177 | 44102 | 12 |
| 1986 | 899 | 35556 | 7 |
| 1987 | 840 | 25368 | 5 |
| 1988 | 724 | 41439 | 8 |
| 1989 | 927 | 36479 | 10 |
| 1990 | 926 | 37561 | 5 |
| 1991 | 782 | 39745 | 6 |

**Table 2. Number of Food Poisoning Incidents According to Etiology.**

| Year | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| Total number | 840 | 724 | 927 | 926 | 782 |
| Causes known | 693 | 603 | 785 | 786 | 659 |
| Agent | | | | | |
| *Salmonella* | 90 | 78 | 146 | 129 | 159 |
| *Staphylococcus aureus* | 139 | 117 | 115 | 110 | 95 |
| *Clostridium botulinum* | 0 | 2 | 3 | 0 | 3 |
| *V. parahaemolyticus* | 321 | 213 | 322 | 358 | 247 |
| Pathognc. *E. coli* | 15 | 17 | 29 | 19 | 30 |
| *C. perfringens* | 9 | 19 | 24 | 24 | 21 |
| *Bacillus cereus* | 15 | 6 | 9 | 11 | 9 |
| *Campylobacter* | 28 | 49 | 31 | 19 | 24 |
| Natural toxins | | | | | |
| Plants | 29 | 67 | 58 | 67 | 34 |
| Animals | 41 | 29 | 38 | 40 | 33 |

**Table 3-1. Number of Food Poisoning Cases According to Etiology.**

| Year | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| Total number | 25368 | 41439 | 36479 | 37561 | 39745 |
| Causes known | 19500 | 34446 | 32663 | 33195 | 33136 |
| Agent | | | | | |
| *Salmonella* | 3600 | 14507 | 6750 | 8303 | 10234 |
| *S. aureus* | 3616 | 3168 | 3224 | 4104 | 2453 |
| *C. botulinum* | 0 | 4 | 6 | 0 | 3 |
| *V. parahaemolyticus* | 8149 | 5231 | 9636 | 9128 | 8063 |
| Pathognc. *E. coli* | 1616 | 1756 | 4736 | 6135 | 4445 |
| *C. perfringens* | 288 | 2671 | 3316 | 2503 | 3691 |
| *B. cereus* | 588 | 77 | 227 | 756 | 2364 |
| *Campylobacter* | 1378 | 4785 | 4189 | 1287 | 1625 |
| Natural toxins | | | | | |
| Plants | 121 | 329 | 231 | 321 | 153 |
| Animals | 65 | 80 | 67 | 110 | 60 |

and it is difficult to estimate what proportion of actual incidents are reported. It seems, however, the number of food poisoning outbreaks, cases and certainly deaths seem very small in Japan. The low incidence may be due to the extreme care Japanese food handlers and housekeepers are taking to keep sanitary conditions because of what they have

**Table 3-2. Number of Food Poisoning Deaths According to Etiology.**

| Year | 1987 | 1988 | 1989 | 1990 | 1991 |
|---|---|---|---|---|---|
| Total number | 5 | 8 | 10 | 5 | 6 |
| Causes known | 5 | 8 | 10 | 5 | 6 |
| Agent | | | | | |
| *Salmonella* | 0 | 0 | 0 | 0 | 0 |
| *S. aureus* | 0 | 0 | 0 | 0 | 0 |
| *C. botulinum* | 0 | 0 | 0 | 0 | 0 |
| *V. parahaemolyticus* | 0 | 0 | 0 | 1 | 1 |
| Pathognc. *E. coli* | 0 | 0 | 0 | 2 | 0 |
| *C. perfringens* | 0 | 0 | 0 | 0 | 0 |
| *B. cereus* | 0 | 0 | 0 | 0 | 0 |
| *Campylobacter* | 0 | 0 | 0 | 0 | 0 |
| Natural toxins | | | | | |
| Plants | 1 | 3 | 4 | 1 | 2 |
| Animals | 4 | 5 | 6 | 1 | 3 |

learned while handling easily spoilable fish as a main component of their diet. The small size of the country may also be advantageous in keeping the time required for transportation relatively short.

### Japanese microbiological and other standards for foods

There is a set of national microbiological standards which specify limits of microbial counts in some foods. They are not in great detail, as shown in Tables 4-1 and 4-2. Local governments set additional microbiological guidelines in many cases, and among them, those of Tokyo Metropolitan Government are the most comprehensive (Table 5). *E. coli* negative, or coliform negative, stated in these regulations and guidelines does not necessarily mean that these bacteria have to be truly negative. These counts are controlled through definitions with regard to sample volumes and dilution factors (see Table 5, footnote). In addition to these microbiological standards and guidelines, some food processing conditions are regulated as well by Food Sanitation Law and ordinances. Regulation for food additives sometimes are confusing because of subtle differences between regulations in the United States and those in Japan. Some examples of these differences are disicussed below.

### Importation of foods into Japan

Japan imports more than 50% of the food energy it consumes (6). It is, therefore, extremely important for Japan to operate the importing business smoothly and to guarantee the safety of the food supply by adequate quarantine control, which is maintained by twenty-four quarantine stations distributed all over the country. Each time an importer wishes to import a food item, the importer will have to file a "Notification Form of Food Importation" to MHW through a quarantine station (3), though there are provisions to abbreviate this process when one imports the same food repeatedly. Upon an inspection of the filed document, the quarantine officer/inspector determines if it is necessary to take samples and perform tests. If the food is classified as required of sampling and test, the inspector is authorized to do this, at a bonded warehouse according to the sampling procedures published, but in actuality, most samplings and tests are done by one of the government "authorized" private laboratories. It is also possible for the importer to have the necessary examination done by one such laboratory ahead of time to make sure that the food to be imported does not

**Table 4-1. Microbiological Standards according to Food Sanitation Law - 1.**

| Foods | Bacteria | Coliforms |
|---|---|---|
| Raw cow's milk, Raw goat's milk | <4 mil. | --- |
| Cow's milk, Pasteurized goat's milk, Partially skimmed milk, Skimmed milk, Ice milk, MiProcessed milk | <40,000 | Negative |
| Special milk, Milk drinks | <30,000 | Negative |
| Cream, Ice cream | <100,000 | Negative |
| Butter, Butter oil, Process cheese, Natural cheese, Concentrated whey | --- | Negative |
| Concentrated milk without sugar added | 0 | |
| Fermented milk | Lactics | |
| Lactic acid bacterial drink with fat >3% | >10 mil. | Negative |
| Lactic acid bacterial drink with fat <3% | >1 mil. | Negative |
| Shelf stable products | 0 | Negative |

**Table 4-2. Microbiological Standard according to Food Sanitation Law - 2.**

| Foods | Bacteria | Coliforms |
|---|---|---|
| Beverages, Meat and Poultry products, Whale meat products, Surimi products | --- | Negative |
| Powdered beverages | <3,000 | Negative |
| Ice and snow | <100 | Negative |
| Ice candies | <10,000 | Negative |
| Frozen, boiled octopus, Frozen foods without heated serving, Raw serving frozen fish | <100,000 | Negative |
| Oysters served raw | <50,000 | <230 *E. coli* MPN/100g |
| Frozen food with heated serving | <3 mil. | *E. coli* neg. |
| Pressure-cooked hermetically sealed food | Negative | |
| Sugar, starch, spices used in meat and poultry products, surimi products whale meat products | Heat resistant spores <1,000 | |
| Mineral water | *Ps. aeruginosa* Negative | |
| | Enterococci | Negative |

violate the Food Sanitation Law, thus he or she can avoid the rejection of the cargo at the port of entry. The items defined by the Japanese Food Sanitation Law include foods, food additives, apparatus, containers/packages and baby toys. Importation of foods for the purpose of selling or distributing to unspecified people incurs the above mentioned necessity to file the importation notification. Though most of the food coming into the country is wholesome, there are small fractions of foods which are in violation of the food regulation. Violations amounted to 3.1% of the imported food in 1979, but they were reduced to 0.67% in 1985 and, in recent years, proportions of foods in violation have been fluctuating between 0.6 and 0.8%(1,8,9). According to 1988 statistics, violations recorded were 155 cases (0.62%) for meat, poultry and their products and dairy products, 126 cases (1.21%) for apparatus, 118 cases (2.96%) for cakes and candies, 64 cases (1.17%) for vegetable products, etc. (1,6,8). The most frequent violations were those of Article 7 of the food sanitation law (47.2% of all the violations in 1988)(1,7,9). The Article 7 establishes standards of methods of manufacturing, processing, using, cooking or preserving of food or additives for sale, or establishes specifications for foods or additives for sale. Violations of Articles 6 and 1 were next most frequent. Article 6 specifies food additives which are permitted for use in foods, and Article 1 states that the purpose of the law is

**Table 5. Microbiological Guidelines of Tokyo Metropolitan Government**

| Foods | Bacteria | Coliforms | Others |
|---|---|---|---|
| Meat, poultry, fishmeat-products | <50,000 | Negative# | Sal., Staph., Neg* |
| Sliced ham, sausages | <500,000 | Negative | Same as above |
| Primary processed foods ready for serving | --- | Negative | Sal., Staph., Vp** |
| Sashimi — fish except octopus, squid | --- | Negative | Vp. Negative |
| Fish for sushi | --- | Negative | Vp. Negative |
| Quick frozen foods | | | |
| Fish, shellfish | <5 mil. | Negative | Vp. Negative |
| Meat, poultry | <5 mil. | | Sal. Negative |
| Raw fish, boiled crab ready to eat | <500,000 | Negative | Vp. Negative |
| Cooked, ready to eat food | <50,000 | Negative | Sal., Staph. Neg. |
| Not cooked — cooked before serving | <3 mil. | Negative## | Sal., Staph. Neg. |
| Fruit | <100,000 | Negative## | |
| Butter, cheese | | Negative | |
| Ice cream | <50,000 | Negative | |
| Cream, ice cream mix | <50,000 | Negative | Sal., Staph. Neg. |
| Milk, processed milk, milk drink | <50,000 | Negative | |
| Raw milk | <5 mil. | | |

*Sal. = *Salmonella* per gram, Staph. = *S. aureus* per 0.01 gram
**Vp. = *Vibrio parahaemolyticus*
#Negative: Coliform counts in sliced ham, sausage, sashimi, fish for sushi: a sample is diluted x 10 fold, and if count is above 11/ml on desoxycholate agar, it is deemed positive. For cooked, ready to eat food among quick frozen category, >1/ml is deemed positive , and for fresh fish, use x 100 diluted sample.
##Applied to *Escherichia coli* only.

**Table 6. Examples of Food Additives NOT Approved In Japan***

| Food additives NOT approved | Food additives approved |
|---|---|
| Iron oxides, Iron hydroxides | |
| Sodium sorbate, Calcium sorbate | Potassium sorbate** |
| Potassium benzoate | Benzoic acid, Sodium benzoate*** |
| Sodium etyl paraben | Ethyl baraben |
| Sodium propyl paraben | Propyl paraben*** |
| Methyl paraben, sodium methyl paraben | |
| Formic acid, Sodium or Calcium formate | |
| Boric acid, Sodium tetraborate/Borax | |
| Potassium acetate, Sodium diacetate | |
| Potassium lactate | |
| Potassium citrate | Sodium citrate, Calcium citrate |
| Potassium tartrate | Sodium tartrate |
| Potassium alginate, Ammonium alginate | Sodium alginate |
| Methylcellulose, Ethylcellulose | |
| | Calcium propionate# |
| | Diphenyl## |
| | Saccharin### |

*Not all the approved additives may be used in all the foods. Examples follow:
**Potassium sorbate, or sorbic acid may not be used in salad dressings or mayonnaise
***Benzoic acid or sodium benzoate is approved only for very limited use: Caviar, Margerin, Non-alcoholic beverages, Syrups, Soy sauces
****Parabens may only be used in Soy sauces, Vinegars, Non-alcoholic beverages, Syrups, Fruit sauces, Skin of fruits, Fruity vegetables
#Calcium propionate may only be used in Bread, Cheese, Cakes
##Diphenyl may only be used to soak piece of paper which is included in container for storage or transportation of Grape fruits, Lemons and Oranges with residuals limited to 0.07 g/kg
###Saccharin is limited to Chewing gum only, at levels not exceeding 0.05 g/kg

to protect the people from health hazards caused by the consumption of foods or drinks, and to contribute to the improvement and promotion of public health, thereby regulates spoiled foods, foods containing toxic substances such as aflatoxins and radioactivity and foods contaminated with foreign substances.

Most of the violations occur because of ignorance or negligence of importers as well as those of exporters. For example, as has been mentioned above, food additives allowed in the United States and those in Japan are somewhat different, though most of them are common to both countries. Some confusing points are listed in Table 6 (1). Neglecting the difference may cause the food to be rejected at the port. Some examples of violations documented are listed in Table 7 (1,7,9). It is imperative for exporters as well as importers to know the regulation. As is shown in Table 8 (1,4), increasing portions of food sanitation examinations are being done by governments or government approved official agencies of exporting countries. It is possible to register a commercial food testing laboratory so that it is recognized as an "official" laboratory for testing foods being exported to Japan. Also, if you are exporting the same product over and over to Japan, there is a system to bring your processing facility to an officially registered status, thus keeping exportation paperwork and other red tape to a minimum.


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**Table 7. Some Examples of Violations of Import Regulation**

| Violation of Food Sanitation Law | Description of Violation |
|---|---|
| Article 4: Sale of unfit food or additive | Spoilage, mold growth, etc. of rice, wheat, peanuts, fresh produce<br>Presence of aflatoxins in peanuts<br>Contamination with radioactivity in treenuts |
| Article 5: Need of certifcate by exporting country on animal products | Lack of certificate or incomplete certificate |
| Article 6: Synthesized food additive has to be previously approved | Use of unapproved food additives such as Aluminum-sodium phosphate, Sodium aluminosilicate, Polysorbate, Azorubin, Allura Red |
| Article 7: Proper use of approved additives, other food standards, manufacturing standards | Violation of proper use of additives<br>a. Use in other foods than approved: e.g., Benzoate in Jam<br>b. Excessive use: e.g., Sorbic acid in wine >0.2g/kg<br>c. Excessive residuals: e.g., Sulfurdioxide in dry fruit >2g/kg<br>Violation of food standard: e.g., Antiobiotic residues in pork, bacterial growth in fruit<br>Violation of manufacturing standard |
| Article 10: Specification of apparatus, packaging apparatus, packages | Violation of standard: e.g., Excessive leaching of cadmium, lead, etc. |
| Article 29: Standards for toys for infants and babies | Violation of standards: e.g., leaching of unapproved dye |

**Table 8. Numbers of Notifications, Examinations and Violations in Food Importation**

| Fiscal year | Notification | Total exam* | Official exam | Examination by Authorized lab | Exam by certified foreign lab** | Continuous Import*** | Number of violations |
|---|---|---|---|---|---|---|---|
| 1985 | 384728 | 45862 | 14892 | 26054 | 1904 | 6196 | 308 |
| 1986 | 477016 | 68184 | 20451 | 37434 | 4127 | 11104 | 558 |
| 1987 | 550568 | 86479 | 26774 | 44944 | 6332 | 15719 | 572 |
| 1988 | 655806 | 131173 | 24306 | 58663 | 23905 | 31514 | 1000 |
| 1990 | 682182 | 157948 | 23613 | 70033 | 38974 | 37228 | 956 |
| 1991 | 678965 | 157989 | 25091 | 59063 | 47674 | 41279 | 993 |
| | 720950 | 168926 | 30102 | 67063 | 38411 | 51240 | 968 |

*Including all the examination minus duplication
**Certified by officially recognized foreign laboratories
***If a same food is imported repeatedly, filing for continuous importation helps to circumvent examination unless accident occurs


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# Solving Environmental Problems: A Behavior Change Perspective

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> Most thoughtful people agree that the world is in serious trouble...fossil fuels will not last forever, and many other critical resources are nearing exhaustion; the earth grows steadily less habitable; and all this is exacerbated by a burgeoning population that resists control. The timetable may not be clear, but the threat is real. That many people have begun to find a recital of these dangers tiresome is perhaps an even greater threat (Skinner, 1987, p. 1).

This quote by the most eminent behavioral scientist of our time defines the crisis addressed in this chapter, and sets the stage for finding solutions to critical environmental problems. Many people deny our environmental exigencies, including acid rain, damage to the earth's ozone layer, ocean pollution, the loss of tropical forests, and the worldwide misuse of land and water (Goleman, 1988); whereas others claim some environmental crises have reached dimensions beyond repair (e.g., Ehrlich, Erlich, & Holdren, 1977; Rifkin, 1980). Many people maintain a relentless optimism regarding planetary concerns, some adopting a "business as usual" stance (as if environmental problems will correct themselves naturally) and others assuming that high technology engineering will find sufficient answers (Robertson, 1986). While a number of technological advances have mitigated environmental problems and we can hope for more of these in the future, we cannot count on "quick-fix" engineering technology alone to solve the environmental crisis. In fact, human behavior contributes most significantly to the degradation of Planet Earth. In other words, as Pogo has said, "We have met the enemy and he is us." Thus, the role of the human element in contributing to environmental problems or in helping to alleviate the crisis undeniable. Understanding and changing individuals' behaviors and attitudes in order to solve problems is a prime focus of psychology, and applying this information to solve environmental problems is one aspect of a relatively new subdiscipline of psychology — environmental psychology.

## Environmental Psychology and Applied Behavior Analysis

As a forum of research and teaching, the field of environmental psychology is less than 25 years old, with the first college textbooks in this domain having appeared in the mid-1970's (e.g., Ittelson, Proshansky, Rivlin, & Winkel, 1974; Proshansky, Ittelson, & Rivlin, 1976). Two basic research questions are addressed by environmental psychologists: 1) How does the physical and natural environment affect people?; and 2) How do people affect the environment? Although the second question is more pertinent to the theme of this chapter, the vast majority of research in environmental psychology relates to the first question. In other words, environmental variables have been investigated most often for their effect on behavior rather than vice versa (cf. Stokols & Altman, 1987). Cone and Hayes (1980) referred to this research as "reactive" (as opposed to "active") because it "examines reactions or responses *to* environmental problems rather than [examining] the problems themselves" (p. 12). However, recent textbooks in environmental psychology (e.g., Bell, Fisher, Baum, & Greene, 1990; Gifford, 1987) have given substantial attention to the second question raised above, and in fact, have addressed a third related question, most relevant to the theme of this chapter - How can human behavior be changed to benefit the environment? To review answers to this question, the textbooks refer to another subdiscipline of psychology - applied behavior analysis.

Applied behavior analysis is founded on the approach to behavioral science developed by B. F. Skinner (1938). In his experimental analysis of behavior (or operant learning paradigm), Skinner rejected unobservable inferred constructs such as drives, needs, motives, cognitions, and so on; and he studied only overt behavior and its observable environmental, social, and physiological determinants. Therefore, behavior analysts usually identify overt behavior as their dependent variable (i.e., the target to measure and change), and environmental stimuli or contingencies (i.e., relationships between designated target behaviors and their consequences) as independent variables (i.e., the aspects of the situation manipulated to change a target behavior). Thus, behavior analysts have addressed environmental problems by first defining the problem in terms of relevant overt behavior, and then designing and implementing intervention programs to decrease behaviors that cause the problem and/or increase behaviors that can alleviate the problem.

Before discussing behavior change interventions for environmental preservation, it is instructive to consider a critical perspective of the behavior analysis approach which is contrary to numerous intervention strategies used currently to attempt an increase in environmental responsiveness among the public. A Common notion among social

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scientists (including psychologists) is that individuals change their behaviors as a result of information or advice, and that attitude change is the necessary mediating variable (e.g., Dennis, Soderstrom, Koncinski, & Cavanaugh, 1990, Fishbein & Ajzen, 1975). In other words, information (e.g., about environmental protection) should focus on changing people's attitudes (e.g., about the environment), and then after appropriate attitude change, individuals will change their behaviors (e.g., to be more protective of the environment). Behavior analysts do not deny that attitude change can lead to behavior change, but claim (on the basis of empirical evidence) it's usually more cost effective to target behaviors directly and then expect desirable attitude change to occur as a result of behavior change (cf. Geller, 1986, 1989).

B. F. Skinner (1987) maintained that human behavior is selected (or determined) by its consequences, and we should not expect many people to change their behavior as a result of information or advice alone, especially when the information is about a distant future, as is the case with most environmental problems. People may follow advice when the advice-giver's information has led to beneficial consequences in the past, but this situation requires people to experience the reinforcing consequences of prior compliance with similar advice-givers or similar rules. Such operant learning or response selection by reinforcing consequences is quite difficult (perhaps impossible in some cases) when the future reinforcing or punishing consequences are unclear, vague or remote (and all three of these characteristics are relevant in the domain of environmental protection). Collecting recyclables, for example, has typically not become common practice until individuals have experienced the consequences of excess solid waste (e.g., the problems of finding suitable landfill space or a port to dock a garbage barge); and petroleum or water conservation behavior have not been practiced widely until the punishing consequences (e.g., inconveniences) of gas or water shortages were experienced.

Although individuals are more inclined to follow advice (e.g., regarding resource conservation) after experiencing consequences related to such advice (e.g., the displeasures or inconveniences of resource shortages), there are often ongoing response-consequence contingencies supporting behaviors incompatible with the advice. For example, the excessive use of environmental resources and the pollution of air and water is maintained by varieties of reinforcing consequences, including convenience, comfort, money, and everything money can buy. Thus, effective behavior change for environmental protection may require the modification or removal of contingencies currently supporting behaviors detrimental to the environment, as well as establishing new response-consequence contingencies to motivate the occurrence of behaviors beneficial to the environment. Most of the applied behavior analysis research for environmental protection has focused on the second challenge, and we turn now to an overview of that research.

## Designing Intervention Programs To Protect the Environment

A simple Activator-Behavior-Consequence framework or ABC model defines the basic behavior analysis approach to intervention development. In other words, conditions or events preceding (i.e., activators) or following (e.g., consequences) designated target behaviors are arranged systematically to increase or decrease the target behavior's frequency of occurrence. Therefore, the first step in designing an intervention program is to define a target behavior to change. Behavior analysts attempt to define the target behavior so precisely (i.e., operationally) that its frequency or rate of occurrence can be observed and tallied reliably. This enables the behavior analyst or intervention agent to obtain an objective record of the target behavior before and after the intervention program, thereby evaluating the behavior change impact of the intervention. Ideally, some behavioral recordings are taken long after the intervention program has ended in order to assess the long-term effects or durability of the behavior change procedures. This entire process can be readily remembered by the acronym "DO RITE" representing the sequence of: (1) *D*efine the target behavior to be changed; (2) *O*bserve the target behavior; (3) *R*ecord occurrences of the target behavior (4) *I*ntervene with a program to change the target behavior; (5) *T*est the impact of the behavior change intervention by comparing records of behavior *before* and *after* the intervention; and (6) *E*valuate whether the program was cost effective, whether a more potent intervention program is needed, whether the program should be implemented on a larger scale, or whether it's advisable to start the DO RITE process all over again (Geller, Lehman, & Kalsher, 1989). To do this process right for optimal environmental protection is not as straightforward as it seems, as is realized by considering only the first step of DO RITE — defining a target behavior to change.

### Defining Target Behaviors for Environmental Protection

The variety of human behaviors related to environmental protection are numerous, occurring daily in almost every setting (e.g., at home, at work, at school, at commercial locations, and in transition between settings). However, defining responses detrimental and beneficial to the planet and prioritizing recommendations regarding desirable change usually requires interdisciplinary input (Geller, Winett, & Everett, 1982). For example, engineering data are required to advise which appliance or vehicle is most energy efficient or environment polluting; architectural data are often helpful in defining optimal insulation techniques and landscape designs for conserving energy in heating and cooling residences; biological data are essential to prescribe optimal procedures for composting and for disposing of hazardous waste; and information from physics and human factors engineering is relevant for defining the most environment-preserving ways to use appliances, vehicles, industrial machinery, conservation devices, and systems for heating, cooling, recycling or water treatment (Geller, 1986).

To categorize the potential target behaviors of a comprehensive plan for environmental protection, Geller et al. (1982) proposed a 2x3x5 factorial array (or three-dimensional matrix), with the following variables: 1) two basic intervention *approaches* (physical vs. behavioral technology; 2) three community *sectors* requiring direct intervention (residential/consumer sector governmental/institutional

sector, and commercial/industrial sector); and 3) five *targets* or domains for intervention within each sector (i.e., heating/cooling, solid waste management, transportation, equipment efficiency, and water). It is noteworthy that these five targets do not cover the entire environmental crisis. For instance, problems related to population explosion, air pollution, land misuse, hazardous waste, and mineral depletion were not addressed by Geller et al., and have not been researched by environmental psychologists or behavior analysts. Cone and Hayes (1980) covered two more environmental targets (i e., population control and noise pollution) in their text on behavioral approaches to the prevention of environmental problems, but the behavior change research in these additional areas has been minimal. In addition, almost all of the behavior change research has targeted individual behaviors in the residential/consumer sector rather than the governmental/institutional or commercial/industrial sectors where the potential for large-scale change for environmental protection is greatest. However, the principles and intervention strategies derived from demonstration projects in the residential/consumer sector are relevant for developing behavior change programs and policy in the corporate and governmental sectors of society. The point is that behavior change researchers have clearly only cracked the surface with regard to making a significant contribution to the human element aspect of environmental problems.

**One-shot vs. repetitive behaviors**. Some strategies for preventing environmental problems require only one occurrence of a particular target behavior or a one-time behavior change (e.g., installing a thermostat which automatically changes room temperature settings to preprogrammed levels; undergoing surgical sterilization for birth control; purchasing an energy-efficient vehicle with optimal emission controls; wrapping insulation around a water heater; inserting a shower-flow restrictor in a showerhead; installing a solar heating system; adding insulation to a building; purchasing longer-lasting equipment; applying appropriate irrigation technology; and constructing a high technology waste separation system). On the other hand, other behavioral approaches to solving environmental problems require repetitive action in order to effect significant environmental protection (such as setting back room thermostats each night; using contraceptives consistently; following antipollution guidelines regularly; driving 55 mph or less; taking shorter and cooler showers; purchasing low-phosphate detergents, white toilet paper, and returnable bottles; using separate containers for recyclable paper, metal, glass and biodegradable trash; maintaining a compost pile for food and yard wastes; and wearing more clothes indoors in order to withstand lower room temperatures).

For "one-shot" behaviors, the user usually pays a one-time, relatively high cost in time and/or money for the subsequent convenience of not having to make continued response input. However, several strategies for environmental responsiveness involve both a one-shot investment and repeated actions. For example, a window fan can be purchased to substitute for an air conditioner, or a moped acquired to substitute for an automobile, but energy conservation does not occur unless the consumer makes repeated decisions to use the more energy-efficient equipment. Likewise, energy-saving or antipollution settings on new energy-efficient and environment-protective appliances are not worth much unless they are used regularly. Furthermore, innovative equipment for separating, transporting, and reprocessing recyclable trash are not protecting the environment until they are used appropriately each day by numerous individuals (e.g., from residents who initiate the process by collecting recyclables to retailers who promote the purchase of recyclable and recycled commodities).

**Peak shift behaviors**. In the realm of energy conservation, there is an additional class of target behaviors for environmental protection. These are "peak shift behaviors", which refer to changing the time when residents (and corporations and governments) emit certain energy consumptive behaviors. Reducing peak demands for energy decreases the need for power companies to build or borrow supplementary generators or other energy sources (e.g., nuclear reactors). In fact, electricity suppliers have been willing to vary their rates according to peak demand (i.e., peak-load pricing), but residents have found it difficult to shift various energy-consuming tasks (Kohlenberg, Phillips, & Proctor, 1976). And, apparently this strategy has not been seriously considered by industries, institutions, or governments.

Peak shifting is usually associated with residential energy use (e.g., changing showering, cooking, laundering, and sleeping times), but this class of behaviors may be even more feasible as a large-scale conservation strategy for the corporate and municipal sectors of a community. Consider, for example, the peak-shift advantages of altering the scheduling and/or length of work shifts at industrial complexes and government agencies (e.g., through the adoption of flexible work schedules or a four-day work week). Large-scale changes in work schedules could result in peak shifts (and energy savings) at the work setting, at home, and during commuting. The major function of urban transit systems, for example, is to serve individuals traveling to and from work; and since most of this commuting occurs during only two short rush periods per weekday, numerous bus drivers make nonproductive runs or actually sit idle much of the day (Zerega, 1981). Before instituting large-scale shifts in work schedules, however, it is necessary to conduct comprehensive, multifaceted pilot testing to define the most energy-efficient plan without disrupting family life, leisure activity, and other functions of a "healthy" community (Winett & Neale, 1981).

### Activators for Environment Preservation

Activators (often referred to as stimulus control, prompting, response priming, or antecedent techniques) are environmental manipulations occurring before an opportunity for the target behavior, in an attempt to increase the frequency of desired target behaviors or decrease occurrences of undesired target responses. Activators can take the form of: 1) verbal or written messages, 2) awareness or education sessions, 3) modeling or demonstrations, 4) goal setting or commitment strategies, and 5) engineering or design procedures.

**Verbal and written messages**. Messages designed to promote environment preservation have been presented in

television commercials, pamphlets, films, verbal instructions, and demonstrations (e.g., from peers, parents, teachers, or public officials) and on environmental displays (such as speed limit signs, feedback meters, beautified trash receptacles, and "energy saving" setting on appliance controls). Behavior change researchers have studied the impact of various antecedent messages on energy conservation, litter control and resource recovery (see review by Geller et al., 1982) and have defined some basic characteristics of effective behavior change messages, including: 1) Messages should refer to specific behaviors (desirable or undesirable); 2) When the avoidance of undesirable behaviors is prompted (e.g., antilittering), an alternative desirable behavior should be specified that is relatively convenient; 3) Messages should be stated in polite language which does not threaten an individual's perceived freedom; 4) To be most effective, behavior change messages should occur in close proximity to opportunities to emit the desired or undesired target behavior; and 5) Messages announcing a certain consequence following the target behavior are more effective than those which do not specify a response consequence. The announcement of a pleasant consequence following the desired behavior (e.g., 10¢ per returnable bottle) is termed an *incentive*; whereas a *disincentive* is the announcement of a penalty if a certain undesirable behavior occurs (e.g., $100 fine for littering).

Delprata (1977) and Winett (1978) were successful in prompting occupants of public buildings to turn off room lights when they placed messages at light switches which specified the lights should be turned out when leaving the room; and Geller, Witmer, and Orebaugh (1976) found 20% to 30% compliance with antilitter messages on handbills when the prompt politely requested that the handbill be deposited for recycling in a conveniently located (and obtrusive) trash receptacle.

**Awareness and education.** Before attempting to change behavior, it is often important to offer potential participants a sound rationale for the behavior change program. A reasonable rationale can facilitate a participant's acceptance of attempts to motivate behavior change, and increase the probability that the person will develop a personal (or intrinsic) justification for the desired behavior and continue this behavior in the absence of extrinsic motivators (i.e., incentives or disincentives).

Applied psychologists (e.g., Lewin, 1958) have shown that education directed toward behavior change is more effective in small (i.e., 10-15 participants) rather than large groups, and that the education should include interactive demonstrations, discussion, and perhaps consensus building, rather than lecturing or showing films to a passive audience. In this regard, a well-known but not frequently practiced educational principle is relevant: TELL THEM AND THEY'LL FORGET — DEMONSTRATE AND THEY'LL REMEMBER — INVOLVE THEM AND THEY'LL UNDERSTAND. Education/awareness sessions and informational packages that did not promote participatory involvement nor provide extrinsic incentives or disincentives were not successful in motivating newspaper recycling, residential energy conservation, or water saving (e.g., see reviews, by Geller, 1986, 1989; Geller et al., 1982).

**Modeling and demonstrations.** Modeling refers to the demonstration of specific behaviors for a target audience, and sometimes includes the display of a response-consequence relationship (or contingency) by presenting a pleasant or unpleasant consequence following a model's desirable or undesirable behavior (Bandura, 1977). Modeling can occur via live demonstrations or through television, video tape, or film. As an activator, modeling involves presenting a specific behavioral message, sometimes with the announcement of a reinforcement contingency (i.e., the model receives a reward following a specific desirable response) or a punishment contingency (i.e., the model receives a penalty after displaying undesirable behavior). Environmental protection programs have essentially ignored modeling strategies, yet modeling (through television or video tape) has the potential of reaching and influencing millions of residents. Winett and his students (e.g, Winett et al., 1985) showed prominent increases in the conservation of electricity for home heating and cooling after residents viewed video tape or T.V. presentations specifying the monetary benefits resulting from simple conservation behaviors by persons in situations similar to those of the viewers.

**Commitment and goal setting.** Commitment and goal-setting techniques request a verbal or written statement from individuals or groups, stipulating that they will emit a particular behavior (e.g., pick up litter or collect recyclables), stop emitting a certain behavior (e.g., littering), or reach a designated outcome as a result of one or more behaviors (e.g., use 25% less water, gas, or electricity). For example, "promise cards" could be available in a variety of settings which obligate the signers to engage in particular behaviors for a given period of time (cf. Geller & Lehman, in press). Completed promise cards can become raffle tickets in a lottery, thus combining commitment and incentive approaches. Likewise, individuals or groups can set a particular environmental protection goal (e.g., in terms of a desired level of program participation, or savings from conservation efforts) and rewards can be offered for achieving the designated goals. Becker (1978) increased the effectiveness of using feedback to decrease home energy use by giving residents difficult but achievable group goals.

Some field researchers (e.g., Burn & Oskamp, 1986; Pardini & Katzev, 1984) found markedly increased participation in neighborhood recycling programs after residents signed cards pledging their participation; and the author and his students demonstrated substantial increases in vehicle safety belt use after "make it click" promise cards were distributed and signed at industrial sites, a community hospital, and throughout a university campus (see review by Geller et al., 1990).

**Engineering and design procedures.** Engineering and design activators for environmental protection involve the design or re-design of equipment, tools, or entire environmental settings to provide opportunities for environmental protective behaviors, or to facilitate (or encourage) the occurrence of such behaviors. For example, simple modifications in the design of an environmental setting or litter collection device can increase the convenience of litter control or resource recovery (e.g., by increasing the availability or size of trash cans or by providing large, obtrusive,

partitioned receptacles for depositing different types of recyclables); or design/engineering interventions can help to motivate trash-can disposals or litter pick-up (e.g., by beautifying trash receptacles or environmental settings). Some behavioral environmental psychologists have shown remarkable litter control effects of simple modifications in the appearance, positioning, and availability of trash receptacles, and others showed household recycling advantages of a "recycle-it" trash receptacle with separate compartments for paper, glass, and cans (see reviews by Geller, 1986 and Geller et al., 1982). Also, Cope and Geller (1984) demonstrated litter-control benefits with a large "put-and-take litter bag receptacle" containing a large disposal chute for automobile litter bags and a litter bag dispenser that held 25,000 plastic litter bags. These investigators, however, found optimal benefits with their special trash receptacle when they combined this activator strategy with a consequence technique (i.e., soft drinks were given to fast food customers who used the litter bag dispensed by the special trash can).

**Consequences for Environment Preservation**

Behavior change interventions for preserving the environment have been more effective when rewards or penalties were consequences for the occurrence of a target behavior or for a particular outcome resulting from the occurrence of one or more target behaviors. Consequences have been distinct stimuli (e.g., a monetary rebate, a self-photograph, a speeding ticket, a verbal commendation or condemnation), or opportunities to engage in certain behaviors (e.g., the privilege to add one's name to an "Energy Efficient" honor roll, use a preferred parking space, or attend a special litter control workshop).

Federal, state, and local governments have traditionally used disincentives and penalties to protect the environment. These behavior modification attempts usually take the form of laws or ordinances (e.g., fines for littering, illegal dumping, excessive water use, or for polluting water, land, or air), and to be effective, these techniques usually require extensive enforcement and legal personnel. Applied behavior analysts have de-emphasized the use of these approaches for large-scale behavior change, not only because enforcement is cumbersome and behavior change depends upon continual promotion of a disincentive (cf. Ross, 1982), but also because negative attitudes often accompany attempts to mandate behavior change through disincentive/penalty tactics.

Although behavior analysts consider it is most cost effective to attack behaviors directly (rather than focusing on attitude change) when addressing environmental problems (as discussed at the start of this chapter), they are concerned with the attitude formation or change following behavior modification. Positive attitudes associated with one's change in behavior maximize the possibility for the desired behavior to become a norm—the socially accepted rule of action. Positive attitudes are apt to follow incentive/reward strategies, since a positive reinforcement approach is generally perceived as "voluntary", and does not elicit perceived threats to individual freedom which can result from disincentive/penalty procedures (cf. Skinner, 1971). A perception of threat to one's freedom can actually lead to overt noncompliance with a mandate, resulting in pleasant feelings of re-gained personal freedom or control (Brehm, 1972). This phenomenon has been labeled "psychological reactance", and is illustrated in the scenario of the vehicle passenger throwing litter at the road sign announcing a $100 fine (i.e., a disincentive) for littering. Of course, drivers will only do this when it is unlikely the litter control ordinance can be enforced — that is, when a police officer is unavailable (which is necessarily most of the time)

**Response-Contingent vs. Outcome-Contingent Consequences**

The positive reinforcement consequences applied toward environmental protection have varied widely. Some rewards have been given following the performance of a particular desired behavior, whereas other reward contingencies did not specify a desired behavior but were contingent upon a given outcome (e.g., based on obtaining a certain level of energy conservation, water savings, or environmental cleanliness). As reviewed by Geller (1986, 1989) and Geller et al. (1982), the following *response*-contingent consequences increased significantly the frequency of the environment-protective behavior targeted: 1) raffle tickets per specified amounts of paper delivered to a recycling center; 2) $5 if a resident's room thermostat was set at 74° F or higher in the summer and all doors and windows were closed when the air conditioner was on; 3) a coupon redeemable for a soft drink following litter deposits in a particular trash receptacle; 4) a merchandise token (exchangeable for goods and services at local businesses) for riding a particular bus; 5) a posted self-photograph and $1 for collecting a specially-marked item of litter and 6) points redeemable for family outings and special favors following reduced use of home appliances.

**Outcome** - contingent consequences effective at increasing the frequency of behaviors beneficial to the environment have included: 1) a tour of a mental health facility for reducing vehicular miles of travel 20 % or more; 2) 10¢ for cleaning a littered yard to a specified criterion; 3) $5 for averaging a 10% reduction in miles of travel over 28 days, and $2.50 for each additional 10% reduction up to 30%; 4) $2 per week for a 5% to 10% reduction in home-heating energy, $3 for an 11% to 20% reduction, and $5 per week for reductions greater than 20%; and 5) a cash return to apartment residents of 75% of energy savings from expected heating costs for a master-metered apartment complex (see reviews by Geller, 1986, 1989; Geller et al., 1982).

**Feedback Interventions**

A variety of energy conservation studies demonstrated beneficial effects of giving residents specific and regular feedback regarding their energy consumption (e.g., see reviews by Geller, 1986, 1989, Geller et al., 1982). As an outcome consequence, feedback indicated amount of energy consumption in terms of kilowatt hours, cubic feet of gas, and/or monetary cost; and the clear display of energy use was rewarding (when the feedback reflected a savings in energy costs) or punishing (when the feedback implied an increase in consumption and costs).

Most of the feedback research by behavioral environmental psychologists targeted residential energy consump-

tion, and for a majority of these field studies the feedback was given individually to particular residences. As reviewed by Geller (1986, 1989) and Geller et al. (1982), successful ways of delivering energy consumption feedback have included: 1) a special feedback card delivered to the home daily, weekly, or monthly; 2) a mechanical apparatus illuminating a light whenever electricity use exceeded 90% of the household's peak level; 3) an electronic feedback meter with a digital display of electricity cost per hour; 4) the use of a hygrothermograph to give readings of room temperature and humidity; and 5) self-contained training programs for teaching and motivating residents to read their own electric meters regularly and graph their energy consumption.

Some feedback research studies addressed the conservation of transportation energy. One field study showed vehicular miles of travel (vmt) to decrease as a function of public display of vmt per individual, and other studies found vehicular miles per gallon (mpg) to increase with a fuel flow meter indicating continuous mpg or gallons-per-hour consumption or with a public display of mpg for short-run and long-haul truck drivers (see reviews by Geller, 1986 and Geller et al., 1982). One feedback intervention targeted litter control, and showed a 35% average reduction in ground litter following daily displays of litter counts on the front page of a community newspaper (Schnelle, Gendrich, Beegle, Thomas, & McNees, 1980).

### Increasing the Impact of Intervention Programs

The author and his students have recently been researching and developing a system for evaluating the impact of behavior change techniques to protect the environment (Geller, Needleman, & Randall, 1990) or improve driving behavior (Geller et al., 1990). This has been a formidable task, especially considering the variety of environmental and individual factors that can moderate intervention effectiveness. Frankly, we have only cracked the surface at developing a practical intervention impact model to evaluate the cost-effectiveness of large-scale intervention programs and guide the development of more effective procedures to change behaviors for environmental protection. This process, including a comprehensive literature review, has led to the identification of five factors which determine the behavior-change impact of an intervention program. Specifically, we propose that the *immediate* impact of an intervention program is a direct function of: 1) the transmission of specific *response information* (i.e., direction to emit a particular target behavior); 2) the amount of participant *involvement* promoted by the intervention, 3) the degree of *extrinsic control* defined by behavior modification procedures or response-consequence contingencies (i.e., incentive/reward or disincentive/penalty strategies); 4) the degree of participant *social support* encouraged by the intervention procedures; and 5) each individual participant's perception of *self efficacy* (Bandura, 1989), *intrinsic control* (Deci, 1975), or *empowerment* (Byham & Cox, 1988), which we presume to be essentially the same inferred construct and reflect the degree to which an intervention program allows the participants to feel a sense of personal freedom or autonomy.

To derive impact or effectiveness scores for various behavior change interventions, Geller et al. (1990) defined each behavior change technique of an intervention program (a given program can apply several different behavior change techniques, as illustrated above), and then judged whether the procedures of each technique had the potential to include aspects of the five evaluation factors listed above, which are presumed to influence intervention impact. To do this, the following questions and issues per factor were addressed:

1. *Response Information* — Does the behavior change procedure have the *potential* to offer new and specific information relevant to the target behavior(s)? Whereas all techniques have the potential of providing new response information, the response information of an intervention program depends upon the particular message used for the behavior change technique and each program recipient's prior knowledge of the target behavior. For example, written activators (e.g., signs or memos specifying desired behaviors) are often informative upon initial exposure to viewers; however, after individuals become aware of the appropriate behavior, the same activator essentially becomes a *reminder* (with less response information upon repeated presentations). Consequently, determining an information score for a particular behavior change technique in an intervention program requires an estimate of the participants' prior knowledge of the target behavior(s) and a consideration of all techniques used in a program.
2. *Involvement* — Does the behavior change technique promote overt participant action relevant to the target behavior? This factor can be measured through direct observation of the amount of behavioral activity resulting from the intervention program, which is generally a direct function of the ratio between intervention agents and program participants (i.e., more intervention agents per participants usually promote greater program involvement).
3. *Extrinsic Control* — Does the behavior change procedure manipulate a response consequence (i.e., a reward or penalty) in order to influence a target behavior? While disincentive/penalty contingencies are perceived as exerting more extrinsic control than incentive/reward programs (Skinner, 1971), the amount of perceived enforcement of a disincentive/penalty program is also a powerful determinant of intervention impact (Ross, 1982).
4. *Intrinsic Control* — Does the technique offer an opportunity for personal choice or control? This factor is particularly important for estimating the long-term effects of an intervention program. That is, powerful extrinsic contingencies (e.g., large penalties and consistent enforcement) may motivate extensive behavior change while the program is in effect; but if the intervention program is withdrawn, the undesirable behaviors are likely to return, unless the participants gain an internal justification for performing the target behaviors. However, the degree of internal justification for a target behavior has been found to vary inversely with the amount of extrinsic control exerted in an intervention program (eg., Lepper, Green, & Nisbett, 1973).
5. *Social Support* — Does the behavior change procedure include opportunities for continual program-relevant support from program participants or other individuals or groups

(e.g., family, friends, or work groups)? For example, interventions which promote group or team interaction (e.g., consensus-building exercises or group goal setting) or promote group/team performance (e.g., group competition feedback or rewards) can influence social or peer support (or peer pressure) among the participants, thereby increasing individual motivation to emit the target behavior(s). Also, if the consequences of meeting the criteria of a reward contingency include prizes valued by several family members, it is likely that social or family support will be activated and add to the impact of the intervention program.

This has been only an introduction to the challenge of developing a reliable and valid system to guide the development of behavior change intervention programs for environmental protection. Although this research is still preliminary, the mission of this venture is actually critical for solving the human behavior aspects of each societal problem raised in this text. The enormity and urgency of changing human behavior to improve (or perhaps only to maintain) quality of life on Planet Earth requires increasing resources and efforts to develop, evaluate, and implement intervention programs to change and maintain public behavior in desired directions. Thus, a reliable and valid taxonomy of behavior change techniques from which to choose particular intervention programs is urgently needed.

### Summary and Concluding Commentary

Behavior change theory was first applied to environmental problems in the early 1970's, following the first Earth Day. During this period, numerous behavior change studies focused on the development and evaluation of interventions to reduce such environment-destructive behaviors as littering, lawn trampling, vehicle miles of travel, and the purchase of beverages in throwaway containers. Other behavioral studies showed how to increase such environment-preserving behaviors as picking up litter, collecting and delivering recyclables, composting, car pooling, and practicing a number of low-cost conservation techniques (e.g., installing insulation and shower-flow limiters, adjusting thermostat settings and wearing appropriate clothing, reducing the use of air conditioners, adjusting for peak-load demands, and increasing the use of mass transit). Several innovative behavior change techniques emerged from this research, many proving to be cost-effective for communitywide application. Although the results from this domain of behavior change research were encouraging, large-scale applications of the practical intervention programs were not to be. The textbooks (Cone & Hayes, 1980; Geller et al., 1982) that reviewed this work were read by very few individuals besides students at the relatively few colleges or universities offering courses in environmental psychology. The failure to apply this knowledge is unfortunate, especially in light of the profound intensification of environmental destruction occurring since the first Earth Day.

There are many possible reasons for the lack of governmental, corporate, and societal interest in the behavioral environmental research of the 1970's, including ineffective dissemination of the practical research findings to agencies and audiences who were more intrigued with high technology and quick-fix approaches to solving environmental problems. Indeed, the theme of this behavior-change research —conservation through low technology community-based intervention — has been typically viewed as incompatible with big business and consumer convenience This viewpoint was summarized succinctly by Clive Seligman, one of the behavior change researchers of the 70's:

> Unless business can make money from environmental products or politicians can get elected on environmental issues, or individuals can get personal satisfaction from experiencing environmental concern, then individuals and organizations will simply do what ever competes with environmentalism if they see the payoff as greater (C. Seligman, personal communication, March 8, 1990, cited in Geller, 1990).

National, state, and local governments have seemed content to pass environmental control legislation and then penalize individual, group, or corporate infractions of such policy. This is partly because laws, policies, and ordinances are relatively quick and easy to implement and monitor; they represent the traditional governmental approach to behavior control, and the monetary fines from infractions provide funds for the mandating government, organization, or community (R. Foxx, personal communication, March 22,1990 cited in Geller, 1990).

This paper has summarized a number of behavior change approaches to environmental protection that did not incorporate mandates, disincentives, or penalties — the techniques which should actually be used only as a last resort if public acceptance and positive attitude change are desired. Although this applied research focused on individuals in the residential/consumer sector, many of the lessons learned can be applied to the governmental/institutional and commercial/industrial sectors. Hopefully, Earth Day 1990 has begun an era of corporate and government concern and community empowerment for addressing environmental issues in sharp contrast to the corporate and individual greed of the 1980's, which occurred at the expense of community and environmental enhancement.

Unlike 20 years ago, it is now fashionable and profitable for companies to promote their products as being environmentally protective. Behavioral and social scientists can play an important role in increasing corporations' environmentally protective behavior by helping them develop more effective environmental programs with the low-technology behavior change interventions reviewed in this chapter. Along these same lines, the government should provide incentives and rewards (e.g., tax breaks) for companies demonstrating environment preserving practices, and should establish funding for researchers interested in studying the human element of environmental issues. Such research support was essentially nonexistent for the behavioral environmental psychologists of the 1970's, and thus most of these researchers and teachers abandoned the field in the early 1980's (Geller, 1990). There is cause for optimism, however, given the increased amount of media attention to environmental issues and the overwhelming expression of environmental concern by the public. These are promising signs that the culture is beginning to change toward a

concern for environmental protection. Clearly, the Zeitgeist is ripe for governments, scientists, corporations, environmental groups, and citizens to work together to preserve the quality of environment we now enjoy. The future of our Planet Earth is indeed in our hands!

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# Phosphorus in Major Varieties of Whey Produced in Wisconsin

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## Abstract

Six varieties of cheese whey, Cheddar, Colby, Monterey Jack, Mozzarella, Swiss and Brick, from 24 Wisconsin cheese plants were analyzed for total phosphorus over one year. Total phosphorus concentrations ranged from 339 to 766 mg/L. Phosphorus in Monterey Jack and Cheddar cheese whey was significantly greater than Swiss whey. Total solids and phosphorus in whey solids were not significantly different for the six varieties of whey. Total phosphorus concentration of whey was not significantly affected by season of the year.

## Introduction

With the increased concern for water quality and the environment, federal and state environmental regulatory agencies are establishing effluent standards for phosphorus in discharges from treatment facilities to surface waters. One of the major contributors of phosphorus to wastewater treatment systems is the dairy industry. Dairy products inherently contain high levels of phosphorus. Whole milk contains an average of 93 mg of phosphorus per 100 g of milk (12), which is equivalent to about 1000 mg of phosphorus per liter of milk. Phosphorus levels in other fluid milk products are very similar to that of whole milk (5).

Milk losses and wastewater characteristics for a number of dairy plants have been previously reported (1,3,5,7,13). Harper et al. (5) reported a range of 11 to 160 mg of phosphorus per liter of wastewater from a variety of dairy plants. Cocci et al. (3) reported a phosphorus concentration of 139 mg/L in the effluent from a multiproduct dairy plant in Maryland. Marshall (7) reported phosphorus concentrations in wastewater ranging from 12 to 56 mg/L for butter/powder plants and 17 to 280 mg/L for Cheddar cheese plants.

As cheese plants, have attempted to assess sources of biological and phosphorus loads from their operations, they have had problems in determining potential contribution from whey and whey processing operations. Phosphorus concentrations in whey reported in literature are varied. Harper et al. (5) reported average phosphorus levels of 530 mg of phosphorus per kg for whey and 160 mg of phosphorus per kg of cottage cheese whey. USDA (12) reports 460 mg of phosphorus per kg for sweet whey and 780 mg of phosphorus per kg for acid whey. Peterson et al. (9) reported .93 to 1.39 g of phosphorus per 100 g of whey solids for whey used for fertilization. The information on phosphorus in whey is limited and generic. For that reason, this survey was conducted to determine phosphorus levels in major varieties of whey produced in Wisconsin.

## Material and Methods

Whey samples were collected quarterly from twenty four randomly selected cheese plants in Wisconsin from September 1991 to August 1992. Duplicate whey samples were taken from two vats of cheese in each sampling period. Whey samples were taken at the initial drain for Cheddar and Mozzarella, at pre-draw for Colby, Monterey Jack and Brick and at dipping for Swiss cheese. Surveyed plants represented ten percent of the manufacturers of Cheddar, Mozzarella, Swiss, Brick, Colby and Monterey Jack cheese in Wisconsin. Six randomly selected whey processors also provided quarterly samples of initial incoming whey, whey permeate and whey retentate for analyses. Samples were refrigerated or frozen immediately after collection and were transported to the laboratory in Madison under refrigerated storage. Samples were maintained in frozen storage until analyzed.

For phosphorus determination, 2.5 ml of whey was first diluted to 100 ml with deionized water. Samples were then analyzed for total phosphorus using the sulfuric acid-nitric acid digestion procedure and the ascorbic acid colorimetric method as outlined in *Standard Methods for the Examination of Water and Wastewater* (2). pH was determined potentiometrically using an Orion Model 420A pH meter with an Orion Triode™ pH electrode Model 9l-56BN (Orion Research Inc., Boston, MA). Total solids in whey were determined using the vacuum oven procedure, as described in *Standard Methods for the Examination of Dairy Products* (10). Analyses were conducted in duplicate.

Data were analyzed by analysis of variance and means were separated by Tukey's Honestly Significant Difference test (8).

## Results and Discussion

Phosphorus, pH, total solids and phosphorus content of whey solids of the major types of whey in the survey are presented in Table 1. Phosphorus levels ranged from 339 to 766 mg of phosphorus per liter of whey. Mean phosphorus concentrations were similar to those reported for sweet whey by Harper et al. (5), Sharratt et al. (11) and the USDA (12). Phosphorus in Monterey Jack and Cheddar cheese whey was significantly higher than in Swiss cheese whey.

**TABLE 1.** Total phosphorus, pH, total solids and phosphorus (P) in whey solids from major varieties of whey from Wisconsin cheese plants.

| Whey variety | Total phosphorus (mg/L)[1] | pH[1] | Total solids (g/100 ml)[1] | P in whey solids (g/100 g)[1] |
|---|---|---|---|---|
| Cheddar (22)[2] | 546 ± 91[a] | 6.15 ± .16[b] | 6.00 ± 1.10[a] | .95 ± .26[a] |
| Colby (9) | 526 ± 92[ab] | 6.17 ± .16[b] | 5.94 ± 1.32[a] | .92 ± .25[a] |
| Monterey Jack (9) | 575 ± 79[a] | 6.06 ± .20[b] | 6.11 ± .76[a] | .95 ± .15[a] |
| Mozzarella (26) | 519 ± 107[ab] | 6.44 ± .22[a] | 5.84 ± 1.40[a] | .97 ± .39[a] |
| Swiss (16) | 447 ± 57[b] | 6.57 ± .14[a] | 5.98 ± 1.27[a] | .80 ± .26[a] |
| Brick (13) | 465 ± 59[ab] | 6.64 ± .16[a] | 6.62 ± .97[a] | .72 ± .16[a] |

[1] Mean ± standard deviation.
[2] Number of samples.
[a,b,c] Means in same column with different superscripts are different ($P < .05$).

The pH values of the various types of whey reflect typical drain or pre-draw pH values for the respective cheese make procedures (4). Cheddar, Colby and Monterey Jack whey pH values were significantly lower than Mozzarella, Swiss and Brick. Results of this survey did not show a significant correlation between phosphorus content and pH of the whey. Other researchers (x,x) have reported that phosphorus content of Cheddar cheese whey is increased as the pH of the curd is decreased. Total solids content of the various wheys were not significantly different. Values were similar to those previously reported by Harper et al. (6), Peterson et al. (9) and the USDA (12). Phosphorus content of the whey solids for all six varieties of whey was not significantly different. Values were slightly lower than those reported by Peterson et al. (9) but were similar to those reported by Mair-Waldburg (6). Mair-Waldburg reported phosphorus contents in dried whey with pH greater than 5.7 of .5 to .7 g of phosphorus per 100 g of whey powder. For dried whey with pH less than 5.1, phosphorus levels of .82 to 1.23 g/100 g were reported. There was no significant difference in whey composition as affected by season of the year.

Phosphorus content of incoming blended wheys from the whey processors ranged from 311 to 835 mg/L while phosphorus in whey permeates ranged from 327 to 786 mg/L. Average phosphorus content of the 30 samples of incoming blended whey was 471 ± 126 mg/L while the average for the whey permeates was 541 ± 131 mg/L. Phosphorus content of whey permeate was not significantly different from that of the incoming blended whey.

## Conclusion

As phosphorus limitations are put in place for wastewater discharges from dairy plants, a greater emphasis will be placed on accounting for product losses within the plant. Results of this survey will provide cheesemakers with the information needed to assist in accounting for phosphorus loads in plant waste streams. Results indicate that whey contains about one half as much phosphorus as milk. However, to effectively limit phosphorus in discharges from cheese plants, losses of whey will definitely need to be minimized.


### Acknowledgments

The authors express their appreciation to the cheese manufacturers and whey processors who provided samples for the survey. We also wish to thank Ed Robatski and Emily Muehlenkamp for assistance in phosphorus analyses in this study. This research was supported in part by the College of Agriculture and Life Sciences and the U.S. Department of Agriculture.


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# Updates . . .

## Food Safety at Home

*Courtesy of Red Lobster, in cooperation with the National Safety Council*

### Look Before You Cook

A knowledge of basic sanitation can keep your family out of trouble every day of the week. Cross contamination occurs when bacteria are transferred to foods during preparation because people do not clean their hands after handling raw meats, as an example. Bacterial growth may also occur if ingredients are improperly cooled or food dishes are left out too long prior to or after serving.

**Temperature Check:** To prevent bacteria from multiplying, the temperature of your refrigerator should be 40°F or below and your freezer temperature should be 0°F.

**Label Check:** Always check frozen food labels for preparation and serving instructions. Unless otherwise stated on container, do not re-freeze.

**Stacking Order:** To prevent contamination, always place cooked food above raw items in the refrigerator. Be sure all food is covered when stacking so particles from the shelf above won't fall onto foods below.

**Clean Counter: Wash - Rinse - Sanitize!** The secret to cleaning up! Before preparing foods on any surface - SANITIZE! This is easy to do. Clean surfaces with a mixture of hot, soapy water, rinse thoroughly, then sanitize with a solution containing chlorine bleach. Mix one cap of chlorine bleach to one gallon cold water. You can even put some in a spray bottle for quick use. Change weekly to assure the bleach hasn't evaporated. Commercially prepared counter cleaners containing chlorine may also be used.

**Chop Shop:** Maple is the only hard wood cutting board health departments accept in restaurants because soft woods may allow bacteria to hide in the texture. We use and suggest hard plastic cutting surfaces; they can be easily washed and sanitized after each use. It is a good idea to sand wood and plastic cutting boards if scratches become too deep.

**Kid Smart:** Wooden tables harbor germs. Since a child spills food and places items directly on the table, it is very important to clean and sanitize children's tables after every use.

**Cleaning:** All knives and cutting surfaces should be washed with hot soapy water, followed by a hot water rinse and sanitized with a chlorine solution after each use.

**Wash:** "Cross contamination" can easily be prevented. It usually occurs when plates and cookware used in preparing raw foods are not thoroughly "washed - rinsed - sanitized" before using on cooked foods, or different utensils used. For example, never use the same plate you use to take the chicken to the barbecue grill to transport back the cooked product. Use a different plate or platter and avoid the potential for cross-contamination.

**Can-do:** Always sanitize can openers after every use. Look for nicks on the cutting wheel as this may produce slivers of metal that could get into the product you are opening.

**Thawing:** Never thaw frozen food at room temperature! Either thaw in the refrigerator or under cold running water. In a pinch for time? A tip: put your frozen product, e.g. fillet of fish, beef steak or chicken breast in a sealed plastic bag, eliminating as much air as possible and let thaw under cold running water. It is still best to let it thaw in a covered container overnight in the refrigerator. Plan ahead. A 20 pound turkey can take as long as four days to thaw.

### Leftovers

**Refrigerate Leftovers:** To prevent bacterial growth when saving leftovers, refrigerate immediately — do not let them sit for an extended period of time. Leftovers should be taken from the proper serving temperature (140°F-180°F) to the proper refrigeration temperature (40°F) as quickly as possible.

**Small Portions:** Leftover food items should be chilled down as soon as possible. It is best to break down large food items into smaller portions before refrigerating. This promotes faster chilling. Leaving leftover food out "to cool down" is not wise as it will promote bacterial growth.

**A Hot Tip:** Health experts strongly suggest that when re-heating leftover food it be brought to a temperature of at least 165° to eliminate any bacterial growth. When using a microwave for re-heating, do so in a covered dish. The retains the heat and increases the heating of food. Use a meat thermometer to check temperatures.

**Chill Out - Heat Up:** Meats should be cooked to a minimum internal temperature of 140°, with the exception of poultry and stuffed meat items. They should be cooked to a minimum of 165°. Pork should reach an internal temperature of 150°. Cold foods should be served at a temperature of 40° or less.

### Tips from the Supermarket

**Last Stop:** Always make sure the supermarket is your last stop before going home.

**Damaged Goods:** Never purchase outdated, broken, or dented goods of any kind. Damaged canned or packaged foods may be contaminated because the airtight seal has been broken. Especially avoid bulging cans.

**Alert Manager:** In order to eliminate possibly contaminated products from reaching others, alert store personnel of damaged goods.

**Look for the Line:** When purchasing frozen foods, always select items in display cases that are below the "frost line" or "load line" (the line marked on commercial freezer cabinets which indicates the safety level).

**Wash First:** Thoroughly clean and wash all fruits and vegetables (including onions) before cooking or eating. Dirt, insects, pesticides and other people handling unwrapped produce may cause bacterial growth on food.

**Bag Separately:** Be sure all refrigerated and frozen food items are bagged separately so they will be stored first when you arrive home. Always place refrigerated items in the coolest area of the car, especially during warm months.

**Last But Not Least:** It is important when grocery shopping that refrigerated and frozen food items be picked up last. This prevents spoilage and safeguards against temperature loss.

For more information about "*Food Safety at Home*", please contact Red Lobster, A Division of General Mills Restaurants, Inc., 5900 Lake Ellenor Drive, Orlando, FL 32809.

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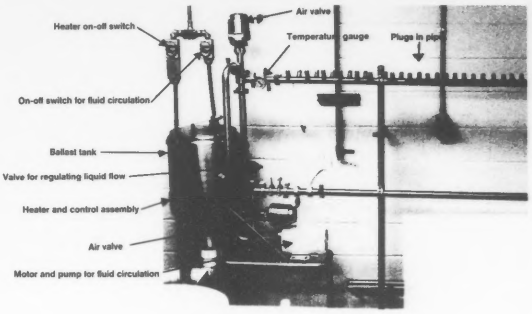


## *Tubular Flow System (TFS) by Diversey Corporation as shown on the January Cover of Dairy, Food and Environmental Sanitation*

The Tubular Flow System (TFS) is a unique stainless steel model pipeline developed by the International Biocide Laboratory at Diversey Corporation's Corporate Technology Centre. Its uniquely designed removable, inline plugs allow one to study bacterial attachment to surfaces, and CIP cleaning and sanitizing products and procedures for removing attached bacteria. Typically, the pipeline is soiled and contaminated by circulating milk or other liquids, to achieve a certain level of bacterial attachment. The system is then cleaned and sanitized. The effectiveness of the cleaning procedure is then based on the elimination of soil and bacteria from the inline surface of the removable plugs. This is determined visually, by microscopic examination, and by microbiological cultural methods.

With the TFS, researchers have been able to discern the role of different steps in eliminating microorganisms in the cleaning regimen, measure the performance of new detergents and sanitizers, and study the effects of various parameters (e.g., detergent and sanitizer concentration, flow rate, contact time, temperature, water hardness) on eliminating surface attached bacteria. Results of some of these studies have been presented at the IAMFES Annual Meeting, Toronto, July 1992 ("Elimination of Surface-Attached bacteria by detergent washing and chemical sanitation in a dynamic flow system," by Dr. Mel Czechowski), and the GAFES Annual Meeting, Atlanta, February, 1990 ("Factors affecting the removal of biofilms in simulated CIP systems" by Dr. Mel Czechowski).

## *3-A Committees to Focus on Cheese Equipment*

The 3-A Sanitary Standards Committees have been petitioned by manufacturers of Mozzarella cheese making equipment to develop 3-A standards for Mozzarella cheese mixing equipment and for Mozzarella cheese moulder-chiller equipment. The first step in this process is to establish an equipment task committee for all cheese making machinery.

The 3-A Secretary, Dairy and Food Industries Supply Association (DFISA) Technical Director, Tom Gilmore, is looking for volunteers to help kick off the effort. "Though the initial work will be on Mozzarella equipment, we anticipate other cheese projects to follow. By joining now you would be assured of being apprised of additional projects that may affect your company," Gilmore said.

The 3-A committees have a 50 year history in providing material, fabrication, and installation criteria for the sanitary design of dairy and food equipment. 3-A standards are accepted by fabricators, users, and regulators because equipment meeting 3-A criteria can be cleaned, protecting the product from environmental contamination.

For additional information on the 3-A Mozzarella cheese equipment task committee, or to volunteer, contact Tom Gilmore at DFISA, 6245 Executive Blvd., Rockville, MD 20852, or call (301)984-1444.

## *Foundation Joins FDA in Seafood Safety Pilot*

The Educational Foundation of the National Restaurant Association recently joined forces with the Department of Commerce and the United States Food and Drug Administration (FDA) to conduct a Seafood Pilot Program workshop, the agencies' first step in developing a seafood safety system for restaurants. Funding for the workshop was provided by the Department of Commerce, FDA, National Oceanic and Atmospheric Administration (NOAA), and the National Marine Fisheries Services Saltonstall-Kennedy Grants Program, through an award to the New England Fisheries Development Association.

According to John Marcello, manager of technical education for The Educational Foundation, the pilot will help NOAA and the FDA develop a voluntary inspection program, based on the Hazard Analysis Critical Control Point (HACCP) System. The Educational Foundation's "SERVSAFE Managing a Food Safety System" course was used as the model for the pilot program. Last year, The Foundation released a revised edition of its industry-known SERVSAFE *Applied Foodservice Sanitation*, the first text to present the HACCP system as it relates to foodservice operations.

"The Seafood Pilot Program helps build cooperation between regulatory agencies and foodservice operators in developing workable food safety systems," Marcello says. "In turn, we see this same HACCP-based program for seafood menu items being expanded to all food items."

Marcello adds that the ultimate goal of the pilot program is to urge the industry to assume a greater responsibility for self-regulation and inspection, reducing the risk of food contamination.

Twelve foodservice operations from across the country are also involved in the pilot. The program is scheduled for completion in May 1993.

For more information contact Susan Brophy at (800)765-2122, ext. 752.

## *Satellite Video Conference for Food Handlers to be Held*

An opportunity to receive training in proper food handling techniques is available to anyone capable of down-linking from video satellites. The three hour program, funded by the Extension Service, USDA and produced by the University of Wyoming, will feature three seasoned trainers presenting up-to-date information on proper food handling. Chuck Higgins, of FDA, private consultant D. L. Lancaster and Howard Hutchings of the Wyoming Department of Health will discuss the major factors associated with the control of foodborne illness, including temperature control, personal hygiene, cross contamination and cleaning and sanitizing.

The program will be geared to food handlers, managers and others who have an interest in proper food handling. We hope that each state will promote the event. A great opportunity exists to provide a service to the industry and public with little effort. A toll free number will be provided so questions can be forwarded to the speakers. Participating agencies may also wish to have sanitarians, inspectors or others trained in proper food handling act as coordinators for the local down-link. Photo ready handout materials will be available to participating agencies and organizations for $10.00 a set.

The event will be held April 21, 1993 from 1:30 to 5:00 p.m. (Mountain Time). Interested participants should contact Linda Melcher, with the University of Wyoming at (307)766-5181 or John Misock, with the Wyoming Department of Agriculture at (307)777-6587, to receive down-link coordinates. University Extension Food and Nutrition Specialists, in each state, are also aware of the program and may be planning to participate.

There is no limit to the number of participants, and the broadcast is public domain, which means anybody can receive and broadcast the event. All we ask is participating agencies complete an evaluation. We are sure that the program will be valuable and hope that people from every state participate.

## *Lactococci Slow* Listeria *Growth in Ultrafiltered Milk*

Commercial cultures of lactic acid bacteria slow the growth of *Listeria monocytogenes* in ultrafiltered skim milk and permeate, research at the College of Agricultural and Life Sciences has shown. Some *Listeria* cells survived fermentation, however. When the fermented products were refrigerated, the pathogen survived for up to five weeks in UF milk and one week in permeate.

If pasteurized ultrafiltered milk becomes contaminated, fermentation with lactic acid bacteria at 30°C (86°F) may reduce *Listeria* numbers somewhat. However, the fermentation will not totally inactivate *Listeria*, either during fermentation or during short-term refrigerated storage, according to E. H. Marth, emeritus professor of food microbiology at the University of Wisconsin-Madison.

In this trial, researchers used a commercial starter culture of lactic acid bacteria suitable for cheesemaking, containing a mixture of four strains of *Lactcoccus lactis* ssp. *cremoris*. The culture produced initial populations of 40 million to 230 million cells per milliliter in the samples — typical of the levels used to make cheese.

Initial *Listeria* populations ranged from about 5,000 to 150,000 cells/ml, representing moderate to severe contamination.

*Listeria* populations remained stable in skim milk and 2x and 5x UF milk during 36 hours of fermentation, Marth reports. Populations decreased by about 90 percent in permeate during 36 hours of fermentation.

The skim milk contained 9.7 percent total solids and 3.2 percent protein; 5x UF milk contained 20.7 percent total solids and 12.9 percent protein; 2x UF milk contained 13 percent total solids and 5.9 percent protein. The permeate contained about 6 percent solids and .3 percent protein. UF milk, due to its higher concentration of proteins and salts, has more buffering capacity than unfiltered milk. More acid must be produced in UF milk than in unfiltered milk for an equivalent reduction in pH.

Permeate has less buffering capacity than either unfiltered or UF milk, Marth notes. In this trial, *Listeria* died more quickly in permeate than in unfiltered or UF milk, even though the lactic acid culture bacteria grew more in the UF milk than in permeate or unfiltered skim milk.

*Listeria* cells survived in the fermented products during storage at 4°C (39°F). Survival times ranged from 1 week in permeate to 4 to 6 weeks in unfiltered skim milk and 3 to 5 weeks in 2X or 5X UF milk.

"These results once again emphasize the importance of sanitation in cheesemaking operations," Marth says. "Although lactic acid bacteria may control *Listeria monocytogenes* if present, they will not eliminate the pathogen under reasonable manufacturing conditions."

In addition to increasing the acidity of milk, lactic acid cultures produce other substances, including hydrogen peroxide, bacteriocins and diacetyl, that may inhibit bacterial growth, according to Marth.

Marth worked on this study with Fathy E. El-Gazzar, an associate professor of dairy microbiology at the University of Assiut, Assiut, Egypt; and Hans F. Bohner, now at the Technical Center, General Mills, Inc., Minneapolis.

For more information, contact Elmer Marth at (608)265-2690.

# Federal Register

## Proposed Residue Chemistry Guidelines; Notice of Availability and Request for Comment

**Agency**: Environmental Protection Agency (EPA).

**Action**: Notice of availability, request for comments.

**Summary**: This notice announces the availability of and requests comments on two proposed guidelines: (1) Guidelines for the Collection of Residue Data for Acutely Toxic Pesticides, and (2) Guidelines for the Use of Anticipated Residues in Dietary Exposure Assessment. These guidelines are being proposed as supplemental guidance to Subdivision O of the Pesticide Assessment Guidelines, which provides guidance for registrants in the conduct of tests to support registration of pesticides under the Federal Insecticide, Fungicide, and Rodenticide Act as amended (FIFRA).

**Dates**: Comments must be received by March 22, 1993.

**Addresses**: Copies of these proposed guidelines may be obtained from the Pesticide Docket, Office of Pesticide Programs, Public Response and Program Resources Branch, room 1132, Crystal Mall #2, 1921 Jefferson Davis Highway, Arlington, VA 22202, (703)305-5805.

**For further information contact**: For Guidelines for the Collection of Residue Data for Acutely Toxic Pesticides contact by mail: Joel Garbus, Health Effects Division (H7509C), Office of Pesticide Programs, Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460. In person or by telephone: room 805B, Crystal Mall #2, 1921 Jefferson Davis Highway, Arlington, VA (703)305-5405.

For Guidelines for the Use of Anticipated Residues in Dietary Exposure Assessment, contact by mail: Michael S. Metzger, Health Effects Division (H7509C), Office of Pesticide Programs, Environmental Protection Agency, 401 M St., SW., Washington, DC 20460. In person or by telephone: room 816G, Crystal Mall #2, 1921 Jefferson Davis Highway, Arlington, VA (703)305-5883.

**Supplementary Information**: Under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), EPA requires registrants and applicants for registration of food use pesticides to provide information concerning the amount of pesticide residue found in or on agricultural commodities. These data are used to ensure that pesticides do not pose unreasonable risks to human health. Specific data requirements for food-use pesticides are codified in 40 CFR 158.240, and guidelines for the conduct of these studies are made available through the National Technical Information Service (NTIS). This notice announces the availability of, and requests comments on, two proposed guidelines — Guidelines for the Collection of Residue Data for Acutely Toxic Pesticides and Guidelines for the Use of Anticipated Residues in Dietary Exposure Assessment. These new guidelines will complement existing guidelines and will lead to a more formal and uniform approach to assessing both short and long-term dietary health risk.

The proposed acute residue data collection guideline is a portion of the overall scheme that EPA has been developing over the past few years to evaluate the potential for health risk from short-term dietary exposure. Current Agency guidelines are designed to address residue levels in or on composite samples (i.e., samples consisting of many individual items of one commodity, such as several potatoes). The proposed guidelines will enhance EPA's ability to evaluate acute risks by outlining procedures for obtaining and assessing residue levels in individual serving sizes of food commodities. The Agency is concerned about the potential for dietary risks from single servings of food containing unusually high levels of residues. Although there is reason to believe that such risks are generally limited, EPA is working to develop a science-based regulatory scheme to assess the potential for such risks. In order to accomplish this, EPA needs to know the range of residues likely to be present in a single serving and the levels of dietary exposure that cause acute toxicity i.e., the minimum amount of residue that would cause an adverse effect from consumption in a single serving.

These studies will not be required in all cases. The Agency will establish criteria for classifying a pesticide as an acute toxicant, and will establish data requirements and procedures for quantifying minimum acute toxicity levels. Internal procedures are being developed to identify and prioritize those pesticides that should be tested in this way and to deal with acute dietary risk in a systematic manner. The Guidelines for the Collection of Residue Data for Acutely Toxic Pesticides will describe for registrants and applicants how to conduct studies to generate data to determine potential short-term exposure to pesticides with acute toxicological effects. The Agency will continue to seek public participation in all facets of the development of this approach.

The Guidelines for the Use of Anticipated Residues in Dietary Exposure Assessment discuss estimating pesticide residues in food at the time of consumption. The guidelines address a number of subjects which have bearing on the assessment of potential dietary exposure including the use of existing residue data, pesticide usage information, statistical considerations, movement of commodities in commerce, and generation of data for anticipated residue determination. These criteria are currently being used by the Agency on a case-by-case basis in performing dietary risk assessments. The Agency wishes to establish a standard approach for estimating dietary risk.

These proposed guidelines will be reviewed by the FIFRA Scientific Advisory Panel, an independent panel of experts required under FIFRA section 25(d), following receipt and incorporation, as appropriate, of public comments and then published in final form as addenda to Subdivision O (Residue Chemistry) of the Pesticide Assessment Guidelines within the next fiscal year. These guidelines will enhance the ability of pesticide registrants to plan, estimate costs, and design studies that EPA will likely require.

Dated: December 21, 1992.

**Douglas D. Campt,**

*Director, Office of Pesticide Programs.*

(Federal Register Doc. 93-1335, Filed 1-19-93; 8:45 am)

# Sanitary Design

## A Mind Set

**Donald J. Graham**
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### A CHECKLIST - PART 4 - EQUIPMENT - IS IT DESIGNED TO BE SANITARY AND CLEANABLE?

Designing a piece of equipment to be functional, efficient, economical and of sanitary design so that it can be easily cleaned and kept clean is an engineering challenge. A U.S.D.A. manual lists equipment that can be used in meat, poultry and egg plants on the basis of its cleanability and sanitation irregardless of its efficiency or cost. The U.S.D.A. wants to know what the food contact surfaces are, how easily the equipment can be dismantled for complete cleaning and other design features to keep the equipment from contaminating products. The Pasteurized Milk Ordinance (PMO) is the regulatory standard for equipment and facilities for milk processing. The Food and Drug Administration (FDA) outlines general sanitation requirements for food processing machinery in 21 CFR part 110.

Many industry groups promulgate sanitary standards for equipment used in their particular industry. These standards do not carry the weight of law but have become recognized and accepted by the food industry, in addition to the regulatory agencies, as the sanitary design authorities. One of the major groups is: the 3-A Sanitary Standards Committee which formulates the 3-A and E-3-A Sanitary Standards. These standards represent criteria for cleanability of dairy processing and egg processing equipment. These standards are under constant review and updating. New standards are published periodically in *Dairy, Food and Environmental Sanitation* by the International Association of Milk, Food and Environmental Sanitarians, Inc.

The Bakery Industry Sanitary Standards Committee (BISSC) is the authority for baking industry equipment. BISSC publishes a manual of standards for the "Design and Construction of Bakery Equipment." BISSC and 3-A Sanitary Standards Committee are the best known groups and are widely quoted and used in segments of the food industry in addition to dairies or bakeries.

Another source of often quoted information is the ASME/ANSI F2.1 "Food, Drug and Beverage Equipment" published by The Society of Mechanical Engineers.

Questions to ask concerning equipment include:

1. Are all food contact surfaces non-toxic, non-absorbent and corrosion-resistant to the product(s) being processed?

   The regulations are specific for food contact surfaces in or on food processing equipment. They must be non-toxic to the consumer, and non-moisture absorbent. Wood is not an approved food contact surface since microbe-carrying moisture can soak into it and contaminate any product or utensil placed on it. The food contact surfaces must also be non-reactive with the product coming into contact with them. In other words, no part of the food contact surface should react with the food product thereby preventing migration of the compounds making up the surface into the food product causing adulteration. The food contact surface must also be non-corrosive when in contact with the product so corrosion by-products cannot migrate into the food and contaminate and adulterate it. Above all, the food contact surfaces must be cleanable and of the kinds that can be sanitized.

2. Are all the food contact surfaces approved by the appropriate regulatory agency?

   Cadmium, antimony and other toxic metals, such as the heavy metals, are prohibited by regulation. In general soft metals do not make suitable food contact surfaces. Lead and tin alloys are not to be used in solders in food contact areas. 21 CFR, Part 110.40 specifically states that: "Food contact surfaces shall be corrosion-resistant when in contact with food. They shall be made of non-toxic materials and designed to withstand the environment of their intended use and the action of food, and, if applicable, cleaning compounds

and sanitizing agents. Food contact surfaces shall be maintained to protect food from being contaminated by any source, including unlawful direct food additives." Copper, bronze, brass, monel and other copper alloys are not to be used where edible oils, liquid shortening, chocolate liquor, and other fatty food products come in contact with metal.

3. Are gear boxes, motors, drives or bearings located outside the product zone to avoid product contamination due to leakage?

It is a given that one day a gear box will leak grease or oil. When it does, good sanitary design of the equipment should have placed it out of the product zone. The product zone is defined as an area 12 inches either side of the product and/or the product contact surface, 12 inches below the product and/or the product contact surface extending all the way to the top of the enclosure. Product conveyers are notorious for having motors and drives located at the very end of the conveyer, directly over the conveyer belt where a leaking gear box can not only contaminate the belt and the product on it but also the product on the next piece of equipment. Bearings on screw conveyers are often placed inside the housing, so grease on or in the bearings that falls off will fall into the product and get mixed in. All bearings on screw conveyers must be placed outside the conveyer housing.

4. Are food grade lubricants used on food contact equipment?

Food grade, non-toxic lubricants should be the only kind found in a food processing plant. Other kinds such as non-toxic, non-food grade lubricants have no place in a food processing facility. Why can't other than non-toxic food grade lubricants be used in non-food processing areas such as warehouses, boiler rooms or machine rooms? The simple answer is that there is no longer any need to have more than one type of lubricant (from a toxicity food grade standpoint) in a processing plant. Most of the criteria for high temperature resistance and other specialty requirements can be met with today's food grade, non-toxic lubricants. Using one correct lubricant prevents potential lubricant mixups in the plant.

5. Are welded joints continuous-welded, ground smooth and flush in food contact equipment, including pipelines?

In 21 CFR Part 110.40 (b) states that: "Seams on food contact surfaces shall be smoothly bonded or maintained so as to minimize accumulation of food particles, dirt and organic matter and thus minimize the opportunity for growth of microorganisms." Rough welds on food contact surfaces can become snag points for food particles and hiding places for microbes. Sanitary pipelines that are welded together are particularly vulnerable at the welds if any internal voids are left in the joint welds. Internal pipeline welding using an inert gas is usually specified. If voids are left in the welds or they have rough surfaces, even prolonged CIP treatments often cannot dislodge the microbes that have gained a foothold. Smooth welds are mandatory in any system that is subjected to only CIP cleaning. Ground welds in sanitary installations also serve a cosmetic purpose. They look good and add to the overall impression of a sanitary facility and piece of equipment. Ground and polished welds make cleaning and sanitizing considerably easier.

6. Is all material used for inspection ports, windows and lights made of shatter-resistant material?

Glass of any kind should never be allowed in a food processing area unless it is the container being filled with product for retail sale. If that is the case, special precautions are usually in place in case of breakage. There are numerous incidents in the literature about glass being found in food products. Just recently there was a major recall of a number of food products because of glass found in one of the ingredients. There are a number of good substitute materials that will not break and are just as transparent, so there is no excuse for glass to be part of food processing equipment in any food plant.

**Part 4 of the checklist will be continued in the next issue.**

# Food and Environmental Hazards to Health

## Shigellosis in Child Day Care Centers — Lexington-Fayette County, Kentucky, 1991

In January 1991, the Lexington-Fayette County (Kentucky) Health Department (LFCHD) received three reports of *Shigella sonnei* infections from the University of Kentucky microbiology laboratory. The infections occurred in children aged 2-3 years, each of whom attended a different child day care center in Lexington-Fayette County (population: 200,000). This report summarizes the findings of an investigation by the LFCHD and the Kentucky Department for Health Services to assess the impact of day care center attendance on communitywide shigellosis.

Public health field nurses obtained stool cultures from family members and day care center contacts of the three children; five contacts tested positive for *S. sonnei* infection. Despite health education efforts and follow-up by LFCHD, cases continued to occur throughout the community. From January 1 through July 15, 1991, 186 culture-confirmed *S. sonnei* infections were reported in Lexington-Fayette County.

Investigators attempted to interview an adult member of each family with at least one case of culture-confirmed infection. Questions were asked about the occurrence of diarrhea and child day care center attendance for all household members during January 1 through July 15, 1991. A case of shigellosis was defined as diarrhea (i.e., two or more loose stools per day for 2 or more days) in a person who resided in a household with a person who had culture-confirmed shigellosis. An initial case of shigellosis was defined as the first incidence of diarrhea in a household member.

Of the 186 persons with culture-confirmed infection, 165 (89%) were contacted; these 165 persons represented 109 households, within which 111 initial cases of shigellosis were identified. Of the 64 children aged <6 years with initial cases, 57 (89%) attended licensed day care centers, compared with 44 (67%) of the 66 children who were not initial case-patients (odds ratio=4.1; 95% confidence interval = 1.5-11.6).

In 1990, approximately 20,000 children aged <6 years lived in Lexington-Fayette County; the total capacity of licensed day care centers in the county was 7754 children (Urban Research Institute, University of Louisville, Kentucky, unpublished data, 1992). Among children aged <6 years, the rates of initial cases were 7.4 per 1000 children who attended licensed child day care centers and 0.6 per 1000 children of the same age group who did not attend day care centers. The rate of initial cases of shigellosis attributable to child day care center attendance was 6.8 per 1000 children aged <6 years, and the attributable risk percentage* was 91%. Thus, 52 (91%) of the 57 initial cases among children aged <6 years in licensed child day care and 47% of the 111 initial cases of all ages were attributed to child day care center attendance.

To control shigellosis, in June 1991, LFCHD created a *Shigella* task force that instituted a diarrhea clinic to facilitate proper diagnosis and treatment, intensified infection-control training and surveillance for shigellosis, and encouraged community-based participation in prevention efforts. Children were monitored in handwashing at day care centers, elementary schools, summer camps, and free-lunch sites. Three weeks after intensive interventions were initiated, the incidence of culture-confirmed cases declined substantially.

**Editorial Note**: Shigellosis is transmitted by the fecal-oral route; transmission is efficient because the infective dose is low. Minor hygienic indiscretions allow fecal-oral spread from person to person, and many persons with mild illness are in contact with others. As a result, community outbreaks are difficult to control.

During 1970-1988, the proportion of young children cared for in licensed centers in the United States increased from 3.5% to 22.0%. Child day care center attendance increases the risk for diarrheal disease. The risk for shigellosis is greatest for children aged <6 years who are most likely to spread disease to their household members. Behavior typical in toddlers, including oral exploration of the environment and suboptimal toileting hygiene, may be associated with this risk.

From 1974 through 1990, 26 cases of *Shigella* infection in Lexington-Fayette County had been the maximum reported in any year. However, a large outbreak with 112 culture-confirmed cases of shigellosis affected the same community in 1972-73. In both outbreaks, child day care center attendance was associated with an increased risk for initial cases in households. Secondary attack rates by age group within households were similar in the two outbreaks: for children aged 1-5 years, rates were 47% in 1972-73 and 53% in 1991. However, in 1991, 51% of the initial cases occurred among children aged <6 years who attended a licensed child day care center, compared with 23% in 1972-73. The attributable risk of 91% for day care center attendance among initial cases in young children in 1991 suggests a need for improved infection-control practices in child day care centers.

One of the national health objectives for the year 2000 is to reduce by 25% the number of cases of infectious diarrhea among children who attend licensed day care centers (objective 20.8). To decrease the likelihood of transmission of diarrheal illness in day care centers, facility operators should ensure the following:

- Staff and children should be instructed in rigorous and consistent handwashing practices, including the use of soap and running water.
- Staff and children should wash their hands after using the toilet and changing diapers, and before handling,

**Incidence among children exposed to day care minus incidence among children not exposed to day care, divided by incidence among children exposed to day care.*

preparing, serving, and eating food. During an outbreak of diarrheal illness, staff and children should also wash their hands on entry to the day care center.

- If possible, staff who prepare food (including bottles) should not change diapers or assist children in using the toilet. If they perform both functions, they should practice rigorous handwashing before handling food and after using the toilet, changing diapers, and assisting children with toilet use.
- Surfaces, hard-surface toys, and other fomites should be decontaminated regularly; in the setting of a diarrheal outbreak, this should be done at least once per day.
- Children with diarrhea should be excluded from child day care until they are well.
- In the outbreak setting, where feasible, convalescing children should be placed in a separate room with separate staff and a separate bathroom until they have two stool cultures that are negative for *Shigella* 48 hours or more after completion of a 5-day course of antibiotics. If cohorting is not feasible, temporary closure of day care centers may be considered to interrupt disease transmission; however, this policy could increase the likelihood of transmission if children are transferred to other centers.

Morbidity and Mortality Weekly Report 6/26/92

## Primary Amebic Meningoencephalitis — North Carolina, 1991

During September 1991, two children in North Carolina died from primary amebic meningoencephalitis (PAM), a rare and often fatal illness resulting from infection with *Naegleria fowleri*. This report summarizes clinical and epidemiologic information about these two cases and characterizes *N. fowleri* infection.

### Patient 1

In September 1991, a previously healthy 3-year-old girl was evaluated by her physician for a 36-hour history of headache and fever; she was lethargic without focal neurologic or meningeal signs. Four hours after evaluation, she became disoriented and did not recognize her parents. When examined at a local emergency department, she was unresponsive to painful stimuli and had fever of 101.8°F (38.8°C). Subsequently, she had a generalized seizure, followed by posturing movements; she was treated with anticonvulsants and tracheally intubated.

Ceftriaxone was initiated for suspected meningitis. She was transferred to a children's hospital, where she responded only to painful stimuli by flexion withdrawal. Computed tomography (CT) of the head without contrast was normal. No organisms were seen on Gram or acid-fast stains of cerebrospinal fluid (CSF); CSF antigen-detection tests were negative for *Haemophilus influenzae* type b, group B *Streptococcus*, *S. pneumoniae*, *Neisseria meningitidis*, and *Escherichia coli* K1. CSF red blood cell count (RBC) was 1800 per $mm^3$; white blood cell count (WBC), 8000 per $mm^3$; glucose, 41 mg/dL and protein, 950 mg/dL.

Fourteen hours after admission, the patient developed primary central hyperventilation and anisocoria. Head CT with contrast revealed generalized meningeal enhancement most prominent in the basilar cisterns, with mild hydrocephalus and no brain swelling. Initial bacterial cultures of blood, CSF, and urine were negative.

On the second hospital day, further history revealed that the family, including the patient, had been swimming in a freshwater pond 7 days before the patient's hospitalization. A second CSF specimen obtained 38 hours after admission was xanthochromic with 17 mg/dL glucose, 3200 mg/dL protein, 500 RBC per $mm^3$, and 2400 WBC per $mm^3$. No amebae were seen on Giemsa stain. There was no evidence of brain stem function; brain death was diagnosed on hospital day 4.

Autopsy findings revealed acute PAM caused by *N. fowleri*. Cerebral and spinal cord edema were severe. Sections of the cribriform plate revealed inflammatory infiltration of the nasal mucosa, submucosa, olfactory nerves and dura mater overlying the frontal cortex at the base of the brain.

Additional history during a postmortem conference indicated that 5 days before illness the patient had been learning to swim at the freshwater pond. She stayed primarily in shallow areas and had repeatedly inhaled and swallowed quantities of water.

### Patient 2

In September 1991, a previously healthy 4-year-old boy was admitted to a community hospital with a 3-day history of fever to 102°F (38.9°C) and headache. The child had vomited during the 2 days before admission but had remained alert and intermittently playful. On evaluation he was febrile with neck stiffness and positive Kernig's and Brudzinski's signs. CSF contained 77 mg/dL glucose and 150 mg/dL protein, with 123 RBC per $mm^3$ and 1830 WBC per $mm^3$. On admission, blood, urine, and CSF cultures were obtained; ceftriaxone was initiated intravenously. Four hours after admission, the patient had brief generalized tonic-clonic seizures. Although anticonvulsant therapy was initiated, he had another brief generalized seizure, after which he remained agitated and intermittently disoriented. He was then transferred to a university medical center.

On admission, additional history revealed that the patient swam in a grassy marsh 18 days before becoming ill. He was afebrile but he remained intermittently disoriented; respiratory distress developed shortly after admission, and a chest radiograph was consistent with aspiration pneumonitis. His respiratory status deteriorated, and he was tracheally intubated. Five hours after admission he developed anisocoria. Head CT showed massive brain swelling. Treatment included hyperventilation, placement of a ventriculostomy, and parenteral dexamethasone.

Despite these efforts, the patient continued to deteriorate. He developed fixed and dilated pupils bilaterally. Spontaneous respirations ceased, and there was no response to painful stimuli. Brain death was diagnosed. Cerebellar brain cuttings during autopsy revealed *N. fowleri* in the subarachnoid space.

Additional history indicated that the patient had been swimming in a freshwater lake 5 days before hospital admission.

**Editorial Note**: *N. fowleri* is an ameboflagellate from the family Vahlkampfiidae, whose members can transform from amebae to flagellates; either form can cause disease. Although infection with *N. fowleri* is rare, cases have been reported throughout the world (e.g., in Australia, Belgium, Czechoslovakia, Great Britain, India, Ireland, New Zealand, Nigeria, Panama, Puerto Rico, Uganda, and Venezuela). During 1991, in the United States, four patients were reported to have had fatal PAM. *N. fowleri* is most frequently isolated from natural and manmade bodies of warm fresh water. Most cases of PAM occur in previously healthy nonimmunocompromised children or young adults and have been traced to water-related activities during hot summer months.

Amebae invade the central nervous system through the cribriform plate and can be found in the subarachnoid and perivascular spaces. Disease characteristics include inflammation of the olfactory bulbs, progressing rapidly to the cerebral hemispheres, brain stem, posterior fossa, and spinal cord. Symptoms occur within 7 days of exposure, are indistinguishable from fulminant bacterial meningitis, and can include headache, fever, anorexia, vomiting, signs of meningeal inflammation, altered mental status, and coma. Signs of brain stem compression and seizures may ensue. Death typically occurs within 72 hours of onset of symptoms.

CSF findings mimic those of bacterial meningitis, with a predominantly polymorphonuclear leukocytosis and increased protein and decreased glucose concentrations. Occasionally, amebae may be seen on Gram-stained smears. Typically, however, PAM is diagnosed at autopsy. The key to diagnosis during life rests on clinical suspicion based on history. PAM should be suspected in a previously healthy patient with history of exposure to fresh, warm water within 7 days of onset of illness and who has clinical findings characteristic of bacterial meningitis and predominantly basilar distribution of exudate by head CT.

If PAM is suspected, a fresh nonrefrigerated specimen of CSF must be brought directly to the laboratory. If lumbar puncture has already been done and another cannot be performed, inspection of the high-velocity centrifuged preparation made for determination of CSF cell count may be helpful, especially if "atypical mononuclear cells" are reported; such cells actually may be amebae. Although culture of the organism on an agar slant or plate containing *E. coli* or *Enterobacter aerogenes* is possible, most laboratories are not prepared to perform such cultures. Thus, diagnosis depends on microscopic examination of CSF. CSF should be examined in wet-mount preparation as well as with fixation and staining. Dilution of 1 drop of CSF with 1 mL of distilled water will allow transformation of the organism within 1-20 hours from the ameboid to the biflagellate form. For permanently stained preparations, Masson's trichrome stain is optimal as it is generally available and readily demonstrates the amebae's typical nuclear morphology consisting of a prominent central nucleolus without any chromatin lining the nuclear membrane.

Three survivors of PAM have been documented. Successful therapy in these cases appeared related to early diagnosis and administration of intravenous and intrathecal or intraventricular amphotericin B along with intensive supportive care. One surviving patient received miconazole intravenously and intrathecally and rifampin orally.

In nearly all instances of infection in the United States, several other persons swam in the same water at the same time but did not become ill. The specific behavioral, physiologic, or anatomic risk factors for disease are unknown. More aggressive diagnosis and reporting of disease may assist in clarifying risk factors and in improving therapeutic interventions and possible strategies for prevention.

MMWR 6/26/92

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Pecan Deluxe Candy Co.
Dallas

**Mike Riley**
Pillsbury Co.
Denison

**Patrick R. Schreiber**
Klenzade, a Service of Ecolab
Garland

**Thomas L. Wright**
B & G Chemicals & Equipment Co., Inc.
Dallas

### *Virginia*

**Donald Utz**
Valley Milk Products
Strasburg

### *Washington*

**Richard Rice**
Monarch Inc.
Toppenish

### *Wisconsin*

**Jan Anderson**
Allied Processors, Inc.
Boyceville

**Doug Farmer**
Bangoft Dairy
Madison

### *Canada*

**J. Stewart Anderson**
Vancouver, British Columbia

# Industry Products

## Refrigerated Recirculators

Science/Electronics announces the addition of recirculating chillers to its line of controlled temperature products. The company, active in the controlled temperature marketplace for more than 20 years, now expands from controlled temperature baths with a versatile and reliable series of chilled circulators.

The systems, called the RRC Series, are offered in four models with refrigeration capacity from 1/4 to 1 hp in a temperature range of 0 to 40°C. Net cooling power, up to 10,300 BTU's per hour is available. The units provide circulation up to 4 gpm at 60 psi. The circulating system uses a positive displacement pump, that can be regulated from 20 to 100 psi - a front panel gauge allows the user to monitor this pressure. The equipment utilizes a hot gas bypass refrigeration system design which eliminates troublesome compressor cycling and maintains temperature stable to within ±1.0°C.

The Science/Electronics RRC units provide self-contained, efficient and dependable heat removal on a continuous recirculation basis. Used with other open or closed systems, this equipment provides a clean and reliable source of controlled temperature fluid. Analog set, digital indication along with quiet pumping and durable refrigeration - Science/Electronics recirculators are available in single phase power, 120 and 230 volt. A circuit breaker provides automatic system shutdown on power overload.

Ruggedly built, the RRC Series is designed for commercial laboratory and applications such as electronics, machining, reactors, diffusion pumps, evaporators, etc.

**Science/Electronics - Dayton, OH**

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## Antisera Products Offer More Convenient Packaging

Now Difco's wide range of more than 200 antisera products are available packaged as individual components. User convenience and cost-effectiveness are enhanced since one does not need to purchase an entire antisera set to obtain the critical single antisera desired.

Difco offers a full range of common and rare antisera for diagnostic and epidemiological purposes. It is listed in a free product guide that is available from the company.

Each product is of a high titer and is absorbed as necessary to offer clear-cut reactions. Where needed, each package comes complete with a dropper and is supplied lyophilized. Difco antisera products are available from your authorized Difco Distributor.

**Difco Laboratories - Detroit, MI**

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## Unipath New Product Announcement —Yeast and Mould Agar

Unipath is pleased to announce the release of a new medium, Yeast and Mould Agar, which enhances the Oxoid range of Dehydrated Culture Media. The medium is recommended for the isolation and maintenance of yeasts and moulds. It may be rendered selective by the addition of acid to reduce the pH of the medium to 4.0. Oxoid Yeast and Mould Agar (code CM920) is available in packs of 500 grams. A suitable acid for use in the selective media is Oxoid Sterile Lactic acid (SR21).

**Unipath Co., Oxoid Division - Ogdensburg, NY**

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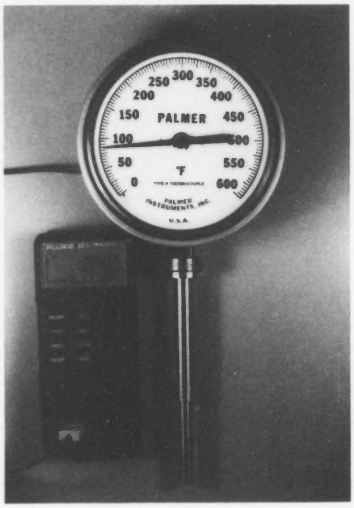


## Announcing the New Dual Sensor Dial Thermometers from Palmer Instruments, Inc.

Your customers will appreciate knowing about this new product which provides independent mechanical and electronic output from a single installation. This gives the user manual "fail safe" monitoring with continuous accuracy confirmation of the electronic control system. The user then has the opportunity to react to inaccuracy problems when they occur.

This combination of traditional instrumentation with computerized monitoring makes the Dual Sensor thermometers the choice for accurate and reliable temperature indication. The thermometer is interchangeable with existing Industrial Type thermowells thus electrical sensing is accomplished without any mechanical change in the process plumbing, saving material and labor costs.

Real time calibration checks can be performed with a calibrated hand held electronic unit. Critical temperature is maintained by mechanically setting the reset gear at one point for zero error. The factory will sentry seal the reset gear so that evidence of tampering can be detected. It is also versatile since a data logger can easily be hooked up converting the indicator into a temperature recorder.

The sensors are available in either a Platinum RTD or Type K Thermocouple, with standard mini-jack or 1/2" conduit connection with terminal block. Other options are available.

The Dual Sensor thermometer has a three year warranty.

**Palmer Instruments, Inc. - Asheville, NC**

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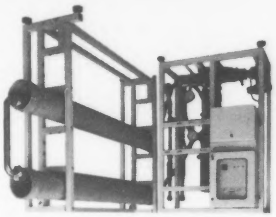

## Ionpure Introduces the Series 8400 Reverse Osmosis Systems

Ionpure Technologies Corporation has recently added its new Series 8400 Reverse Osmosis Systems to its RO product line. These systems are price competitive and designed to be rapidly installed and commissioned, with expansion capabilities if pure water needs increase. Systems require less floor space than conventional high flow RO's because of a unique two-skid design feature, with the pump and control box on one skid and the membrane housing on the other. This feature allows flexibility in the placement of either skid to accommodate customers with space limitations.

The RO 8400 systems have been designed to produce up to 52 gallons per minute (gpm) of high purity water for surface finishing, chemical and pharmaceutical processing, microelectronics, biotechnology, boiler feed, and other industrial applications. They are also ideally suited to pre-treat feed water to Ionpure's Continuous Deionization applications. Systems can house from four to twelve 8" x 40" thin film composite polyamide membrane cartridges. Control options include an integral control box, with or without conductivity monitor, or remote control by a programmable logic controller (PLC).

**Ionpure Technologies Corp. - Lowell, MA**

**Please circle No. 259 on your Reader Service Card**

## Special Interest/New Sanitation, Leak Detection Process for Plate Heat Exchangers

Immediate identification and location of faulty heat exchanger plates has the dairy and food industry talking and taking action for a good reason:

The food engineering department at Lincoln Suppliers, Inc. has developed and patented an innovative process that is unique in the detection of minute pin holes and cracks, breaches that over time occur in all plate heat exchangers.

Customers in the field at actual plant locations are amazed at the accuracy and speed in which the dye check process is able to locate the problem that they are experiencing with their heat exchangers.

Often situations are located before they become a significant problem that could possibly result in product contamination, and hence lost revenue.

Plant maintenance engineers are pleased at the cost effectiveness and speed in which the process can be performed on site at actual plant location. Less down time and reduced cost add up to increased profits in todays competitive market.

**Lincoln Suppliers, Inc. - Owatonna, MN**

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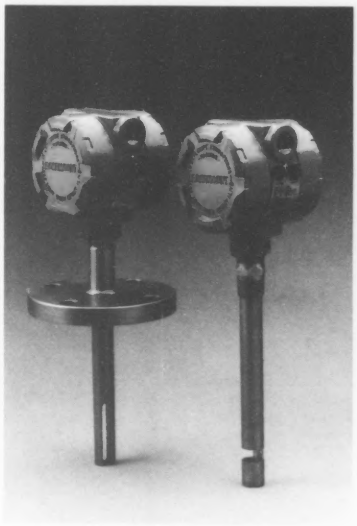

## New Sensall® Sapphire™ Liquid Level Sensing Switches

From the originator of ultrasonic level technology and the patented Gap sensor, Kay-Ray/Sensall, Inc. has introduced the new SAPPHIRE™ Series of Liquid Level Sensing Switches. SAPPHIRE Switches utilize state-of-the-art electronics, advancements in acoustical design, and a new proprietary TIME GATE™ technology to provide the most reliable and technically advanced instrument of its type.

Each SAPPHIRE Switch incorporates a unique self-test feature to continuously monitor total system integrity including electronics, sensor, and crystal bond to the sensor body without the need for electronics inside the probe.

SAPPHIRE Switches are available in either relay output or two-wire, 4-20 mA dc output models. The standard Gap sensor will perform exceptionally well in most applications, including aerated and attenuative liquids, which can be problems for other ultrasonic technologies. The optional Slot sensor provides for reliable operation in even more severe applications.

SAPPHIRE's dual-compartment housing provides quick and easy access to field connections without exposing the electronics to harsh environments or physical damage. SAPPHIRE Switches offer the most comprehensive Factory Mutual approvals of any point level ultrasonic switch available today.

By combining a simplified, more reliable sensor with the capability to verify crystal bonding, SAPPHIRE sets a new standard for dependable, trouble-free operation in the broadest possible range of critical applications.

Kay-Ray/Sensall, Inc. is a member of the Rosemount Group, which is headquartered in the Minneapolis suburb of Eden Prairie, Minnesota. The Rosemount Group is a worldwide manufacturer and marketer of high-precision measurement and analytical instrumentation, distributed control systems, and valves for the process and aerospace industries, and has sales in excess of $1 billion. The company markets its products under the Rosemount Inc., Rosemount Analytical Inc., Brooks Instrument, Micro Motion, Inc., Kay-Ray/Sensall Inc., and Xomox Corporation names.

**Kay-Ray/Sensall, Inc. - Mt. Prospect, IL**

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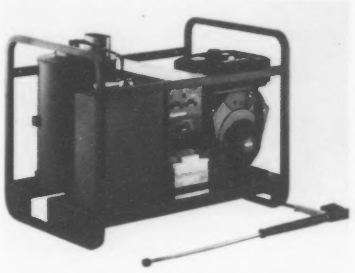

## New, Skid Mount, Cold-Hot-Steam High Pressure Washer

Kärcher introduces the HDS 1200 BE, Cold-Hot-Steam High Pressure Washer. This direct drive, skid mount unit is durably constructed and designed for applications where optimum cleaning power and gasoline independence are a must.

The HDS 1200 BE comes complete with infinitely variable operation pressure, water volume temperature control, and chemical metering. This high-performance electric-start unit features a +90% fuel efficient burner system, automatic idle down when the trigger gun is released, and low water, fuel, and oil cut off which protects the machine from damage.

The HDS 1200 BE is part of a complete line from Kärcher, the world's largest manufacturer of high pressure cleaning equipment.

**Alfred Kärcher, Inc. - West Paterson, NJ**

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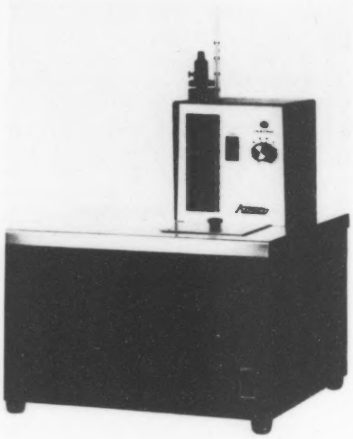

## *High Capacity Rapid Cooling Refrigerated Circulators*

Kernco Instruments Co., Inc. is pleased to introduce two new rapid cooling high capacity refrigerated circulators, Models 11W19 and 11W20. These circulators are excellent for those applications that demand samples to be cooled very rapidly. These circulators provide greater heat removal over a broad temperature range. Additionally, a modulating refrigeration control system is employed on the 11W20; this new technology delivers the appropriate amount of refrigerant for a given heat load. This refrigeration system is up to 50% more energy efficient than traditional control systems that buck refrigeration with heat.

Both circulators feature dual pumping speeds of 7 or 15 liters per minute. The digital model 11W20 features low-level liquid cutoff for additional safety. The analog bath 11W19 provides the convenience of allowing the user to preset the three temperatures that are most often used. Both have an adjustable overtemperature cutoff; the digital 11W20 also features a low liquid cutoff. Both models feature a new 2 year warranty program.

**Kernco Instruments Co., Inc. - El Paso, TX**

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## *Lee Complete Line of USDA Approved Ball Valves*

Fluid Transfer, a division of Lee Industries, Inc. offers the only complete line of USDA approved sanitary ball valves. Fluid Flow Ball Valves were specifically designed for the sanitary market. Other sanitary ball valves are basically industrial valves modified for the sanitary market through the use of body cavity fillers and sanitary end connections.

The Fluid Flow line consists of 1-1/2" through 4" flush bottom, two-way, and three-way In-line ball valves. They feature Type 316 stainless steel with Mica-Filled Teflon or Solid Teflon construction. The simple yet durable design of the valve allows fast breakdown for easy cleanup and maintenance. Standard, fully encapsulated seals provide minimum product entrapment, while full-flow ports eliminate product flow restrictions. A sanitary #4 I.D. finish is standard, while a #4 O.D. finish is offered as an option.

Lee Industries designs and manufactures an extensive line of sanitary processing equipment and systems for the food, pharmaceutical, and cosmetic industries.

**Lee Industries, Inc. - Philipsburg, PA**

**Please circle No. 264**
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## *World Dryer Announces Expansion Plans*

World Dryer Corporation, for over 40-years the industry leader in the manufacturing of warm air hand dryers for public washrooms, recently announced its expansion plans to market a full range of products specifically dedicated to hand sanitation.

"Safe food handling has become a critical concern for the foodservice industry. World's new product line will provide touchless equipment that will address hand sanitation for a wide range of applications," said Randy M. Cordova, President of World Dryer.

The signature product is the Sensamatic Washstation, a stainless steel unit that dispenses soap, water, and warm air, all without the user touching the unit. The washstation replaces traditional employee handwashing methods, and features a cycle counter to monitor the number of handwashings that take place during a given time period.

"Because foodborne illness is costing the foodservice industry billions of dollars each year, we can no longer teach employees hand sanitation and then give them unsanitary faucet handles, buttons, knobs, and levers to use," says Cordova, "touchless equipment is as necessary to food protection as healthy employees."

During 1993, World Dryer will introduce this complete line of touchless hand sanitation equipment, which will feature product and price options for every foodservice and healthcare application.

**World Dryer Corp. - Berkeley, IL**

**Please circle No. 265**
**on your Reader Service Card**

## *Munox® "Bug-in-a-Bag®"*

Osprey Biotechnics, Inc. has announced the development of a bioaugmentation system designed specifically for wastewater, treatment, pretreatment facilities, and industrial drain lines. The system utilizes MUNOX a patented bacterial inoculant which has the ability to oxidize specific problem organics.

Proven results range from specific reduction of targeted organics such as phenol, grease, oil, and priority pollutants, to more general BOD, TSS, nutrient level and odor reduction.

Developed by Osprey Biotechnics and sold through independent agents, the unique "Bug-in-a-Bag" system uses pre-measured amounts of highly concentrated freeze dried MUNOX bacteria. MUNOX culture is packaged in 55 gallon plastic dispensing bags which are folded and shipped to the end user. At point of use the MUNOX "Bug-in-a-Bag" is placed in a fifty-five gallon drum and filled completely with water. The bag quick connects to a special metering pump which automatically feeds the inoculant to the waste stream or drain line. The bag will last from one week to a month depending on the strength and flow of the waste.

MUNOX has been used successfully in such diverse wastewater treatment systems as those of our space program, military operations, food processing plants, and chemical industries.

**Osprey Biotechnics, Inc. - Sarasota, FL**

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**on your Reader Service Card**

## *Hurrisystem's Model HS800 Cleans Faster - Saves Money!*

Designed for the food service industries, the Hurriwasher HS800 is portable, making it ideal for interior and exterior restaurant cleaning. Whether it's slippery floors, grease traps, hoods, vents, rest rooms, dumpsters, drive-thrus, outdoor signs, sidewalks and eating tables ... a Hurriwasher contains its own heating coil and simply connects to your cold water source instantaneously heating that water to 190°. With 1000 PSI and 2.2 GPM of water, cleaning's a snap ... yet safe on tile, grout and prep areas. A Hurriwasher HS800 makes cleaning faster and better than the way you're cleaning now saving you thousands of dollars in cleaning costs.

**Hurrisystems Corp. - Norman, OK**

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# Affiliate News

## Upcoming IAMFES Affiliate Meetings

**1993**

**APRIL**

•**8, Nebraska Association of Milk and Food Sanitarians Annual Meeting** will be held at the Douglas County Extension Office, Omaha, NE. For more information, please contact Allen Ackerman at (402)471-0387.

•**7-9, Missouri Milk, Food and Environmental Health Association's Annual Education Conference** will be held at the Ramada Inn, Columbia, MO. For more information, please contact Janet Murray at (816)263-6643.

•**28, Ontario Food Protection Association's Spring Workshop on "Computers in the Food Industry: The Next Generation"** will be held at the Hockley Valley Resort, Hockley Valley, Ontario. For more information contact Krista Mountjoy at (416)973-1584.

**JUNE**

•**8-9, Texas Association of Milk, Food and Environmental Sanitarians Annual Meeting** will be held at the Wyndham Hotel, 4140 Governor's Row at Benwhite Exit off 1H35, Austin, TX (512)448-2222. For more information, please contact Ms. Janie F. Park, TAMFES, P. O. Box 2363, Cedar Park, TX 78613-2363, (512)4458-7281.

**JULY**

•**13-15, Basic Pasteurization Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Le Baron Hotel, 1055 Regal Row, Dallas, TX. For more information, please contact Ms. Janie F. Park, TAMFES, P. O. Box 2363, Cedar Park, TX 78613-2363, (512)4458-7281.

**AUGUST**

•**1-4, 80th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc.** to be held at the Stouffer Waverly Hotel, Atlanta, GA. For more information please contact Julie Heim at (800)369-6337 (US) or (800)284-6336 (Canada).

•**17-19, Special Problems Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Seven Oaks Hotel, 1400 Austin Hwy, San Antonio, TX. For more information, please contact Ms. Janie F. Park, TAMFES, P. O. Box 2363, Cedar Park, TX 78613-2363, (512)4458-7281.

**OCTOBER**

•**26-28, Basic Pasteurization Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Le Baron Hotel, 1055 Regal Row, Dallas, TX. For more information, please contact Ms. Janie F. Park, TAMFES, P. O. Box 2363, Cedar Park, TX 78613-2363, (512)4458-7281.

**NOVEMBER**

•**15-17, Pennsylvania Association of Dairy Sanitarians and Dairy Laboratory Analysts Fall Meeting** will be held at Penn State University, University Park, PA. For more information, conttact Mike John at (717)762-7789.

## Connecticut Association of Dairy and Food Sanitarians, Inc. Holds Annual Meeting

The Annual Meeting of the Connecticut Association of Dairy and Food Sanitarians, Inc. met at the Hawthorne Inn, Berlin, CT on January 20, 1993. After being welcomed by President Dan Donahue he introduced the speakers. Alan Nelson, Chief of the Weights and Measures Division of the CT Department of Consumer Protection spoke about metric labeling coming in 1994. He described how the labeling should be formatted and the proper form. He also spoke about the meeting of the National Conference on Weights and Measures.

The next speaker was Christopher Flick, group leader at DeKalb Plant Genetics in Mystic, CT. He described how scientists go about trying to produce new plants through biotechnology. The last speaker at the morning session was Diane Hirsch, Nutritionist from the Extension Service of the University of Connecticut. She spoke about trends in nutrition, such as low fat foods, increase use of fruits and vegetables and current thinking about ways to lose weight.

After lunch, Stew Leonard of Stew Leonards, Inc. described how his company, a food store operation, makes customers happy and keeps them coming back as customers. A question and answer period followed each speaker.

The following were elected as officers for 1993: Colleen Mears, President; David Herrington, Vice President; Donald Shields, Secretary and IAMFES Contact; Kevin Gallagher, Treasurer; Carl Dickinson, Asst. Treasurer; and Dan Donahue; Past President.

# Synopsis of Papers for the 80th Annual Meeting

*The following are abstracts of papers to be presented at the 80th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc., to be held in Atlanta, Georgia, August 1-4, 1993.*

**THE VALUE OF A DNA PROBE - HGMF PROCEDURE TO DETECT SHIGELLA/ENTEROINVASIVE E. COLI AND VTEC IN FOOD**, E. C. D. Todd*, J. MacKenzie and C. Munro, Bureau of Microbial Hazards, Health Protection Branch, Sir F. G. Banting Research Centre, Ottawa, Ontario

An enzyme-linked antibody (ELA) procedure combined with growth of organisms on HGMFs has been successfully used to isolate *E. coli* and *Salmonella* from foods. This approach has been modified to allow specific genes to be detected. Primers for the invasive plasmid gene found in *Shigella* and enteroinvasive *E. coli* (EIEC) were used to prepare a 760 bp PCR product. Libraries of 35 *Shigella* and 5 EIEC strains were grown overnight on nutrient agar, and colonial growth lysed to expose the DNA, which was hybridized with the PCR product labeled with digoxigenin from a commercial kit. Only strains known to have the invasive gene gave a positive reaction. To test the value of this procedure for food microbiology, *Shigella* and other organisms were added to 2% milk and filtered through the HGMFs. Only the *Shigella* were successfully detected on the HGMFs.

For verotoxigenic *E. coli* a 340 bp probe was generated using VT2 primers and incorporated digoxigenin-labeled dUTP directly into the PCR reaction. This probe reacted with all but one of 65 VTEC strains and cross-reacted with only one (*C. freundii*) of 217 non-VTECs. This probe was successful in detecting VTEC in hamburger meat.

**DEVELOPMENT OF A SIMPLE RT-PCR METHOD FOR THE DETECTION OF ENTERIC VIRUSES IN OYSTERS**, Lee-Ann Jaykus*, R. DeLeon, & M.D. Sobsey, Department of Environmental Sciences, CB 7400, University of North Carolina, Chapel Hill, NC 27599-7400

Enteric virus transmission due to the consumption of fecally-contaminated shellfish is a significant public health concern. Our goal was to develop methods to purify and concentrate intact virions from oyster extracts to a volume and quality compatible with RT-PCR. Virus-seeded oyster extracts processed by adsorption-elution-precipitation were further cleaned and concentrated by Freon extraction, PEG precipitation, and CTAB precipitation to reduce sample volumes to 100 ul and remove RT-PCR inhibitors. Total virus recoveries were 10% for poliovirus and 20-40% for HAV. Direct RT-PCR detection was possible at levels of 78 pfu polio and 295 pfu HAV. Thus, progress has been made in developing a rapid, sensitive, and effective method to process oysters for RT-PCR detection of enteric viruses at naturally occurring low levels.

**AUTOMATED ELISA DETECTION OF *LISTERIA* FROM MEAT AND POULTRY PRODUCTS USING THE VIDAS SYSTEM**, J.S. Bailey* and N.A. Cox, USDA, ARS, Russell Research Center, P. O. Box 5677, Athens, GA 30613

The VIDAS® automated immunoanalysis system which combines the ELISA technique with a final reading using fluoresence (ELFA) technology was used to detect the presence of *Listeria* spp. in meat and poultry products. After 48 hr in enrichment broths, samples are boiled for 15 min, loaded in the VIDAS® and automatically run in 45 min. *Listeria monocytogenes* inoculated into 25 gm of hot dogs were correctly identified in all samples with 0.2 or 2.0 cells/gm and in 2 of 5 samples with 0.02 cells/gm initial inoculum. Sixty raw processed chicken carcasses were analyzed for the presence of naturally occurring *Listeria* using the procedures of USDA. There were 27 of 60 samples with confirmed *Listeria* as identified by Fraser broth positive, MOX plate positive, CAMP test and Micro-ID *Listeria*. The VIDAS® identified 20 of these 60 samples as *Listeria* positive. The VIDAS® and other currently available ELISA tests for *Listeria* require between $10^5$ and $10^6$ *Listeria*/ml of broth, and the failure to detect the 7 positives is directly related to competitors from raw chicken suppressing the growth of *Listeria*. Improvements in enrichment techniques for raw products are needed to assure minimal growth.

**USE OF IMMUNOMAGNETIC CAPTURE ON BEADS TO RECOVER *LISTERIA* FROM ENVIRONMENTAL SAMPLES**, B.A. Mitchell, J.A. Milbury, A.M. Brookins and Barb J. Jackson*, VICAM, 29 Mystic Avenue, Somerville, MA 02145

Most methods for isolation of *Listeria* from food or environmental samples employ selective agents, which can kill injured *Listeria*. Use of selective agents can be minimized if *Listeria* are subjected to immunomagnetic isolation, by using microscopic magnetic beads. Such magnetic beads are coated with antibodies directed against the target organism, and the bound organisms are subsequently isolated in a magnetic field.

Using magnetic beads coated with antibodies directed against *Listeria*, isolation of *Listeria* from environmental samples was achieved within hours. Isolation was coupled to a second stage of *Listeria* growth and immunological characterization, resulting in a total test time of 24 hours. Immunomagnetic isolation and characterization of *Listeria* allowed their detection in 100% of the samples, at contamination levels where a standard cultural method gave detection in 36% of the samples. At lower levels of contamination,

immunomagnetic isolation allowed detection of *Listeria* in 58% of the samples, while the cultural method failed to detect *Listeria* in any samples. Because immunomagnetic isolation did not rely on enrichment, the number of *Listeria* colonies isolated was related to the original level of contamination.

**IDENTIFICATION OF THE *LISTERIA MONOCYTOGENES* VIRULENCE FACTORS INVOLVED IN THE CAMP REACTION**, Robin C. McKellar, Senior Research Scientist, Centre for Food and Animal Research, Agriculture Canada, Ottawa, Canada K1A 0C6

The synergistic hemolytic reaction between *Listeria monocytogenes* and *Staphylococcus aureus* or *Corynebacterium equi* was explored. Crude extracts of *S. aureus* sensitized sheep red blood cells (SRBC) to subsequent lysis with either *L. monocytogenes* or *C. equi*. The interaction between *L. monocytogenes* and *C. equi* apparently did not involve a presensitization step; simultaneous exposure of SRBC to the two extracts was required. Synergism was also found with *L. monocytogenes* and purified cholesterol oxidase from either *Pseudomonas fluorescens* or *Brevibacterium brevi*. Various *L. monocytogenes* mutants were tested for ability to secrete listeriolysin O (LLO) and phospholipases C (PLC), and to produce lysis of SRBC. The results suggest that the synergistic reactions with *S. aureus* and *C. equi* involve the *L. monocytogenes* PLC and LLO, respectively. A modified CAMP test, which incorporates cholesterol oxidase into sheep blood agar, is proposed for the rapid (4-6h) identification of *L. monocytogenes*.

**ENHANCED RECOVERY AND ISOLATION OF *SALMONELLA* USING A NOVEL CULTURE AND TRANSFER DEVICE**, Karl F. Eckner*, Wendy A. Dustman, Anna A. Rys-Rodriguez, Jay Myrick, and Richard B. Smittle, Silliker Laboratories Research, 1304 Halsted Street, Chicago Heights, IL 60411

A novel transfer-inoculation device for improved detection of *Salmonella* in food and environmental samples was evaluated. Samples were prepared and analyses performed according to BAM/AOAC procedures. The only modification to the standard cultural procedures was utilization of the transfer-inoculation device. A total of 504 food and environmental samples from 20 separate trials consisting of 11 foods or sample types were analyzed for *Salmonella*. Detection of *Salmonella* was improved by >43% compared to the standard BAM/AOAC cultural method without inclusion of the device. A second blind field test in a routine testing laboratory used naturally contaminated and intentionally *Salmonella*-contaminated samples. To date, a total of 226 food and environmental samples have been analyzed for *Salmonella*. Detection of *Salmonella* with the transfer-inoculation device was improved by >25% compared to the standard BAM/AOAC cultural method without inclusion of the device. Performance improvement was statistically significant ($p<0.0001$) in both set of trials. There were a total of 4 false-negative results with the transfer-inoculation device and 22 false-negative results for the standard cultural methods in the field test.

**ENZYME IMMUNOASSAY FOR THE DETECTION OF STAPHYLOCOCCAL THERMONUCLEASE IN FOODS**, Paul F. Bina*, Robert H. Deibel, Kristin A. Hedlof, William L. Rose and Raoul F. Reiser, Toxin Technology/ Deibel Labs, 7165 Curtiss Avenue, Sarasota, FL 34231

Staphylococcal thermonuclease (TNase) is an extracellular product produced by coagulase positive Staphylococci. TNase presence in foods is used as an indicator of current or previous Staph. contamination. An enzyme immunoassay (EIA) was developed to detect as little as 0.1 ng TNase per ml of food extract. The EIA uses an affinity purified rabbit anti-TNase IgG as the capture antibody. The detection antibody is an affinity purified rabbit anti TNase IgG conjugated to horseradish peroxidase. This assay was performed on a variety of food products and food products spiked with either a quantitated amount of TNase or with TNase producing Staph. The results were then compared with the traditional plate-activity method. The results indicated that not only is the EIA method more sensitive, it also has more versatility in the type of foods it can be used to screen. Results from both methods are available in less than 4 hours.

# Preview of the 80th IAMFES Annual Meeting

*The following is a preview of the papers that will be presented at the 80th IAMFES Annual Meeting, August 1-4, 1993, Atlanta, GA. Some of the titles are subject to change. A more complete program will be printed in the April Issue of Dairy, Food and Environmental Sanitation.*

## Monday Morning — August 2, 1993

### *Listeria monocytogenes*: Current Issues and Concerns Symposium

*Sponsored by the International Life Sciences Institute*

- *Listeria monocytogenes*: State of the Science
- Industry Perspectives on *Listeria monocytogenes* in Foods — American Meat Institute
- Industry Perspectives on *Listeria monocytogenes* in Foods — National Food Processors
- Industry Perspectives on *Listeria monocytogenes* in Foods — Grocery Manufacturers of America
- Regulatory Concerns of the USDA
- Regulatory Concerns of the USFDA
- Epidemiology of Listeriosis in the US
- European Perspectives on *Listeria monocytogenes*
- Status of *Listeria monocytogenes* in the Canadian Food Industry
- *Listeria monocytogenes* and Food: the UK Approach
- Australian Perspectives on *Listeria monocytogenes*

### Technical Session — Analytical Methods

- The value of a DNA probe - HGMF procedure to detect *Shigella*/enteroinvasive *E. coli* and VTEC in food
- Development of a simple RT-PCR method for the detection of enteric viruses in oysters
- Automated ELISA detection of *Listeria* from meat and poultry products using the VIDAS system
- Use of immunomagnetic capture on beads to recover *Listeria* from environmental samples
- Identification of the *Listeria monocytogenes* virulence factors involved in the CAMP reaction
- Enhanced recovery and isolation of *Salmonella* using a novel culture and transfer device
- Enzyme Immunoassay for the Detection of Staphylococcal Thermonuclease in Foods
- Occurrence of false positive tests for Staphylococcal enterotoxin using the TECRA kit
- Time/temperature response of acid phosphatase in cooked broiler breast using a fluorometric assay

### Fumonisin Symposium

- What are Fumonisins and Why are they Important in Foods?
- Toxicity of Fumonisins to Man and Animals
- Analytical Techniques for Analysis of Fumonisins
- Regulation of Fumonisin and other Mycotoxins in Foods
- How Foodborne Toxins became "Political Poisons"

### Scientific Poster Session

Authors Present 10:00 — Noon, Tuesday, August 3, 1993

- Evaluation of different media for recovery of thermally-injured *Escherichia coli* O157:H7
- Fate of Enterohemorrhagic *Escherichia coli* O157:H7 in Unpasteurized Apple Cider With and Without Preservatives
- Storage temperature and heat resistance of *Escherichia coli* O157:H7 in ground beef patties
- Growth of *Escherichia coli* O157:H7 in Ground, Roasted Beef as Affected by pH, Acidulant and Temperature
- Competitive Growth in Biofilm of *L. monocytogenes* with Cultures Isolated from a Meat Plant Environment
- Interactions of diacetate with nitrite, lactate, and pediocin on viability of *Listeria monocytogenes* in turkey slurries
- Microbial inhibition of *Listeria monocytogenes* by other bacteria in a commercial milk and a buffer broth system
- Interaction of Citric Acid Concentration and pH on the Kinetics of *Listeria monocytogenes* inactivation
- Comparative growth rates of *Listeria monocytogenes* on raw and cooked muscle tissues
- Growth of *Listeria monocytogenes* at Fluctuating Temperatures
- Comparison of methods for isolation of *Listeria* from rainbow trout (Oncorhynchus mykiss)
- Enhanced recovery and isolation of *Listeria* using a novel culture and transfer device
- Comparison of Oxygen Scavengers for Their Ability to Enhance Resuscitation of Heat-injured *Listeria monocytogenes*
- Advanced genotypic typing of *Listeria monocytogenes* using clamped homogeneous electric fields (CHEF) electrophoresis
- Determining differences in microbial growth rates using linear regression
- Acid enhancement of *Clostridium perfringens* Sporulation
- Thermal Resistance of Spores of Non-proteolytic Type B and Type E *Clostridium botulinum*
- Effect of Sodium Lactate on Toxigenesis of *Clostridium botulinum* in 'Sous Vide' Products
- Relationship of Vibrio spp. in soft clams and water with *Clostridium perfringens* and fecal indicators
- Control of thermophilic spore activity with pressurized carbon dioxide and egg white lysozyme
- Chemical changes of pre-packaged Sheephead during frozen storage
- Effects of trisodium phosphate and lactic acid on microbiological and physical quality of packaged rainbow trout
- Antimicrobial Containing Edible Films as an Inhibitory System to Control Microbial Growth on Meat Products
- The Effectiveness of the Bacteriolytic Organism, *Bdellovibrio bacteriovorus* 109J, at Reducing the Level of Gram-Negative Foodborne Pathogens
- Inhibition of *Salmonella typhimurium* by the Lactoperoxidase System in a Broth System and on Poultry
- Visualization of bioluminescent *Salmonella enteritidis* in food samples and penetration of *Salmonella enteritidis* to whole-shell eggs
- Effect of NaCl or Water Content on the Survival of *Salmonella typhimurium* on Irradiated Meat
- Attachment of *S. typhimurium* and *C. jejuni* to skins of Chicken Scalded at Various Temperatures
- Evaluation of a Nitrocellulose Membrane Lift Method for the Detection of Campylobacter spp. attached to Chicken Carcasses

- An ELISA Method for the Detection of Campylobacter in Raw and Processed Foods
- Comparison of Tecra VIA Kit with Oxoid and CHO Cell Assay for the Detection of *Bacillus cereus* diarrheal Enterotoxin
- Evaluation of Rapid Test Methods for Direct Detection of *Vibrio cholerae* 01
- Detection of coliforms in food using Colilert — An assessment of the effect of different sugars found in various foods
- Bioluminescent Method for Measuring Total Viable Counts
- Occurrence and Production of Enterotoxin Producing Strains of *Staphylococcus aureus* in Bakery Products
- Yeasts Associated with Fruit Juice Concentrates
- Use of Aerobic Plate Counts Incubated at Elevated Temperatures for Detecting Temperature-Abused Refrigerated Foods: Effectiveness under Transitory Abuse Conditions
- Assessment of previous heat treatment of beef and pork products using a dry chemistry enzyme system
- Fermentation and Sensory Characteristics of Kimchi Containing KCl as a Partial Replacement for NaCl
- Characterization of attached, psychrotropic bacteria isolated from a water distribution system
- Degradation of Ochratoxin A by Acinetobacter calcoaceticus

**Video Theatre**

All day Monday, Tuesday morning and all day Wednesday

## Monday Afternoon — August 2, 1993

**Campylobacter Update Symposium**
*Sponsored by the International Life Sciences Institute*

- *Campylobacter jejuni*: State of the Science
- *Campylobacter jejuni*: Perspectives from the International Scientific Community
- *Campylobacter jejuni*: the U. S. Government Perspective

**International Perspectives on *Escherichia coli* O157:H7 Symposium**
*Sponsored by the International Life Sciences Institute*

- *E. coli* O157:H7 Time Capsule: What Did We Know and When Did We Know It
- *E. coli* O157:H7: Perspectives from the International Scientific Community
- *E. coli* O157:H7 Outbreak in Western United States
- *E. coli* O157:H7: the U. S. Government Perspective

**Technical Session — General Food Microbiology**

- Comparison of aflatoxin production in modified Czapek's solution agar, AFPA, and dye media
- Influence of aflatoxin and nutrient concentration on the degradative ability of *Flavobacterium aurantiacum*
- Determination of cytosolic aflatoxin B1-degrading activity of *Flavobacterium aurantiacum*
- Level of Campylobacter spp. on broiler farms and after chicken transport
- Influence of season and storage on Campylobacter spp. contaminating broiler carcasses
- Incidence of *Clostridium botulinum* in Modified Atmosphere Packaged Vegetables
- Prevalence of *Salmonella* in rainbow trout (Oncorhynchus mykiss)
- Rates of adherence to stainless steel by foodborne microorganisms
- Bacteria on beef briskets and ground beef: association with slaughter volume and antemortem condemnation
- *Pseudomonas syringae* from compressed air, *Pseudomonas aeruginosa* from city water, *Bacillus* sp. in dust as contamination sources in an aseptic processing system

**Dairy Symposium**

Topics to be announced.

**Baking Equipment Standards and General Sanitation in Baking Operations Symposium**

- BISSC Overview
- Good Sanitation Through Building Design and Equipment Installation
- OSHA Regulatory Requirements
- Hazard Analysis and Critical Control Points
- Maintaining a High Standard of Sanitation through Equipment Design

## Tuesday Morning — August 3, 1993

**Microbial Concerns of the International Community Symposium**
*Sponsored by the International Life Sciences Institute*

- Microbial Safety of Foods in Europe of the Nineties: What Does That Imply?
- Microbial Concerns of the North and South American Countries and Scientific Implications for Harmonizing Free Trade
- Food Microbiological Criteria of the South American Countries
- Microbial Concerns of the Pacific Rim Countries and Scientific Implications for Harmonizing Free Trade
- Safety and Quality Management through HACCP and ISO 9000

**Technical Session — Antimicrobials**

- Activities of lactic acid bacteria isolated from ready-to-eat turkey products
- Efficacy of Using Antagonistic Microorganisms to Inhibit Psychrotrophic Pathogens in Refrigerated, Cooked Poultry
- The role of metabolic intermediates in the inhibition of *Salmonella enteritidis* by a Veillonella species
- pH and Inhibition of *Listeria monocytogenes* and other Bacteria by Acetates
- Antimicrobial Effects of Trisodium Phosphate Against Bacteria Attached to Beef Tissue
- Antilisterial Activities of Lactic Acid Salts in Sausage and the Relationship to pH and Water Activity

**Technical Session — Dairy**

- Keeping Quality of Commercially Processed Fluid Milks Held at 7.2°C (45°F) for 10, 12 and 14 days
- Control of Biofilm Bacteria in Dairy Sweet Water (Cooling

Water) Systems
- Inhibition of Gram-Positive Pathogens in Cold-Pack Cheese Made from Cheese Containing Nisin
- Antimicrobial Use and Dairy Disease Patterns
- A Rapid Dipstick Biosensor for Beta-Lactams in Milk
- Use of the pig as a model to study colonization of the gastrointestinal tract by bifidobacteria and *Lactobacillus acidophilus*

**Technical Session — Risk Assessment and Education**

- Analysis of Listeria risk management for food processors
- The Impact of Employee Food Sanitation Knowledge and Handling Practices on Supermarket Deli Profitability
- Educating Fifth Graders About Food Safety through the Use of a Video
- Reliability of Pop-up Timers in Turkeys
- Food Sanitation in the Ice Age

**Scientific Poster Session**
Authors Prersent 10:00 — Noon

## Tuesday Afternoon — August 3, 1993

**General Session — Food Safety in the News: What Needs to be Done**

- Responses to Public Issues on Food Safety
- Proactive Positions to Food Safety Concerns
- Educational Requirements to Enhance Food Safety
- Roundtable Discussion

## Wednesday Morning — August 4, 1993

**Research Update**
*Sponsored by the International Life Sciences Institute*

- *Escherichia coli* O157:H7 Diarrhea in the US: A Multi-Center Surveillance Project
- Establishment of Bovine Surveillance Program for *E. coli* O157:H7 in Washington State
- Source of *Escherichia coli* O157:H7 Establishment of a Retail Food Surveillance Project
- Insertion Sequence Fingerprinting: A New Subtyping System for *E. coli* O157:H7 Strains
- Use of In Vitro Primer-directed Enzymatic Amplication of DNA for Rapid Detection of *Listeria monocytogenes*: Studies with Food Samples
- Development of DNA Probes Specific for Virulent *Listeria* by Amplification of Virulence-Related Genes of *Listeria monocytogenes*
- Microbial Ecology of *Listeria monocytogenes* Biofilms Associated with the Food Processing Plant Environment

**Control of Bacteria and Public Health Significance in Foods of Animal Origin Symposium**

- Competitive Exclusion
- Control in Live Animals - Swine
- Control by Processing
- Control by Natural Antimicrobials-Bacteriocins
- Regulatory Concerns
- Overall Aspects and Future Applications

**Viral Foodborne Disease Symposium**

- Viral Foodborne Disease Agents of Concern
- The Epidemiology of Viral Foodborne Disease
- Norwalk Virus Gastroenteritis
- Detection Methods for Viral Agents
- Hepatitis A Foodborne Disease

**FDA Computer Data Base and Reporting Systems Symposium**

- Third Party Data Base for Drug Residue Testing in Milk
- National Drug Residue Milk Monitoring Program
- Feed Contamination and Aflatoxins Data Base Reporting
- Prime Connection
- FDA Electronic Inspection System
- Evaluation of Vitamins in Milk-Inspection and Reporting

## Wednesday Afternoon — August 4, 1993

**Economics of Foodborne Disease Symposium**

- What is Human Life Worth?
- The Costs of Foodborne Parasitic Disease
- The Costs of Foodborne Bacterial Disease
- Cost of Foodborne Disease to Industry
- Cost-Benefit Analysis of Foodborne Prevention

**Selected Topics in Food Safety Symposium**

- The Next Emerging Pathogen: Cryptosporidium
- Food Security in the Olympics
- Eating Safety — A Challenge for the Immunocompromise
- ISO 9000 — Effect on US Food Industry and Regulations
- Food Allergies
- Time Temperature Probes/Sensors for Foods

**Dairy Symposium**

- Dairy Economics/Pricing of Dairy Products/Subsidies
- Marketing Dairy Products — Bifidobacterium and other Health Aspects
- Antibiotic Residues and Extralabel Uses — a Fieldman's Perspective
- Antibiotic Residues and Extralabel Uses — a Regulatory Perspective
- Bacteriocins in Dairy Products — Potential for Improving Dairy Products

**Food Safety Research Networks Symposium**

- The Food Safety Consortium
- The Centers for Disease Control
- The USDA/ARS Group
- The Agriculture Canada network
- The Guelph Group
- Computer Networks

# 80th IAMFES Annual Meeting
# Spouse/Companion Tours and Special Events

### Atlanta — A "Peach" of a Town

*Buckhead* *Martin Luther King, Jr.* *Cyclorama* *Lenox Square*
Monday, August 2, 1993 — 9:00 a.m. - 2:30 p.m.
Cost: $22, Lunch on your own, Lenox Square ($27 on-site)

The results are in and as you probably are aware, Atlanta has been chosen to host the 1996 Olympic games in addition to being the site of the 1994 Super Bowl and the 1993 IAMFES Annual Meeting. What an outstanding opportunity to view some of the sites where the games will be held, in addition to viewing some of Atlanta's most well known attractions.

Your ride through downtown will take you to the location of the new Georgia Dome, the Omni sports complex and the massive World Congress Center. We'll then move on through Georgia State University, the State Capitol and Government complex, and Martin Luther King, Jr.'s Memorial and Birth Home as you ride down "Sweet Auburn." You'll have an opportunity to see the Inman Park area, the first garden suburb developed in the 1880's.

You will relive the Battle of Atlanta as you stop and tour the Cyclorama, an awe inspiring three dimensional diorama depicting the Battle of Atlanta during the Civil War. This is the world's largest panoramic painting measuring 50' high and 400' in circumference.

Next, you'll drive up world famous Peachtree Street where among other sights, you'll see the fabulous Fox Theatre, Colony Square and the majestic Woodruff Arts Center.

As you continue your trip, you will drive through Atlanta's elegant Northwest residential area, noted throughout the country for its breathtaking homes set amid acres of glorious greenery and spectacular landscaping. You will see the Governor's Mansion, the Atlanta History Center's Swan House plus the stunning homes of many influential and famous Atlantans.

Your destination is to the most famous shopping area on Peachtree Street — Lenox Square. 200 shops and restaurants of all varieties, including Ralph Lauren, Doris Vitton and Laura Ashley, make this shopping mall anchored by Rich's, Macy's and Neiman Marcus a favorite of Atlantans. There you can enjoy a dutch treat lunch.

### The Charm of the Old South

*Covington, Georgia*
Tuesday, August 3, 1993 — 9:00 a.m. - 3:30 p.m.
Cost: $37, including lunch ($42 on-site)

Take a trip back in time to the quiet serenity of Covington, Georgia, one of the few areas whose magnificent plantations and town homes were spared by General Sherman on his "march to the sea."

You will be greeted in Covington by a local guide who will take you down historic tree-shaded streets lined with antebellum homes.

Let your imagination soar as you visit the majestic Regency Hall, constructed before the turn of the century with 18 inch thick solid brick walls. This elegant Old South mansion is furnished with an extensive collection of fine American Empire furniture from the 1800-1840 period and Victorian and Empire Revival furniture from the 1870-1885 period. There is a marvelous collection of antiques and fine porcelain.

Sound enchanting? Wait till you see what's next as we move on to Whitehall, a 13,000 square foot antebellum home build in 1830. One of the most outstanding examples of Greek Revival architecture in Georgia, Whitehall has been beautifully renovated and furnished to reflect its original grandeur. In fact, Margaret Mitchell, author of *Gone With the Wind*, personally lobbied MGM to use Whitehall as "Twelve Oaks" in the famous movie.

You'll enjoy a delicious Southern buffet lunch amid the breathtaking splendor of the Blue Willow Inn. This antebellum home converted into a wonderful restaurant is located in Social Circle, Georgia, just five miles from Covington.

You'll be charmed by your visit to the Old South and your glimpse of days that are truly Gone With the Wind!

### Atlanta's Homegrown Hits

*CNN* *Underground Atlanta* *World of Coca-Cola*
Wednesday, August 4, 1993 — 10:00 a.m. - 4:00 p.m.
Cost: $26, Lunch on your own ($31 on-site)

Take a ride on one of Atlanta's longest escalators as you begin to experience the electricity of the world's foremost news service in action. Tour the Atlanta Headquarters of CNN and CNN Headline News, the two 24 hour all news networks that have revolutionized television journalism. You will see Ted Turner's dream blossomed into reality. See how many CNN personalities you recognize as you walk through the studios and production areas. Learn the behind-the-scenes activities that lead to the finished product you see on the air.

Next, your bus will whisk you to Underground Atlanta, the setting which bridges the past to the present for the journey into Atlanta's future. You'll enjoy touring the six city blocks which have been transformed into a spirited urban market place featuring 200,000 square feet of specialty shops, restaurants, entertainment, and push carts. Treat yourself to lunch at one of Underground's many eateries.

After lunch, encounter the past, present and future as you begin your exciting tour of the World of Coca-Cola. You will be greeted at the door by the world's most remarkable Coca-Cola sign, a revolving neon spectacular. Inside, you'll see priceless memorabilia tracing the more than 100-year history of the world's best-known consumer product. Through dazzling exhibits, you'll travel to the more than 160 countries of Coca-Cola. Enjoy a taste of timeless refreshment at a fanciful soda fountain of the future, and you'll shop in a one-of-a-kind Coca-Cola store.

## *MONDAY NIGHT SOCIAL EVENT*

### "GRANITE" — You'll Love the Stone Mountain Plantation Evening

Monday, August 2, 1993 — 6:00 p.m. - 11:30 p.m.
Cost: $35 ($40 on-site)
Children $20 ($25 on-site)

Hop on board your transit buses for your ride to one of the true wonders of the world — breathtaking Stone Mountain. As you arrive at the resort park, you'll truly be in awe at the magnificence of this 3,200 acre site of scenic beauty.

"Granite" you'll love Stone Mountain as you look up at the world's largest granite monolith with the images of Jefferson Davis, Robert E. Lee and "Stonewall" Jackson captured forever in a sculpture larger than an entire football field and carved meticulously over the years.

You will be fascinated by the typical Southern Plantation of the 1800's where your lawn party will be held. Stroll through a completely restored antebellum plantation, including the plantation house, overseer's house, cabins and outbuildings. All are completely and authentically furnished.

Then proceed to the Meadow of the Plantation where dinner will be served under a tent erected especially for our group. Your Old South Barbecue Buffet will include Fried Chicken, BBQ Pork, Brunswick Stew, Cole Slaw, Potato Salad, Baked Beans, Corn on the Cob, Rolls and Butter, Cobbler, and Iced Tea. There will be a cash bar available throughout the evening.

And if that's not enough, experience Stone Mountain's spectacular show of luminous lasers projected on the Mountain's North face. From special reserved seating, you'll delight in seeing comical characters, dramatic stories, and graphic images choreographed to popular music on this one million square foot screen.

You'll treasure the scenic beauty and pure Southern style fun of this night at Georgia's Stone Mountain Park!

### TENTATIVE BASEBALL OUTING

The Atlanta Braves will be in town on Tuesday, August 3, matched against the Philadelphia Phillies. We will try to buy a block of seats, but tickets have not gone on sale yet. Watch for more information in the upcoming issues of IAMFES's journals.

### NEW this Year!
### Children's Supervised Activities

Plans are being made this year to provide supervised activities for the children who accompany their parents to the IAMFES Annual Meeting. They are on vacation after all, right? Right! So let's make it fun for them also.

There will be a 'Get Away Room' on Monday, Tuesday and Wednesday for the children to play video games, pinball machines, watch movies, etc. Also, on Wednesday Evening, there will be a **'Kids Banquet'** for the children while the parents attend the IAMFES Annual Awards Banquet. All children's activities will be properly supervised.

Please watch for more details on these events in the upcoming issues of IAMFES' Journals.

Cost: $10 ($15 on-site)

# Traditional IAMFES Gatherings

**Ivan Parkin Lectureship**
Sunday, August 1, 1993 7:00 p.m.
Dr. Morris Potter, "The Challenge of Epidemiology in Food Protection"
Dr. Potter is the Assistant Director for Bacterial and Mycotic Diseases at the Centers for Disease Control, National Center for Infectious Diseases, Atlanta, GA

Followed by the **Cheese and Wine Reception** for the opening of the Educational Exhibits.
An opportunity to greet old friends, make new ones
and view the excellent technical displays.

**IAMFES Annual Awards Reception and Banquet**
Wednesday, August 4, 1993
Reception 6:00 p.m.
Banquet 7:00 p.m.
Cost: $30 ($35 on-site)

**Guest Room Committment**
**GOOD UNTIL JULY 1, 1993**
**Make Your Reservation Now**

# HOTEL RESERVATIONS
# IAMFES

**80th Annual Meeting**
**August 1-4, 1993**
**Stouffer Waverly Hotel**
**Atlanta, Georgia**

Please check accommodation requested:

❑ Single (1 person) ❑ Triple (3 persons)
❑ Double (2 persons) ❑ Quad (4 persons)

Bed type:

❑ King Bed
❑ 2 Queen Beds

Special Requests _____

❑ Please indicate here if you have a disability requiring special accomodations.
All room rates are subject to prevailing taxes.
Reservations must be received by hotel prior to arrival.

NAME _____

SHARING WITH (Name) _____

COMPANY NAME _____

ADDRESS _____

_____ CITY _____

STATE/PROVINCE _____ COUNTRY _____ ZIP _____

TELEPHONE _____

ARRIVAL DATE _____ (Check-In Time is after 3 p.m.) DEPARTURE DATE _____ (Check-out Time is 12 p.m.)

SPECIAL REQUESTS _____

After July 1, 1993 reservations will be accepted on a space availability basis only. Reservations will be held until 6:00 p.m. on the date of arrival, unless guaranteed by one night advance deposit, payable by certified check or a Major Credit Card.

CREDIT CARD #_____ CREDIT CARD _____

EXPIRATION DATE _____

CARD HOLDERS SIGNATURE _____

**SPECIAL ROOM RATES** for this convention $89 plus tax . . . single/double occupancy
$109 plus tax . . . triple occupancy
$129 plus tax . . . quad occupancy

For Reservations Call:
(404)953-4500
or FAX (404)953-0740

MAIL DIRECTLY TO:

STOUFFER WAVERLY HOTEL
C/O RESERVATIONS
2450 GALLERIA PARKWAY
ATLANTA, GA 30339

# 80th IAMFES Annual Meeting Registration Form

**Stouffer Waverly Hotel — Atlanta, Georgia — August 1-4, 1993**
**(Use photocopies for extra registrations)**

FOR OFFICE USE
Date Rec'd._____ First initial _____ Last name _____
ID#_____ Registration #_____

***Sign up to become a NEW member**
**and take advantage of the member discount.**

First Name (will appear on badge) (please print) Last Name

Title Employer

Mailing Address (Please specify: Home Work)

City State Zip

Fax # Area Code & Telephone

**Please check where applicable:**
- ___ IAMFES Member
- ___ Non-Member
- ___ Local Arrangements
- ___ 30 Yr. Member
- ___ 50 Yr. Member
- ___ Past President
- ___ Executive Board
- ___ Speaker
- ___ Honorary Life Member
- ___ Exhibitor

**Credit Card payments may be sent via Fax today! 515-276-8655**

| | | | Amount | # of tickets | Total Amount |
|---|---|---|---|---|---|
| **Registration** | | | | | |
| | IAMFES Member (Banquet included) | | $145 ($180 on-site) | | |
| | Non-Member (Banquet included) | | $195 ($230 on-site) | | |
| | IAMFES Student Member | | $ 20 ($ 25 on-site) | | |
| | IAMFES Member One Day (Circle: Mon/Tues/Wed) | | $ 75 ($ 95 on-site) | | |
| | Non-Member One Day (Circle: Mon/Tues/Wed) | | $100 ($125 on-site) | | |
| | Spouse/Companion (Name):_____ | | $ 20 ($ 20 on-site) | | |
| | Children (14 & Under), Name: _____ | | FREE | | |
| ***New Membership Fees:** | Membership (*Dairy, Food & Environmental Sanitation*) | | $ 50 | | |
| | Membership *Plus* (*Dairy, Food & Env. Sanitation & Journal of Food Protection*) | | $ 80 | | |
| | Student Membership ❒ *Dairy, Food & Env. San.* **or** ❒ *Journal of Food Protection* | | $ 25 | | |
| | Student Membership *Plus* (*Dairy, Food & Environmental Sanitation & Journal of Food Protection*) | | $ 40 | | |
| | **POSTAGE CHARGES: OUTSIDE THE U.S. - SURFACE RATE** | | $ 15 per journal | | |
| | **AIRMAIL** | | $ 95 per journal | | |
| **Other Fees: (Per Person)** | Cheese & Wine Reception (Sun., 8/1) | | FREE | | |
| | Stone Mountain Plantation Evening (Mon., 8/2) | Adult | $ 35 ($ 40 on-site) | | |
| | | Child | $ 20 ($ 25 on-site) | | |
| | IAMFES Awards Banquet (Wed., 8/4) | | $ 30 ($ 35 on-site) | | |
| | IAMFES Kids Banquet (Wed., 8/4) | | $ 10 ($ 15 on-site) | | |
| **Spouse/Companion Events:** | Atlanta — A "Peach" of a Town (Mon., 8/2) | | $ 22 ($ 27 on-site) | | |
| | The Charm of the Old South (Tues., 8/3) | | $ 37 ($ 42 on-site) | | |
| | Atlanta's Homegrown Hits (Wed., 8/4) | | $ 26 ($ 31 on-site) | | |

❒ Please indicate here if you have a disability requiring special accomodations.

Credit Card Payments: Please Circle: VISA/MASTERCARD/AMERICAN EXPRESS

Card #_____ Exp. Date _____

Name on Card _____ Signature _____

Total Amount Enclosed $_____
**U.S. FUNDS DRAWN ON U.S. BANK**

### Registration Information

Send payment with registration to IAMFES, 200W Merle Hay Centre, 6200 Aurora Avenue, Des Moines, IA 50322. Make checks payable to IAMFES. Pre-registration must be post-marked by July 9, 1993. The pre-registration deadline will be strictly observed. For additional information contact Julie Heim at 1-800-369-6337 (US), 1-800-284-6336 (Canada).

### Refund/Cancellation Policy

The IAMFES policy on meeting cancellation/refunds is as follows: "Registration fees, minus a $15.00 processing fee, will be refunded for written cancellations post-marked at least two (2) weeks prior to the start of the meeting. No refunds will be made for cancellations made less than two (2) weeks prior to the start of the meeting, however, the registration may be transferred to colleague with written notification to IAMFES.

### Exhibitor Information

An exhibition of products and consultant services will be at the Stouffer Waverly Hotel. For more information on exhibiting at the conference, please contact Scott Wells at 1-800-369-6337, 1-800-284-6336 (Canada).

# 1993 IAMFES Workshops

## Quality Assurance in Microbiology

Conducted by Michael H. Brodsky, Ontario Ministry of Health

July 30-31, 1993, Stouffer Waverly Hotel, Atlanta, GA

If an auditor paid a surprise visit to your laboratory, would your QA program and your practices be adequate for accreditation purposes? Are your SOP's documented? Have you been meaning to develop or introduce a QA program but "haven't found the time" or are unsure how to do it?

If any of these questions make you feel uncomfortable, uneasy or embarrassed, register for the one-and-a-half day Quality Assurance Workshop for Microbiology Laboratories and put your mind at ease.

Learn how to confidently describe the QA program operating within your laboratory and outline procedures related to specific analytical protocols. Be confident in the results generated by your laboratory and ensure that your clients will not doubt the validity of the data.

## Rapid Microbiological Methods

Conducted by Daniel Y.C. Fung, Kansas State University and James Dickson, Iowa State University

July 30-31, 1993, Stouffer Waverly Hotel, Atlanta, GA

A one-and-a-half day workshop on Rapid Microbiological Methods will be conducted under the direction of Daniel Y.C. Fung and Jim Dickson. The program will include lectures and hands-on experience on some systems. Commercial companies will be invited to demonstrate their systems and instruments in the workshop. With increasing awareness and concern about food safety, rapid methods in microbiology are essential as a first step to help monitor the microbial safety of our food supply and when problems arise these methods are needed to quickly pin-point the source of the problem so that actions can be taken. The workshop is designed for laboratory directors, food scientists, applied microbiologists and consultants. Appropriate hand-out materials will be provided for the partticipants in the workshop

**Informational Brochures will be available soon**

**Workshop Hours will be:**
Friday, July 30 - 1:00 to 5:00 p.m.
Saturday, July 31 - 8:30 a.m. to 5:00 p.m.

**Workshop Registration Fees are:**

| **Before June 1, 1993** | | **After June 1, 1993** | |
|---|---|---|---|
| Member | $195 | Member | $225 |
| Non-Member | $235 | Non-Member | $265 |

**Informational Brochures will be available soon**

For further information, please contact IAMFES at
(800)369-6337 (US), (800)284-6336 (Canada), FAX (515)276-8655

# REGISTRATION FORM

## ❑ Rapid Microbiological Methods Workshop
## ❑ Quality Assurance in Microbiology Workshop

**Stouffer Waverly Hotel — Atlanta, GA — July 30-31, 1993**

**First Name** (will appear on badge) (please print) **Last** _____

**Title** _____ **Employer** _____

**Mailing Address (Please specify: Home Work)** _____

**City** _____ **State/Province** _____ **ZIP/Postal Code** _____

**Area Code & Telephone #** _____ **FAX #** _____

**Charge Card Payments: VISA/MASTERCARD/AMERICAN EXPRESS**

**Account #** _____

**Name on Card:** _____

**REGISTRATION:**

| | Before 6/1/93 | After 6/1/93 |
|---|---|---|
| **IAMFES Member** | **$195** | **$225** |
| **Non-Member** | **$235** | **$265** |

**TOTAL AMOUNT ENCLOSED:** $ _____
US FUNDS on US BANK

**Limited Seating—RESERVE NOW. (Subject to cancellation)**

**Exp. Date** _____

**Signature:** _____

# IAMFES Audio Visuals Library

### A Free IAMFES Members Benefit

## DAIRY

❑ **The BST Debate: Biotechnology and the Dairy Case** - (13 minute videotape). Provides retail grocers with an overview of bovine somatotropin or BST...a biotechnology product now being used to enhance the efficiency of milk production in cows. This video report focuses on how BST fits into the overall biotechnology picture, what possibilities it is likely to present at the retail level, and offers some specific tactics retailers can use in addressing questions shoppers may have on BST. (Monsanto Agricultural Company)

❑ **Babcock Method for Determination of Butterfat in Raw Milk** - A videotape report that describes the purposes, procedures and refinements of The Babcock Method for determining fat content in raw milk. Revised test procedures are presented which will result in greater accuracy and reproducibility. Viewing is recommended by anyone in public health or the dairy industry who uses the Babcock test. (Ozark Film & Video Production, Inc.)

❑ **The Bulk Milk Hauler: Protocol & Procedures** - (8 minute videotape). Teaches bulk milk haulers how they contribute to quality milk production. Special emphasis is given to the hauler's role in proper milk sampling, sample care procedures, and understanding test results. (Iowa State University Extension)

❑ **Causes of Milkfat Test Variations and Depressions** - (140 slides-tape-script-30 minutes). This set illustrates the many factors involved in causing milkfat test variations or depressions in your herd, including feeding, management, stage of lactation, age of samples, handling of samples, and testing procedures. The script was reviewed by field staff, nutritionists, laboratory personnel and county extension staff. It is directed to farmers, youth and allied industry. (Penn State-1982)

❑ **Controlling Volumes and Fat Losses** - (110 slides-tape-script-30 minutes). Keeping milk volume and product loss from farm to supermarket of fluid dairy products is discussed. This set was done with the cooperation of the dairy industry who reviewed the script and provided opportunities to take pictures. It is designed to be used by milk plants for their processing personnel, regulatory representatives, field staff and milk haulers. (Penn State-1982)

❑ **Ether Extraction Method for Determination of Raw Milk** - (26 minute video). Describes the ether extraction procedure to measure milkfat in dairy products. Included is an explanation of the chemical reagents used in each step of the process. (CA-1990)

❑ **The Farm Bulk Milk Hauler** - (135 slides-tape-script-30 minutes). This set covers the complete procedure for sampling and collecting milk from farms. Each step is shown as it starts with the hauler entering the farm lane and ends when he leaves the milk house. Emphasis is on universal sampling and automated testing. Funds to develop this set were provided by The Federal Order #36 Milk Market Administrator. (Penn State-1982)

❑ **Frozen Dairy Products** - (27 minute videotape). Developed by the California Department of Food and Agriculture. Although it mentions the importance of frozen desserts, safety and checking ingredients; emphasis is on what to look for in a plant inspection. Everything from receiving, through processing and cleaning and sanitizing is outlined, concluded with a quality control program. Directed to plant workers and supervisors, it shows you what should be done. (CA-1987)

❑ **The Gerber Butterfat Test** - (7 minute video). Describes the Gerber milkfat test procedure for dairy products and compares it to the Babcock test procedure. (CA-1990)

❑ **High-Temperature, Short-Time Pasteurizer** - (59 minute videotape). Provided by the Dairy Division of Borden, Inc. It was developed to train pasteurizer operators and is well done. There are seven sections with the first covering the twelve components of a pasteurizer and the purpose and operation of each. The tape provides the opportunity for discussion after each section or continuous running of the videotape. Flow diagrams, processing and cleaning are covered. (Borden, Inc., 59-min.-1986)

❑ **The How and Why of Dairy Farm Inspections** - (110 slides-tape-script-15 minutes). This was developed at the request of seven northeast dairy cooperatives and with their financial support. Emphasis is on clean cows, facilities and equipment and following proper procedures. Regulatory agencies cooperated in reviewing the script and taking pictures. This was developed for farmers, youth and allied industry. (Penn State-1984)

❑ **Milk Plant Sanitation: Chemical Solution** - (13 minute video). This explains the proper procedure required of laboratory or plant personnel when performing chemical titration in a dairy plant. Five major titration are reviewed ... alkaline wash, presence of chlorine and iodophor, and caustic wash and an acid wash in a HTST system. Emphasis is also placed on record keeping and employee safety.

❑ **Milk Processing Plant Inspection Procedures** - (15 minute videotape). Developed by the California Department of Food and Agriculture. It covers pre and post inspection meeting with management, but emphasis is on inspection of all manual and cleaned in place equipment in the receiving, processing and filling rooms. CIP systems are checked along with recording charts and employee locker and restrooms. Recommended for showing to plant workers and supervisors. (CA-1986)

❑ **Pasteurizer: Design and Regulation** - (15 1/2 minute videotape). This tape provides a summary of the public health reasons for pasteurization and a nonlegal definition of pasteurization. The components of an HTST pasteurizer, elements of design, flow-through diagram and legal controls are discussed.

❑ **Pasteurizer Operation** - (10 1/2 minute videotape). This tape provides a summary of the operation of an HTST pasteurizer from start-up with hot water sanitization to product pasteurization and shut-down. There is an emphasis on the legal documentation required.

❑ **Processing Fluid Milk** - (140 slides-script-tape-30 minutes). It was developed to train processing plant personnel on preventing food poisoning and spoilage bacteria in fluid dairy products. Emphasis is on processing procedures to meet federal regulations and standards. Processing procedures, pasteurization times and temperatures, purposes of equipment, composition standards, and cleaning and sanitizing are covered. Primary emphasis is on facilities such as drains and floors, and filling equipment to prevent post-pasteurization contamination with spoilage or food poisoning bacteria. It was reviewed by many industry plant operators and regulatory agents and is directed to plant workers and management. (Penn State-1987)

❑ **Producing Milk of Good Quality and Flavor** - (114 slides-tape-script-25 minutes). The steps and corrective measures necessary to produce quality milk with good flavor are outlined. It is directed at dairy farmers, field staff, milk haulers and youth. (Penn State-1982)

❑ **Safe Milk Hauling - You're the Key** - (34 minute videotape). Recommended for anyone who samples, measures and collects milk from dairy farms. The purpose of this tape is to acquaint milk handlers with the proper procedures for sampling and picking up milk at the farm and delivering it safely to the handling plant. This tape provides an excellent review for experienced milk haulers and shows step-by-step procedures for novice milk haulers. (Cornell University)

❑ **3-A Symbol Council** - (8 minutes). A video which was developed to make people in the dairy and food industries aware of the 3-A program and its objectives.

## FOOD

❑ **BISSC - A Sign of Our Times** - (50 slides-script-tape). The presentation was prepared by the Baking Industry Sanitary Standards Committee. The purpose of BISSC, formed in 1949 by six of the national organizations serving the baking industry, is to develop and publish voluntary standards for the design and construction of bakery equipment. Those Standards are now recognized as the definitive sanitation standards for equipment used in the baking industry.

❑ **Close Encounters of the Bird Kind** - (18 minute videotape). A humorous but in-depth look at Salmonella bacteria, their sources, and their role in foodborne disease. A modern poultry processing plant is visited, and the primary processing steps and equipment are examined. Potential sources of Salmonella contamination are identified at the different stages of production along with the control techniques that are employed to insure safe poultry products. (Topek Products, Inc.)

❑ **Food Irradiation** - (30 minutes). Introduces viewers to food irradiation as a new preservation technique. Illustrates how food irradiation can be used to prevent spoilage by microorganisms, destruction by insects, overripening, and to reduce the need for chemical food additives. The food irradiation process is explained and benefits of the process are highlighted. (Turnelle Productions, Inc.)

❑ **Food Quality, Food Safety, and You!** - (80 slides, script, and cassette tape). This is an educational program designed for consumers. The presentation deals with the role of the consumer in maintaining the freshness, quality and safety of food in the home. It is intended for use by home economists, dieticians, cooperative extension agents and others interested in food quality and safety. (Cornell University)

❑ **Food Safe - Series I** - (4-10 minute videos). (1) "Receiving & Storing Food Safely", details for food service workers the procedures for performing sight inspections for the general conditions of food, including a discussion of food labeling and government approval stamps. (2) "Foodservice Facilities and Equipment", outlines the requirements for the proper cleaning and sanitizing of equipment used in food preparation areas. Describes the type of materials, design, and proper maintenance of this equipment. (3) "Microbiology for Foodservice Workers", provides a basic understanding of the micro-organisms which cause food spoilage and foodborne illness. This program describes bacteria, viruses, protozoa, and parasites and the conditions which support their growth. (4) "Foodservice Housekeeping and Pest Control", emphasizes cleanliness as the basis for all pest control. Viewers learn the habits and life cycles of flies, cockroaches, rats, and mice. (Perennial Education)

❑ **Food Safe - Series II** - (4-10 minute videos). Presents case histories of foodborne disease involving (1) *Staphylococcus aureus*, (sauces) (2) *Salmonella*, (eggs) (3) *Campylobacter*, and (4) *Clostridium botulinum*. Each tape demonstrates errors in preparation, holding, or serving food; describes the consequences of those actions; reviews the procedures to reveal the cause of the illness; and illustrates the correct practices in a step-by-step demonstration. These are excellent tapes to use in conjunction with hazard analysis critical control point training programs. (Perennial Education)

❑ **Food Safe - Series III** - (4-10 minute videos). More case histories of foodborne disease. This set includes (1) Hepatitis "A", (2) Staphylococcus Aureus (meats), (3) Bacillus Cereus, and (4) Salmonella (meat). Viewers will learn typical errors in the preparation, holding and serving of food. Also included are examples of correct procedures which will reduce the risk of food contamination. (Perennial Education)

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

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

❑ **HACCP: Safe Food Handling Techniques** - (22 minute videotape). The video highlights the primary causes of food poisoning and emphasizes the importance of self-inspection. An explanation of potentially hazardous foods, cross contamination, and temperature control is provided. The main focus is a detailed description of how to implement a Hazard Analysis Critical Control Point (HACCP) program in a foodservice operation. A leader's guide is provided as an adjunct to the tape. (The Canadian Restaurant & Foodservices Association)

❑ **Is What You Order What You Get? Seafood Integrity** - (18 minute videotape). Teaches seafood department employees about seafood safety and how they can help insure the integrity of seafood sold by retail food markets. Key points of interest are cross-contamination control, methods and criteria for receiving seafood and determining product quality, and knowing how to identify fish and seafood when unapproved substitutions have been made. (The Food Marketing Institute)

❑ **Northern Delight - From Canada to the World** - A promotional video that explores the wide variety of foods and beverages produced by the Canadian food industry. General in nature, this tape presents an overview of Canada's food industry and its contribution to the world's food supply. (Ternelle Production, Ltd.)

❑ **Proper Handling of Paracidic Acid** - (15 minute videotape). Introduces paracidic acid as a chemical sanitizer and features the various precautions needed to use the product safely in the food industry.

❑ **Purely Coincidental** - (20 minute video). A parody that shows how foodborne illness can adversely affect the lives of families that are involved. The movie compares improper handling of dog food in a manufacturing plant that causes the death of a family pet with improper handling of human food in a manufacturing plant that causes a child to become ill. Both cases illustrate how handling errors in food production can produce devastating outcomes. (The Quaker Oats Company)

❑ **On the Front Tine** - (18 minute video). A training video pertaining to sanitation fundamentals for vending service personnel. Standard cleaning and serving procedures for cold food, hot beverage and cup drink vending machines are presented. The video emphasizes specific cleaning and serving practices which are important to food and beverage vending operations. (National Automatic Merchandising Association)

❑ **On the Line** - (30 minute VHS videocassette). This was developed by the Food Processors Institute for training food processing plant employees. It creates an awareness of quality control and regulations. Emphasis is on personal hygiene, equipment cleanliness and good housekeeping in a food plant. It is recommended for showing to both new and experienced workers.

❑ **100 Degrees of Doom ... The Time and Temperature Caper** - (14 minute videotape). Video portraying a private eye tracking down the cause of a salmonella poisoning. Temperature control is emphasized as a key factor in preventing foodborne illness. (Educational Communications, Inc.)

❑ **Pest Control in Seafood Processing Plants** - (26 minute videotape). Videotape which covers procedures to control flies, roaches, mice, rats and other common pests associated with food processing operations. The tape will familiarize plant personnel with the basic characteristics of these pests and the potential hazards associated with their presence in food operations.

❑ **Product Safety and Shelf Life** - (40 minute videotape). Developed by Borden Inc., this videotape was done in three sections with opportunity for review. Emphasis is on providing consumers with good products. One section covers off-flavors, another product problems caused by plant conditions, and a third the need to keep products cold and fresh. Procedures to assure this are outlined, as shown in a plant. Well done and directed to plant workers and supervisors. (Borden-1987)

❑ **Safe Food: You Can Make a Difference** - (25 minute videotape). A training video for foodservice workers which covers the fundamentals of food safety. An explanation of proper food temperature, food storage, cross contamination control, cleaning and sanitizing, and handwashing as methods of foodborne illness control is provided. The video provides an orientation to food safety for professional food handlers. (Tacoma-Pierce County Health Department)

❑ **Safe Handwashing** - (15 minute videotape). Twenty-five percent of all foodborne illnesses are traced to improper handwashing. The problem is not just that handwashing is not done, the problem is that it's not done properly. This training video demonstrates the "double wash" technique developed by Dr. O. Peter Snyder of the Hospitality Institute for Technology and Management. Dr. Snyder demonstrates the procedure while reinforcing the microbiological reasons for keeping hands clean. (Hospitality Institute for Technology and Management)

❑ **Sanitation for Seafood Processing Personnel** - A training video suited for professional food handlers working in any type of food manufacturing plant. The film highlights Good Manufacturing Practices and their role in assuring food safety. The professional food handler is introduced to a variety of sanitation topics including: 1) food handlers as a source of food contamination, 2) personal hygiene as a means of preventing food contamination, 3) approved food storage techniques including safe storage temperatures, 4) sources of cross contamination, 5) contamination of food by insects and rodents, 6) garbage handling and pest control, and 7) design and location of equipment and physical facilities to facilitate cleaning.

❑ **Sanitizing for Safety** - (17 minute video). Provides an introduction to basic food safety for professional food handlers. A training pamphlet and quiz accompany the tape. Although produced by a chemical supplier, the tape contains minimal commercialism and may be a valuable tool for training new employees in the food industry. (Indiana -1990)

❑ **Seafood Q & A** - (20 minute VHS). Anyone who handles seafood, from processor to distributor to retail and foodservice, must be prepared to answer questions posed by customers. This tape features a renowned nutritionist and experts from the Food & Drug Administration, the National Marine Fisheries Service, and the National Fisheries Institute who answer a full range of questions about seafood safety. Excellent to educate and train employees about seafood safety & nutrition. (National Fisheries Institute)

❑ **SERVSAFE® Serving Safe Food** - (Four videotapes). This video series illustrates and reinforces important food safety practices in an informative and entertaining manner. The material is presented in an easy to understand format, making it simpler for employees to learn and remember this essential information. Each video includes a leader's guide that provides all the information managers need to direct a productive training session.

❑ **Supermarket Sanitation Program - "Cleaning and Sanitizing"** - (12.5 minute videotape). Contains a full range of cleaning and sanitizing information with minimal emphasis on product. Designed as a basic training program for supermarket managers and employees.

❑ **Supermarket Sanitation Program - "Food Safety"** - (10.5 minute videotape). Contains a full range of basic sanitation information with minimal emphasis on product. Filmed in a supermarket, the video is designed as a basic program for manager training and a program to be used by managers to train employees.

❑ **Wide World of Food Service Brushes** - An 18 minute video tape that discusses the importance of cleaning and sanitizing as a means to prevent and control foodborne illness. Special emphasis is given to proper cleaning and sanitizing procedures and the importance of having properly designed and constructed equipment (brushes) for food preparation and equipment cleaning operations.

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

## ENVIRONMENTAL

❑ **The ABC's of Clean - A Handwashing & Cleanliness Program for Early Childhood Programs** - For early childhood program employees. This tape illustrates how proper handwashing and clean hands can contribute to the infection control program in daycare centers and other early childhood programs. (The Soap & Detergent Ass'n.)

❑ **Acceptable Risks?** - (16 minute VHS). Accidents, deliberate misinformation, and the rapid proliferation of nuclear power plants have created increased fears of improper nuclear waste disposal, accidents during the transportation of waste, and the release of radioactive effluents from plants. The program shows the occurrence of statistically anomalous leukemia clusters; governmental testing of marine organisms and how they absorb radiation; charts the kinds and amounts of natural and man-made radiation to which man is subject; and suggests there is no easy solution to balancing our fears to nuclear power and our need for it. (Films for the Humanitites & Sciences, Inc.)

❑ **Air Pollution: Indoor** - (26 minute VHS). Indoor air pollution is in many ways a self-induced problem ... which makes it no easier to solve. Painting and other home improvements have introduced pollutants, thermal insulation and other energy-saving and water-proofing devices have trapped the pollutants inside. The result is that air pollution inside a modern home can be worse than inside a chemical plant. (Films for the Humanities & Sciences, Inc.)

❑ **Asbestos Awareness** - (20 minute videotape). This videotape discusses the major types of asbestos and their current and past uses. Emphasis is given to the health risks associated with asbestos exposure and approved asbestos removal abatement techniques (Industrial Training, Inc.)

❑ **Down in the Dumps** - (26 minute VHS). Garbage is no laughing matter. The fact is that we are running out of space to dump the vast amounts of waste we create each day. Since many of the former methods of disposal are environmentally unacceptable, what are we to do? The program examines the technological approaches to the garbage dilemma, including composting, resource recovery, and high-tech incinerators, and public reaction to the creation of new waste treatment facilities. (Films for the Humanities & Sciences, Inc.)

❑ **EPA Test Methods for Freshwater Effluent Toxicity Tests (using Ceriodaphnia)** - (22 minute tape). Demonstrates the Ceriodaphnia 7-Day Survival and Reproduction Toxicity Test and how it is used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity. The tape covers the general procedures for the test including how it is set up, started, monitored, renewed and terminated.

❑ **EPA Test Methods for Freshwater Effluent Toxicity Tests (using Fathead Minnow Larva)** - (15 minute tape). A training tape that teaches environmental professionals about the Fathead Minnow Larval Survival and Growth Toxicity Test. The method described is found in an EPA document entitled, "Short Term Methods for Estimating the Chronic Toxicity of Effluents & Receiving Waters to Freshwater Organisms." The tape demonstrates how fathead minnow toxicity tests can be used to monitor and evaluate effluents for their toxicity to biota and their impact on receiving waters and the establishment of NPDES permit limitations for toxicity.

❑ **Fit to Drink** - (20 minute VHS). This program traces the water cycle, beginning with the collection of rain water in rivers and lakes, in great detail through a water treatment plant, to some of the places where water is used, and finally back into the atmosphere. Treatment of the water begins with the use of chlorine to destroy organisms; the water is then filtered through various sedimentation tanks to remove solid matter. Other treatments employ ozone, which oxidizes contaminants and makes them easier to remove; hydrated lime, which reduces the acidity of the water; sulfur dioxide, which removes any excess chlorine; and flocculation, a process in which aluminum sulfate causes small particles to clump together and precipitate out. Throughout various stages of purification, the water is continuously tested for smell, taste, titration, and by fish. The treatment plant also monitors less common contaminants with the use of up-to-date techniques like flame spectrometers and gas liquefaction. (Films for the Humanities & Sciences, Inc.)

❑ **Foodservice Disposables: Should I Feel Guilty?** - (11 1/2 minute videotape). The video, produced by the Foodservice & Packaging Institute, Inc., national trade association of manufacturers and suppliers of single service articles for foodservice and packaging, examines such issues as litter, solid waste, recycling, composting and protection of the earth's ozone layer, makes for an excellent discussion opener on the theme of conservation of natural resources (trees, fresh water and energy) and the environmental trade-offs (convenience, sanitation and family health) that source reduction necessarily entails. (Foodservice & Packaging Institute, Inc.)

❑ **Garbage: The Movie** - (24 1/2 minute videotape). A fascinating look at the solid waste problem and its impact on the environment. Viewers are introduced to landfills, incinerators, recycling plants and composting operations as solid waste management solutions. Problems associated with modern landfills are identified and low-impact alternatives such as recycling, reuse, and source reduction are examined. (Churchill Films)

❑ **Global Warming: Hot Times Ahead?** - (23 minute videotape). An informative video tape program that explores the global warming phenomenon and some of the devastating changes it may cause. This program identifies greenhouse gases and how they are produced by human activities. Considered are: energy use in transportation, industry and home; effects of deforestation, planting of trees and recycling as means of slowing the build-up of greenhouse gases. (Churchill Films)

❑ **Kentucky Public Swimming Pool and Bathing Facilities** - (38 minute videotape). It was developed by the Lincoln Trail District Health Department in Kentucky and includes all of their state regulations which may be different from other states, provinces and countries. It was very well done and could be used to train those responsible for operating pools and waterfront bath facilities. All aspects are included of which we are aware, including checking water conditions and filtration methods. (1987)

❑ **Putting Aside Pesticides** - (26 minute VHS). This program probes the long-term effects of pesticides and explores alternative pest-control efforts; biological pesticides, genetically-engineered microbes that kill objectionable insects, the use of natural insect predators, and the cross-breeding and genetic engineering of new plant strains that produce their own anti-pest toxins. (Films for the Humanities & Sciences, Inc.)

❑ **Radon** - (26 minute VHS). This program looks at the possible health implications of radon pollution, methods homeowners can use to detect radon gas in their homes, and what can be done to minimize hazards once they are found.

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

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

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

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

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

❑ **Tape 4 - Emergency Preparedness and Community Right-To-Know** - (48 minutes). A major part of SARA is a free-standing act known as Title III: The Emergency Planning and Community Right-To-Know Act of 1986, requiring federal, state, and local governments and industry to work together in developing local emergency preparedness/response plans. This program discusses local emergency planning committee requirements, emergency notification procedures, and specifications on community right-to-know reporting requirements, such as using OSHA Material Safety Data Sheets, the emergency & hazardous chemical inventory and the toxic chemical release inventory.

❑ **Tape 5 - Underground Storage Tank Trust Fund and Response Program** - (21 minutes). Another addition to SARA is the Leaking Underground Storage Tank (LUST)Trust Fund. One half of the U.S. population depends on ground water for drinking -- and EPA estimates that as many as 200,000 underground storage tanks are corroding and leaking into our ground water. This program discusses how the LUST Trust Fund will be used by EPA and the states in responding quickly to contain and clean-up LUST releases. Also covered is state enforcement and action requirements, and owner/operator responsibility.

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

❑ **Sink A Germ** - (10 minute videotape). A presentation on the rationale and techniques for effective handwashing in health care institutions. Uses strong imagery to educate hospital personnel that handwashing is the single most important means of preventing the spread of infection. (The Brevis Corp.)

❑ **Waste Not: Reducing Hazardous Waste** - (35 minute VHS). This tape looks at the progress and promise of efforts to reduce the generation of hazardous waste at the source. In a series of company profiles, it shows activities and programs within industry to minimize hazardous waste in the production process. Waste Not also looks at the obstacles to waste reduction, both within and outside of industry, and considers how society might further encourage the adoption of pollution prevention, rather than pollution control, as the primary approach to the problems posed by hazardous waste. (Umbrella films)

## OTHER

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

❑ **Eating Defensively: Food Safety Advice for Persons with Aids** - (14 1/2 minute videotape). While HIV infection and AIDS are not acquired by eating foods or drinking liquids, persons infected with the AIDS virus need to be concerned about what they eat. Foods can transmit bacteria and viruses capable of causing life-threatening illness to persons infected with AIDS. This video provides information for persons with AIDS on what foods to avoid and how to better handle and prepare foods. (FDA/CDC)

❑ **Legal Aspects of the Tampering Case** - (about a 25-minute, 1/2" videocassette). This was presented by Mr. James T. O'Reilly, University of Cincinnati School of Law at the fall 1986 Central States Association of Food and Drug Officials Conference. He emphasizes three factors from his police and legal experience - know your case, nail your case on the perpetrator, and spread the word. He outlines specifics under each factor. This should be of the greatest interest to regulatory sanitarians, in federal, state and local agencies. (1987)

❑ **Personal Hygiene & Sanitation for Food Processing Employees** - (15 minute videotape). Illustrates and describes the importance of good personal hygiene and sanitary practices for people working in a food processing plant.

❑ **Psychiatric Aspects of Product Tampering** - (about a 25 minute, 1/2" videocassette). This was presented by Emanuel Tanay, M.D. from Detroit, at the fall 1986 conference of CSAFDA. He reviewed a few cases and then indicated that abnormal behavior is like a contagious disease. Media stories lead to up to 1,000 similar alleged cases, nearly all of which are false. Tamper proof packaging and recalls are essential. Tampering and poisoning are characterized by variable motivation, fraud and greed. Law enforcement agencies have the final responsibilities. Tamper proof containers are not the ultimate answer. (1987)

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

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

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# Business Exchange "Classifieds"

## Services / Products



## Equipment For Sale

# Coming Events

1993

## April

•7-9, **Missouri Milk, Food and Environmental Health Association's Annual Education Conference** will be held at the Ramada Inn, Columbia, MO. For more information contact Janet Murray at (816)263-6643.

•8, **Current Changes in Food Policy and Regulations: Their Impact on the Food and Dairy Industry,** sponsored by the Nebraska Association of Milk and Food Sanitarians, will be held at the Douglas County Extension Office, Omaha, NE. For more information, please contact Fred Cook at (402)595-7822.

•14-15, **Food Micro '93**, sponsored by the Food Processors Institute (FPI), will be held at the Hyatt Regency-Crystal City, Arlington, VA. For more information contact Rita Fullem, FIP's executive director, at (202)639-5944.

•19-22, **Purdue Better Process Control School** to be held at Purdue University. For more information contact James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907, (317)494-8279.

•20-22, **NIR Spectroscopy,** offered by the American Association of Cereal Chemists, will be held in Chicago, IL. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121-2097, USA. Telephone (612)454-7250; FAX (612)454-0766.

•28, **"Computers and Automation in the Food Industry: The Next Generation",** a seminar/workshop sponsored by the Ontario Food Protection Association (OFPA) will be held at the Hockley Valley Resort, Toronto, Ontario. For further information please contact Andrew Cavasin at (416)680-4730 or Krista Mountjoy at (416)973-1584.

## May

•2-7, **National Conference on Interstate Milk Shipments 1993 Meeting** will be held at the Sheraton Central Park Hotel, Arlington, TX. For more information contact Leon Townsend, Executive Secretary/Treasurer, National Conference on Interstate Milk Shipments, 110 Tecumseh Trail, Frankfort, KY 40601, telephone and/or FAX (502)695-0253.

•6-12, **INTERPACK 93, 13th International Trade Fair for Packaging Machinery, Packaging Materials and Confectionery Machinery**, will be held at the fairgrounds in Dusseldorf, Germany. For further information on exhibiting at or attending INTERPACK 93, contact Dusseldorf Trade Shows, Inc., 150 North Michigan Avenue, Suite 2920, Chicago, IL 60601,(312)781-5180; FAX (312)781-5188.

•17-20, **Purdue Aseptic Processing and Packaging Workshop** to be held at Purdue University. For more information contact James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907, (317)494-8279.

•26-28, **National Conference on Health Education and Health Promotion** will be held in Atlanta, GA. For more information regarding submitting an abstract or on the conference, please contact Lydia Pendley, Health Promotion Bureau/PHD/DOH, 1190 St. Francis Drive, P.O. Box 26110, Santa Fe, NM 87502.

## June

•8-9, **Texas Association of Milk, Food and Environmental Sanitarians Annual Meeting** will be held at the Wyndham Hotel, 4140 Governor's Row at Benwhite Exit off IH35, Austin, TX (512)448-2222. For more information, please contact Ms. Janie F. Park, TAMFES, P. O. Box 2363, Cedar Park, TX 78613-2363, (512)4458-7281.

•15-17, **Low Calorie Food Product Development (with IFT & CFDRA),** offered by the American Association of Cereal Chemists, will be held in Chipping, Campden, England. For more information, contact Marie McHenry, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121-2097, USA. Telephone (612)454-7250; FAX (612)454-0766.

•20-23, Joint International Summer Meeting of **The American Society of Agricultural Engineers and The Canadian Society of Agricultural Engineering** to be held in Spokane, WA. For more information contact The American Society of Agricultural Engineers, 2950 Niles Road, St. Joseph, MI 49085-9659, (616)429-0300; FAX (616)429-3852.

## July

•13-15, **Basic Pasteurization Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Le Baron Hotel, 1055 Regal Row, Dallas, TX. For more information, please contact Ms. Janie F. Park, TAMFES, P. O. Box 2363, Cedar Park, TX 78613-2363, (512)4458-7281.

•16-23, **Rapid Methods and Automation in Microbiology: International Workshop XIII** to be held at the Kansas State University, Manhattan, KS. For more information contact Dr. Daniel Y. C. Fung, Workshop Director, telephone (913)532-5654, FAX (913)532-5681. A mini--symposium will occur on July 16-17.

## August

•1-4, **80th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc.** to be held at the Stouffer Waverly Hotel, Atlanta, GA. For more information please contact Julie Heim at (800)369-6337 (US) or (800)284-6336 (Canada).

•**10-11, Mini Workshop on the Management of Refrigerated and Frozen Foods in the Distribution System**, sponsored by Purdue, Michigan State and Ohio State Universities, will be held at the Hilton Inn at the Airport, Indianapolis, IN. For program information please contact James V. Chambers, Purdue University, at (317)494-8279, William C. Haines, Michigan State University, at (517)355-2176 or Winston D. Bash, Ohio State University at (614)292-7004.

•**17-19, Special Problems Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Seven Oaks Hotel, 1400 Austin Hwy, San Antonio, TX. For more information, please contact Ms. Janie F. Park, TAMFES, P. O. Box 2363, Cedar Park, TX 78613-2363, (512)4458-7281.

## October

•**3-8, 1993 National Safety Council Congress and Exposition "World Class Solutions"** will be held at the McCormick Place, Chicago, IL. For more information, please contact Robin L. Ungerleider at (708)775-2303.

•**19-21, Food Preservation 2000 - Integrating Processing, Packaging, and Consumer Research** is sponsored by and held at U. S. Army Natick Research, Development and Engineering Center, Natick, MA, USA. For additional information, please contact Lisa McCormick or Sonya Herrin, Science and Technology Corporation, (804)865-7604.

•**26-28, Basic Pasteurization Course**, sponsored by the Texas Association of Milk, Food and Environmental Sanitarians, will be held at the Le Baron Hotel, 1055 Regal Row, Dallas, TX. For more information, please contact Ms. Janie F. Park, TAMFES, P. O. Box 2363, Cedar Park, TX 78613-2363, (512)4458-7281.

**To insure that your meeting time is published, send announcements at least 90 days in advance to: IAMFES, 200W Merle Hay Centre, 6200 Aurora Avenue, Des Moines, IA 50322.**

# Advertising Index



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# IAMFES

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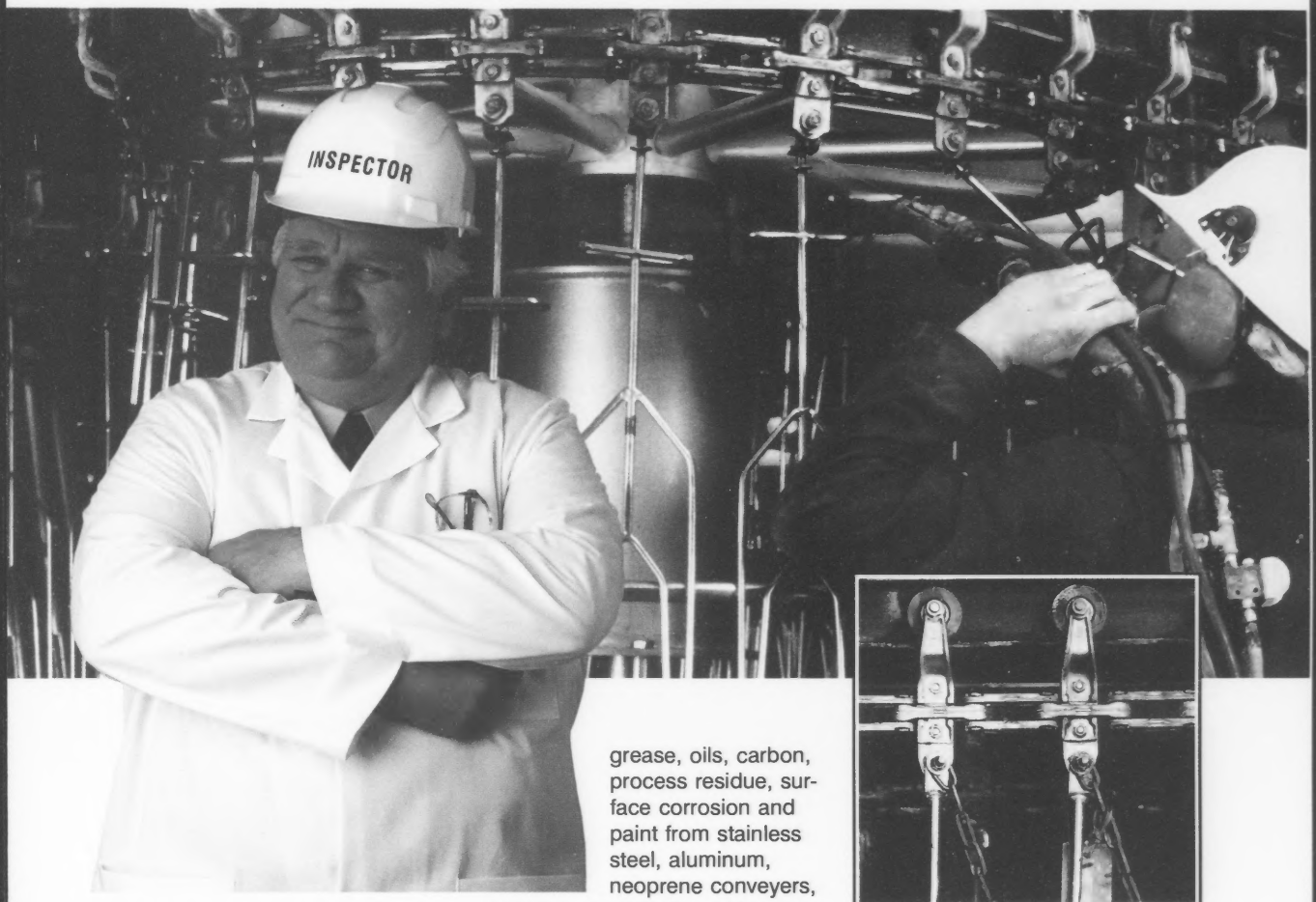




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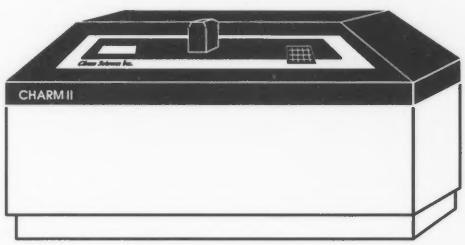


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