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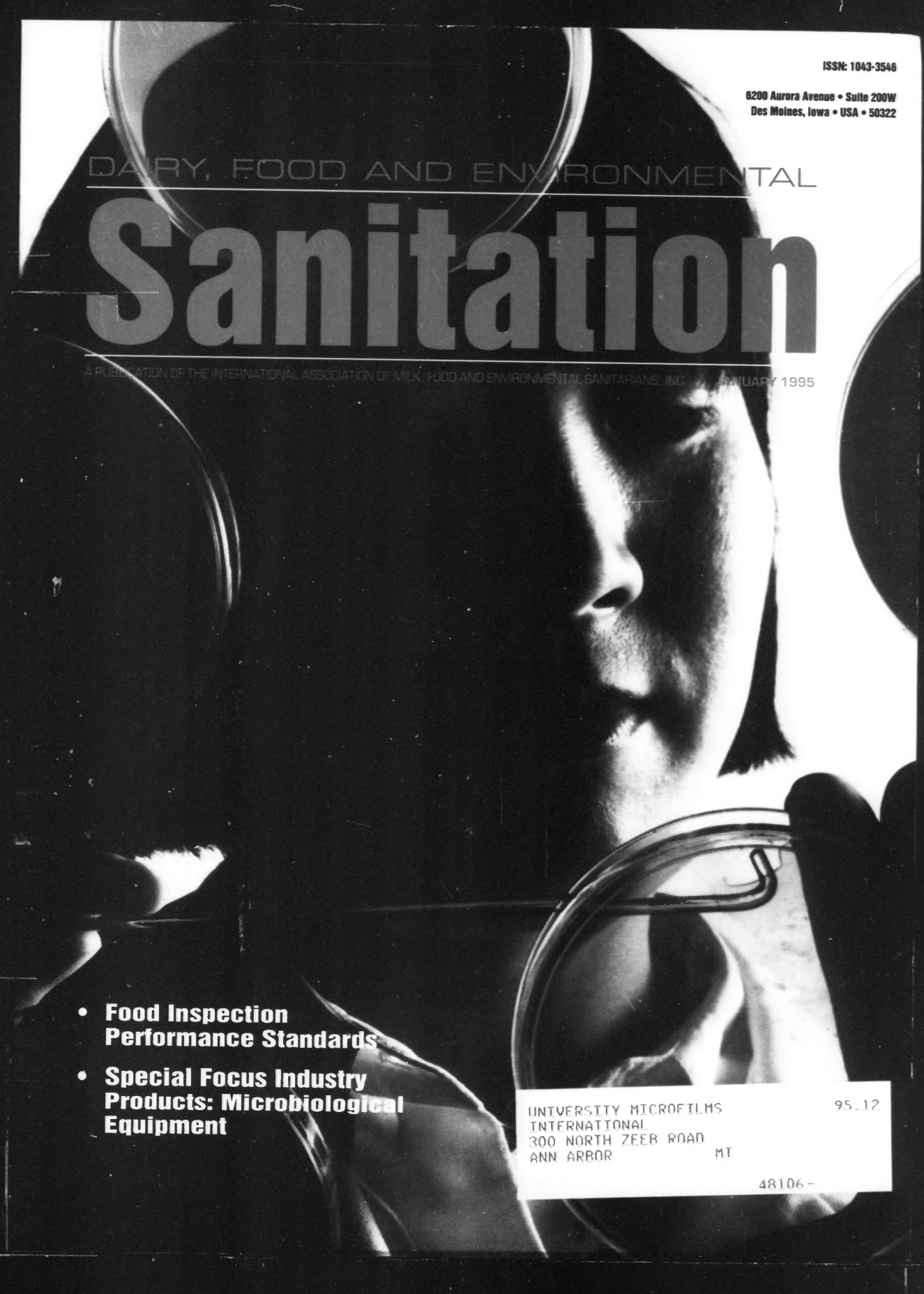
DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

A PUBLICATION OF THE INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS, INC. • JANUARY 1995



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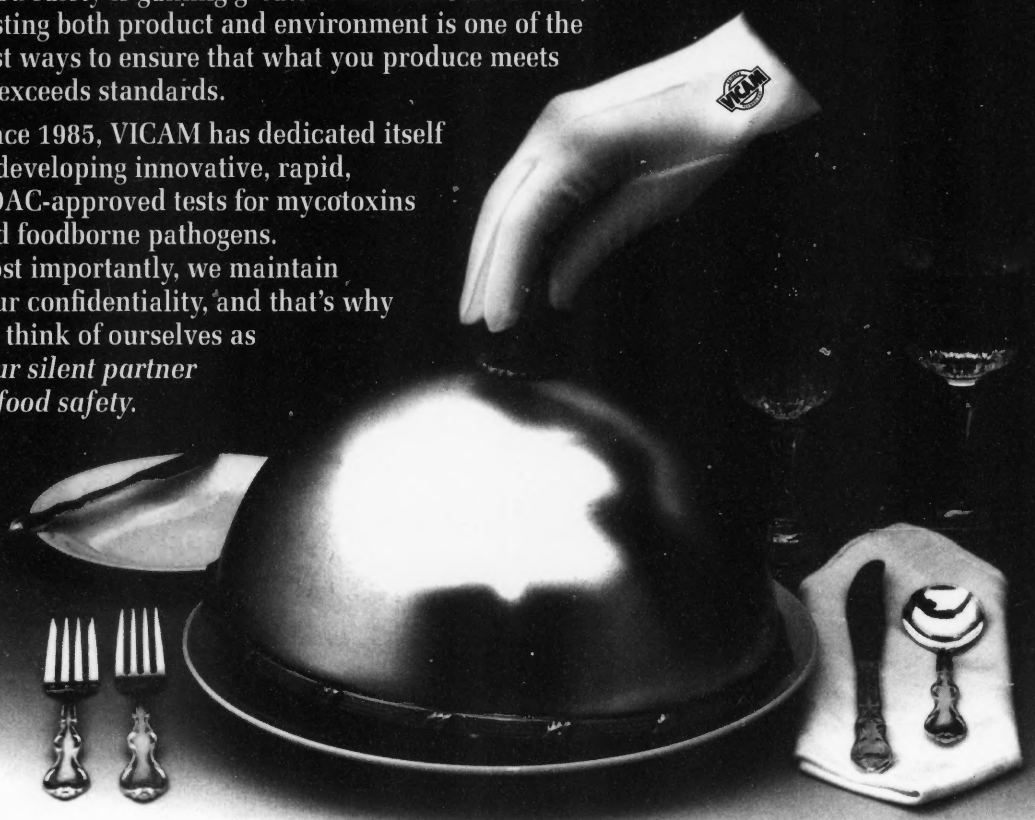

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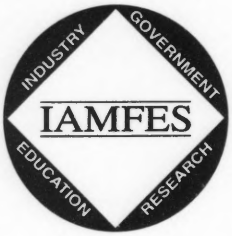

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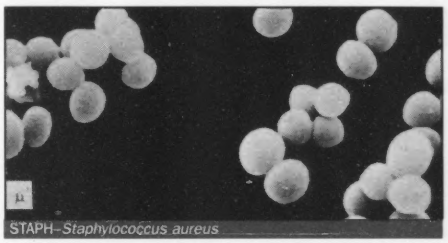
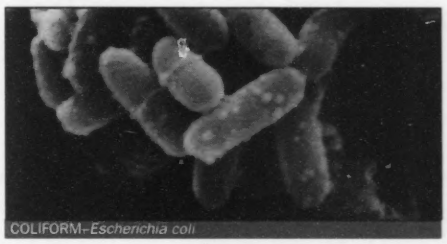
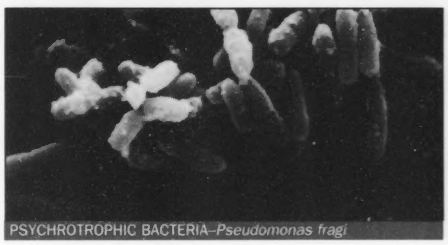
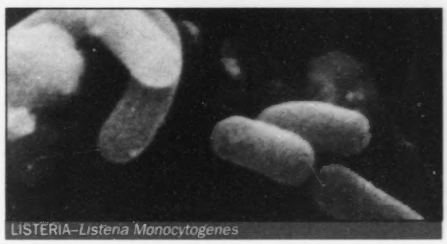

STAPH–*Staphylococcus aureus*


COLIFORM–*Escherichia coli*


PSYCHROTROPHIC BACTERIA–*Pseudomonas fragi*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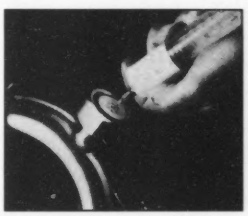

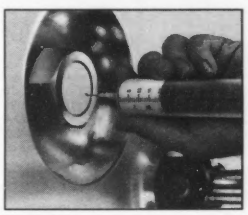

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DAIRY, FOOD AND ENVIRONMENTAL
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ARTICLES

ASSOCIATION NEWS

Editor's Note:

The following five advertisers were mistakenly left off the Summary of 1994 Annual Meeting Exhibitors published in the November issue:

Dynal
3-A Symbol Council
Capitol Vial
Nickel Development Group
Prism

Descriptions can be reviewed on page 30 of this issue.

We apologize for the error.

DEPARTMENTS

EXTRAS

DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

Dairy, Faad and Enviranmental Sanitation (ISSN-1043-3546) is published monthly beginning with the January number by the International Association of Milk, Food ond Environmental Sanitarians, Inc. executive offices ot 6200 Auroro Avenue, Suite 200W, Des Moines, IA 50322-2838, USA. Each volume comprises 12 numbers. Printed by Heuss Printing, Inc., 911 N. Second Street, Ames, IA 50010, USA. Second Closs Postage poid at Des Moines, IA 50318 and additional entry offices.

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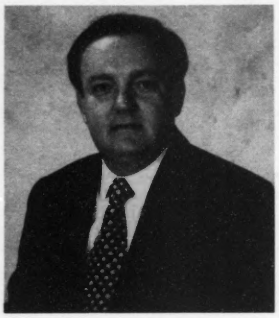
THOUGHTS

FROM THE PRESIDENT



By C. DEE CLINGMAN,
IAMFES President

If You are Not the Lead Dog in the Pack, Your View Never Changes

Leadership is the most often talked about concept in management development courses these days. Leadership is often misconstrued by some because it is felt that it only applies to people who supervise others directly. But this is not the case. Some examples of leaders who are not in a supervisory role are: a basketball player who leads his teammates and to whom they respect, political leaders, a senior employee who is held in high regard by his or her coworkers, and even TV evangelistic preachers who lead people to their cause emotionally, financially, and even to death. Individuals such as Michael Jordon, Fidel Castro, Walter Cronkite, Rev. Jim Baker, and Rev. Jim Jones are or were powerful leaders.

Leadership is not solely a management skill but an emotional or psychological process. Most likely many great leaders probably had trouble supervising people directly. But they developed and fine tuned their psychological skills to become the lead dog of the pack. And as the lead dog you are the only one with a panoramic view. The rest of the pack looks at the back end of the others in the pack.

So what does this have to do with IAMFES? Good question. Specifically, I don't know. But I do know that as a professional environmental and food safety organization we want to be the leader. We want to position ourselves as a group of professional members, to be looked upon as leaders in our field. We want to have the skill and finesse of Michael Jordon, the stature and discipline of Fidel Castro, the peer respect of Walter Cronkite, the financial motivation to the cause of Rev. Jim Baker and the commitment to the cause Rev. Jim Jones gave to his followers even to the bitter end. How do or did these people do it? How will we as an Association accomplish it?

Leadership begins with the individual. Each IAMFES member needs to continue to be the focal point of information, guidance, experience, and motivation. Through this collective group of individuals we can draw upon as an Association to move the "pack" positively forward. But what makes individuals successful in IAMFES? First, the constant recognition of your professional Association is essential. Talking about IAMFES in business and personal circles is important. This includes recruiting new members and encouraging current members to remain in the "pack".

A former boss of mine said once, "Dee, if you are going to establish yourself as a leader you have to first position yourself in the center and secondly, vibrate in all directions". There is some good advice in those words. One can't look at leadership, even as an Association, in a vertical manner. The concept is multi-directional or global in nature. Even in business today hierarchical management is fading away in progressive companies. Today's leaders are those who can successfully maneuver around the organizational matrix.

All of us want IAMFES to be the leader in the food safety arena; the place to go for current information and sound scientific principles. But like individuals, we have our competition; organizations like NEHA, IFT, ILSI, APHA, ASQC, etc. all want to be the leader, too. But successful leadership of a professional Association is only achieved by participation – participation of its members in the Association, in committees, and on professional development groups and task forces. Just taking 15 to 30 minutes each month to review the *Journal of Food Protection* or the journal of *Dairy, Food and Environmental Sanitation* is participating.

The success of IAMFES to become the undisputed leader as a professional Association will not come from the efforts of the paid headquarters staff. It will come from each person reading this article. Please plan on becoming an "active" member. If we are successful, a future IAMFES President can write "Just Because You're First, Doesn't Mean You Stay First" in his or her column.

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Reader Service No. 124

On My MIND...

By STEVEN K. HALSTEAD, CAE
IAMFES Executive Manager

"The question I would like to raise with you is, 'Have we done too good a job of sanitizing?'"

...is "oversanitation."

I may have made up another new word, I'm not sure. Probably, there are those of you who would say that "oversanitation" is a contradiction in terms – you just can't get too much sanitation. Others would say that there simply isn't such a word.

The question I would like to raise with you is, "Have we done too good a job of sanitizing?"

Let me digress for a minute. I have a friend who has a six year old daughter. To look at the child, you would think that she is the picture of health. She is, unless she stops taking her daily dose of antibiotics. If she so much as misses a day (I may be exaggerating a bit here), she comes down with an ear infection.

That requires a trip to the pediatrician who looks in her ears and prescribes – antibiotics. Usually more powerful (and more expensive and more difficult to pronounce) than the last. After listening to my friend relate this story and how it is a constant battle, I got to looking around.

Both my nephew and niece have had tubes in their ears because of ear infections. Every one of the children of our office staff have tubes in their ears because of ear infections (that's five kids!). Both of my neighbor's kids have had tubes in their ears. I know several children from church who have tubes in their ears. There may well be a great many more out there with tubes in their ears – it's not the most obvious thing in the world.

If you talk to the parents involved, they all have essentially the same story: ear infections; somewhat controlled by antibiotics, but in the end resulting in tubes being inserted.

Now it could be that this is a newly accepted treatment regimen; or perhaps that all children go to the same pediatrician; or that aliens have invaded our children's ears. (Aiming for their minds, but missed?)

Or, it could be that our reliance on antibiotics for all sorts of ills has left our children with a somewhat impaired immune system, susceptible to certain microbes that find their way to the vulnerable ears.

We know that insects and plants have the ability to develop resistance to pesticides and herbicides, and that they can do this in relatively short periods of time. Is it not possible that microbes can, and are, doing the same thing?

Now, let's talk about emerging pathogens. Are they truly emerging, or are we just discovering them? Have they been there all along, but we were, for whatever reason, unable to detect them or catalog them?

Or – and this leads me back to – "oversanitation," have our advances in techniques and sanitizers allowed us to kill off the weaker, perhaps competing strains and left us with just the survivors? Have we accidentally genetically engineered these emerging pathogens? Have we caused them to mutate and evolve in order to survive?

Have we oversanitized? And, is that bad? Considering the alternatives...

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Extending the Keeping Quality of Fluid Milk to 21 Days

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ABSTRACT

Sixty-two steps are a lot to read, understand, and follow. However, careful attention to each one is necessary if you expect unopened containers of fluid milk to keep up to 21 days at 7.2°C (45°F), and still have acceptable flavor. Your goal should be to have at least 50% of the bacterial counts showing less than one coliform per ml and less than 20,000 SPC per ml after 14 days at 7.2°C (45°F). This list of processing and sanitation practices could become the Good Manufacturing Practices (GMPS) for your plants. You can select from these the few points to serve as your Hazard Analysis Critical Control Points (HACCP) program for your operation, also. You are challenged to hold daily samples from each filler at 7.2°C (45°F) for the length of open date you are using. One hundred percent of those samples will remain acceptable if all employees perform their responsibilities ideally.

Penn State studies show that traditional pasteurization and packaging can protect fluid milk so that it remains good for 21 days or longer at 45°F. Present procedures and practices of the more than 40 plants processing milk in Pennsylvania show that more than 90% of their product samples retained quality for 14 days at 45°F. Continual improvements in processor performance are moving keeping quality well beyond the 12-day open-dating mandated by the Division of Milk Sanitation of the Pennsylvania Department of Agriculture, as adopted in August 1991. Developing the changes recommended and getting them into practice required the cooperative efforts of the Food Science Department at Penn State, the Pennsylvania Association of Milk Dealers and their dealer member employees, Pennsylvania Department of Agriculture regional sanitarians, and representatives of allied industries.

Eleven studies of Pennsylvania plant-obtained samples have been made since May 1989. Two additional studies (Fall, 1993, April, 1994) involved only samples from the University's Creamery. Two of the last three industry plant surveys showed 90% of the samples remaining acceptable for up to 14 days at 7.2°C (45°F). In the two studies of University Creamery samples, processed two days a week, 99% kept for 14 days at 7.2°C (45°F), and 88% keeping for 21 days at 7.2°C (45°F).

This is the second revision of the listing of recommended procedures and practices compiled by the authors from personal experience in troubleshooting keeping quality problems in milk processing plants. The initial listing, presented in March 1990 to attendees at regional meetings for Pennsylvania dairy-processing employees, was published in the February 1992 issue of *Dairy, Food, and Environmental Sanitation* and summarized in the April 1992 issue of Dairy Foods.

Recommended Procedures and Practices

1. The most important step is to use hot water to sanitize from the HTST pasteurizer, through all pasteurized milk equipment, to the overflowed filler bowls, then drained out through every valve of every filler. To meet the legal definition, sanitizing requires a minimum temperature of 76.6°C (170°F) for at least 5 min at any spot where you can check with a thermometer (such as draining from a pasteurized surge tank, entering a filler bowl, and draining from filler valves). To achieve 21-day keeping quality at 7.2°C (45°F) water temperatures were maintained above 82.3°C (180°F) for circulation and draining times of at least 10 min.
2. It may be necessary to start with water as hot as 93.2°C (200°F), unless the water can be reheated as it flows from the pasteurized surge tanks. It is imperative that all inner surfaces of all pasteurized surge tanks, pumps, pipes, assembled fillers and all other parts used to convey any pasteurized product to every retail package or dispenser-bag filler be heated to at least 76.5°C

(170°F) for 5 min. At the University Creamery, it takes about 600 gal of 93.2°C (200°F) water to sanitize a three-valve paper filler, a single-valve dispenser filler, and the tanks and piping in five circuits. A multiple-filler plant could easily require 2,000 gal of hot water, unless the water can be recovered and reheated.

3. Follow (in accordance with manufacturers' instructions) the hot water with a cool-water chemical-sanitizer solution, at a temperature of 21°C to 31°C (70 to 90°F). DO NOT USE HOT WATER OR MIX CHEMICALS for this purpose. Flush the sanitizer solution for at least 2 min; 5 to 10 min is recommended. Never allow chlorine or iodine solutions to exceed 49°C (120°F).

4. If it is deemed absolutely impossible to hot-water sanitize pasteurized surge tanks, be sure they have been thoroughly cleaned, using a spray ball. Check all protrusions, openings, and gaskets for cleanliness, then sanitize with an acid-type or other sanitizer, using the circulation cleaning system and spray ball. Spraying the inside surfaces of a pasteurized surge tank with metered sanitizer solution usually will not, in itself, give you the desired keeping quality.

5. Allow sanitized surfaces to drain. Never use tap water from your private or a municipal supply to rinse off sanitizer solutions. These waters frequently contain psychrotrophs. Even if coliform-free, these organisms will contaminate pasteurized milk, hastening spoilage.

6. Provide a separate area and facilities where milk will help keep them out of pasteurizing and packaging rooms. This means coffee, restrooms, refrigerated cases for samples, ice, drinking fountain, table and comfortable chairs.

7. Check the appearance, temperature, and odor of milk in all truck tanks when received. Before unloading, take an aseptic sample for flavor testing, microscopic examination, drug-residue testing, determination of bacterial counts, and titratable acidity. Reject all loads of milk arriving warmer than 40°C (4.4°F), with bacteria counts exceeding 100,000/ml, or with positive tests for any drug residue, pronounced off-flavors, or titratable acidity exceeding 0.20%.

8. Minimize spoilage or leaking of raw milk. Using a sanitizer solution, promptly flush spills down the drain, or collect the leaking milk in the recovery system for separation, pasteurization, and use in manufactured products.

9. All raw milk is to be processed within 48 h of its collection from farms.

10. Place footbaths and/or provide squirt bottles containing a quaternary ammonium compound [800 to 1,000 ppm] at all outside doorways and passageways between processing areas. Insist that all personnel and visitors use them.

11. Each day, empty footbaths and manually brush or foam-clean with a chlorinated alkaline cleaner, rinse and refill with quaternary ammonium sanitizer. Lack of good rinsing will greatly reduce effectiveness of the sanitizer.

12. Do not use high-pressure pumps to clean the exteriors of trucks or floors, walls, and other dairy-processing equipment. High-pressure sprays create aerosols that can harbor bacteria and spread them widely via the air.

13. Establish and follow a preventive program to control all insects, rodents, and birds. Carry out your own program or engage a commercial exterminator. Check to see that prevention is accomplished. Keep in mind the possibility of pesticide contamination and make certain your exterminator understands the situation.

14. You must manually clean the manhole cover, vent, gasket, pump, and fittings each day you collect milk. If circulation cleaning does not result in clean flexible hose and fittings, they must be disassembled and manually cleaned.

15. Disassemble all raw-milk pumps at least weekly. Wash manually and reassemble, then sanitize before using. Pumps on some milk-collection trucks must be disassembled and cleaned each day they are used.

16. If you must repair equipment with raw or pasteurized milk-contact surfaces while it is in use, wear rubber or plastic gloves and chemically sanitize the surfaces. Drain, rinse, and sanitize milk-contact surfaces and equipment if it is not possible to follow a complete cleaning and sanitizing procedure.

17. Have a separate CIP system for cleaning and sanitizing truck tanks and raw-milk storage tanks and lines. This will help prevent the possible spread throughout the plant of disease-causing bacteria that may be present in the raw milk or raw-milk product. Separate CIP systems help prevent contamination of pasteurized products and equipment in production areas.

18. Empty, wash and sanitize raw-storage tanks at least every 72 h. Never put fresh raw milk on top of older milk in a raw-milk storage tank.

19. Provide lockers, changing space, footwear and uniforms for all plant personnel. Employees should be able to get to the locker room from outside without crossing any processing area. Employees arriving for work should change into their uniforms, leaving street clothes and footwear in the locker room. The objective is to avoid bringing to the processing areas soil and bacteria that might come from rural areas where animals are kept.

20. All employees, including management and sales personnel, should wear hair nets and hard hats, as well as nets over beards and mustaches. This is most important for all persons working in or walking through processing and packaging areas.

21. Processing, product-manufacturing, and packaging employees should wear no jewelry, other than a wedding band, while at work. Other jewelry, wristwatch, etc., should be left at home or in the employee's locker. Pens, pencils, and thermometers should not be carried in the shirt or blouse pocket.

22. Each employee must thoroughly wash hands when returning from any area away from his/her work responsibilities. Use an E-3-rated handsoap. Dry hands on single-service paper towels, single-use cloth toweling, or under hot-air driers.

23. Have flow diagrams of all raw- and pasteurized-milk piping and equipment, as well as of lines conveying water, steam, cleaning solution or ingredients for dairy products. It is our experience that, in many cases, plant diagrams are not current. Update these diagrams whenever changes are made. Color-code lines to indicate product and direction of flow. Make sure all key plant personnel know where the diagrams are kept and how to read them.

24. Move or remove any kind of piping that is directly above any 'open' piece of processing or packaging equipment. Condensation forming on such piping may drip into the milk or dairy product. Dripping condensation can be a major source of spoilage.

25. Seal all cracks in floors, walls, and ceiling. Resurface floors, so they slope to drain and prevent pooling of liquids.

26. Wash and rinse weekly any product or case-conveying system, whether in gutters in the floor or out in the open. Install drip shields beneath overhead conveyors and use a lubricant containing a bactericide. Wash and sanitize these weekly.

27. Provide separate rooms, apart from areas used for processing and packaging, where returning containers and cases may be cleaned and sanitized with quaternary ammonium compound at 400 to 600 ppm. Wash, rinse, sanitize, and dry all product cases upon return or before moving them to the packaging area.

28. Do not install any piece of dairy equipment over a floor drain. Reposition any equipment that interferes with free access to a drain. Floor drains must be cleaned each processing day.

29. Install drain covers, with bell traps and grating, that are easily removed for daily cleaning and sanitizing.

30. On each processing day, clean all drain pipes with brushes designed and used only for that purpose. Rinse, then pour full-strength quaternary ammonium sanitizer into the reassembled drain cover and down the pipe. Sanitizer tablets or rings are available. Tablets or rings placed in your drains provide sanitizer in the drain at all times.

31. Pressurize the packaging room, preventing inward-moving air currents. This will help reduce entry of dust and airborne organisms.

32. Color-code your cleaning brushes, using separate brushes for raw and pasteurized milk-contact surfaces, for floors and walls and for drains.

33. Minimum required pasteurization temperatures destroy disease-causing and spoilage bacteria that may have contaminated raw milk. Temperatures in excess of 73.2°C (165°F) and holding times longer than 18 s for fluid white milk will not, in themselves, extend keeping quality.

34. The 99% of 188 samples from the University Creamery cold room which kept for 14 or more days at 7.2°C (45°F) were pasteurized at 73.2°C (165°F). Complete cleaning and proper hot water sanitizing are the keys to extended keeping quality. This must extend from the HTST into the container.

35. Provide covers and shields for all processing and packaging equipment, and keep them in place to prevent entry of contaminants into products or containers. Wash and sanitize all covers and shields daily. Check the undersides of the shields to be sure that they are clean and free of moisture. Any wet surface can become the source of contamination.

36. Close and seal all cartons of product containers and covers which remain at the end of the run. This will help prevent entry of dust, dirt, and other contaminants.

37. Any product resulting from change-over of product or container size should be re-pasteurized and used the same day. Spray forming and sealing mandrels and/or shields with a sanitizer solution as often as every 20 min and whenever you change products or sizes, but at least every 60 min.

38. Add all flavorings and sweeteners to milk prior to pasteurization. Vitamins should be added, in the correct amount, to separated milk and then thoroughly agitated prior to pasteurization.

39. Check samples of sweet water and glycol coolant on a frequent, but irregular, schedule. Look for disease-causing and spoilage bacteria (coliform and psychrotrophs).

40. Minimize the use of water in processing and packaging areas to keep floors as dry as possible. This eliminates a place for bacteria to grow. When rinsing spills during processing, use a sanitizer solution.

41. Do not accept back into your cold room any product that has left a delivery truck and been delivered to a wholesale customer. If you must accept returns, put them in a separate area. The ideal means of disposal is to a farmer with pigs, but do not let product cases or boxes that have gone to the farm come back to your plant.

42. Have a circulation cleaning and sanitizing system (CIP) dedicated to pasteurized-milk equipment to prevent contamination from raw milk. A single-use or solution-recovery system is recommended. With top-opening vats, it is helpful to pre-rinse with a hose prior to a CIP rinse. Discharge all rinse water from CIP systems to drain.

43. Empty and recharge CIP systems with fresh water and chemicals each processing day. Change wash solution whenever it becomes cloudy and loaded with soils, and at least every 10 cycles. Level of Cl concentration in the wash solution is an indicator of soil load.

44. Write out the cleaning and sanitizing programs for all operations in your plant, specifying quantities, products, times and temperatures. This should be done with the help of a technical commercial representative of your chemical-compounds supplier. Check-off lists, if carefully thought out, can be extremely helpful to employees. Use cleaning and sanitizing compounds in the recommended amounts, so that solutions are of the proper concentration and pH. Check and record the strength of cleaning and sanitizing solutions at the beginning of each processing day.

45. Use cleaning and sanitizing compounds in the recommended amounts, so that solutions are of the proper concentration and pH. Check and record the strength of cleaning and sanitizing solutions at the beginning of each processing day.

46. To keep milkfat in a liquid state, temperatures of circulation-cleaning alkaline solutions should be at least 5.5°C (10°F) above the temperature of the raw or pasteurized product. When cleaning cold milk-contact surfaces, solution temperature at the end of the wash cycle should be no less than 43.3°C (110°F).

47. Start with solution temperatures between 54°C (130°F) and 65°C (150°F) for raw-milk equipment and lines. Temperatures for pasteurizers, fillers, and pasteurized-milk surfaces and lines should be 56.7°C (135°F) to 78.6°C (175°F) at the start for alkaline cleaning solutions.

48. For CIP cleaning, solution velocity through the pipes should be a minimum of 5 feet per second. To successfully clean a HTST press you need a velocity of up to one and one-half times milk-flow velocity.

49. It is usually necessary to manually clean the following silo tank parts: agitator, door and gasket, sample cock, vent, sight glass, valves, and any protrusions into the tank.

50. Other system components requiring hand-washing at the end of each processing day include plug valves, air-operated valves that do not pulse, pump seals, and pump gaskets.

51. Certain parts of your HTST systems require hand-washing or frequent disassembly and visual checking. These include vacuum breaker, timing pump, impellers, stand pipe, balance tank, dead-end pipes (pressure surge absorbers), divert lines and leak-detector lines.

52. You must have filters on air-blow systems to prevent contamination of product and lines with coliforms and spoilage bacteria. With blow systems the product is pushed out of the system with air, rather than by the next product in the line.

53. Disassemble and manually clean vacuum breakers each processing day. Be sure to remove any stand pipes for hand-cleaning and cap the tees down at the horizontal lines.

54. Examine each valve in all valve clusters often enough that you know they are clean. This could be monthly, weekly, or even each processing day if the valves are the manual three-way plug type.

55. Federal regulations prohibit circulation cleaning and sanitization of your homogenizer. Install bypass piping during CIP. Check the screens and gauges at least weekly to be sure that they are clean. Screens should be autoclaved each processing day.

56. Wear plastic or rubber gloves if you have to hook up fittings, adjust fillers, or handle a milk contact surface. Sanitize your clean gloved hands for 1 min in a proper strength sanitizer solution.

57. Thorough cleaning and sanitizing of fillers may be the most challenging job in the plant. With most machines many parts must be disassembled and manually cleaned. Be alert for foreign material.

58. Filler parts requiring manual cleaning and frequent checking include drive chains, splash shields, chain guards, heaters, mandrels, defoamer tubes and hoses, filler valves and shields, and cups or pistons.

59. When parts are clean and dry, check all surfaces to ensure that they are completely free of any deposits. Do this on an irregular, but as frequently as weekly ba-

sis, prior to assembly and sanitizing (which usually means in the middle of the night).

60. Be sure the system is completely assembled prior to hot-water sanitizing. Remove the filler screens from the chemical sanitizer and install prior to hot water sanitizing. Drain hot water through each of the valves, not just one or two.
61. Identify the hard-to-clean areas on each machine or process. Disassemble and inspect these as often as necessary to be sure they remain clean.
62. Develop a maintenance-record book or log listing dates: when gaskets were changed, when the HTST press was last opened, filler gaskets inspected and air-operated valves checked. Designate the employee responsible for recording this information, and make certain that all employees know of the book and its importance. Change gaskets and disassemble air-operated valves at least quarterly and open the HTST press at least twice each year.

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Food Inspection Performance Standards

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INTRODUCTION

This paper identifies qualitative performance standards for retail food-inspection work. We should regard standards as essential staff training guides and performance-review criteria. Enhanced standards should help achieve more effective inspections, and thus better address public-health concerns and provide more value for taxpayer funding.

Managers will have to become more involved in implementing change to meet competition and survive. Supervisors will need to join work teams so as to establish and maintain field performance having demonstrable public value.

Effective inspections should help prevent, or reduce the severity of, food-borne disease outbreaks. These are estimated as high as 81 million cases every year in the U.S., and result in an estimated 10 thousand deaths *(1)*. A great many of these illnesses and deaths occur from poor food-preparation practices in retail and institutional kitchens. Many inspections, even in facilities with high volumes of food preparation or with at-risk clients, fail to address the factors associated with outbreaks. Higher levels of staff professionalism – for both restaurant workers and health inspection staff – should lessen this very high toll of suffering and economic loss from food-borne illness.

Each day most Americans eat out or buy food from a store. Improved inspections should reduce the discomforting chance of finding half a cockroach in a sandwich, as can happen from infested, dirty kitchens. There is enough stress in life without the worry of what happened to the other half of the bug! Having to take time off from work and care for a child stricken with salmonellosis resulting from a store's undercooked barbecued chicken is unneeded stress. These incidents don't have to happen in a modern, technologically advanced society like the United States.

There are some 1 million retail facilities in the U.S. These are inspected approximately twice a year. If we cost out this work *(2)*, several hundred million dollars are spent every year. Any significant portion of ineffective inspections would waste a lot of taxpayer dollars. Also, there is a rationale for industry to exchange annual permit fees, which can be several hundred dollars for each facility, for more helpful, risk-directed private consultations.

Higher performing food inspection professionals are more able to communicate and share food risk and sanitation knowledge with industry. Ultimately, this should help industry managers and workers to be better educated, motivated, and empowered to do their important jobs. We can not inspect additional quality or safety into a food product than already exists. Industry has to do it.

We believe that high staff performance standards are essential factors leading to effective inspections, and conversely when lacking, bring about ineffective inspections. We will illustrate and compare inspections.

The Effective Inspection

We are defining this as an inspection utilizing good interpersonal skills and efficient inspection techniques. The inspection achieves a reasonable balance between physical facility and equipment matters, and those areas relating to greater food safety risk, such as inadequate food-temperature control, employee health problem *(3)*, and poor hygienic practices. The inspection findings are code specific and are reviewed in helpful detail. Inspection staff consider themselves professionals, take pride in their work, and find job satisfaction.

The Ineffective Inspection

We are defining this as an activity where the end result focuses on filling out a check list of debits. Some call this a "report card" inspection. The inspection dwells almost exclusively on physical facilities and equipment, plumbing matters, and garbage handling. Work emphasis is on "Get the numbers accomplished." This satisfies the jurisdiction's high priorities of bean counting and revenue generation. Reports are often superficial "equipment in disrepair" or "clean the floor" narratives. In that findings are not detailed, the reports can be considered useless for most legal action considerations. Few significant, higher health-risk problems are found, and more importantly, resolved.

Inspections are often conducted in an adversarial or authoritarian style. With this approach and often trivial findings, the inspection program does not generate much support or credibility from industry. Jurisdiction employees consider food-inspection work to be a low-level stepping stone to more important (and better paying) environmental-health work, such

as toxic waste control. Managers are complacent "desk-potatoes."

We do not intend for the above to be a broad-brushed indictment of retail work inefficiency. In the writer's experience with over a thousand retail inspections, including the review of numerous reports prepared by federal, state, and local jurisdictions, the depiction above is not a typical inspection. However, the "ineffective" factors are found frequently enough to bring genuine concern for work quality, which prompted this paper on enhanced performance standards.

Suggested Performance Standards of Inspection Technique, Inspection Balance, Reporting, and Specialist Skills

Inspection Technique

The health officer shows efficiency and good focus. Other important factors include:

1. Starts the activity with a satisfactory introduction and explanation of visit to management.
2. Is courteous and establishes good rapport.
3. Is a good role model in personal hygienic practices, such as by washing hands at the beginning of the inspection, and by the cleaning and sanitizing of temperature probes.
4. Generates professional demeanor by personal appearance and garb appropriate for the facility (which may include hair restraints and smocks in the larger facility).
5. Prepares beforehand for the inspection with appropriate report forms, equipment, and file familiarity.
6. Conducts the inspection in an efficient, organized manner and without disruption of kitchen operations.
7. Demonstrates the satisfactory use of inspection equipment, such as chemical sanitizer-check strips, temperature measuring devices, pH meters or paper strips, cameras, and. flashlights.
8. Uses satisfactory skill and safety precautions in examining kitchen equipment.
9. Can explain or demonstrate technological features to retail staff, such as how a bimetallic thermometer works or is calibrated, or just what "sanitization" means i.e., bacterial load reduction.
10. Shows good interview skills in establishing facts. Does not ask questions in such a way as to solicit the "correct" answer (e.g., "Do you sanitize? Of course we do").
11. Reviews in a careful, helpful manner the more significant violations.
12. Listens well. Is positive. Is able to negotiate.
13. Establishes mature and lasting "win-win" *(4)* inspection outcomes.

Inspection Balance

The health professional emphasizes the quality of work over the quantity of work. Other features include:

1. Establishes inspection priorities, such as first reviewing food preparation processes - and risk for representative foods. Does the food safety review by observing, by checking recipes or written procedures, and by interviewing kitchen staff? Identifies what are or are not "potentially hazardous foods" (PHF) and follows food flows.
2. Finds and helps resolve hazardous or poorly controlled processes. An example would be the review of the preparation history of a large pot of PHF food taken into the walk–in refrigerator from the cook line.
3. Establishes a satisfactory voluntary destruction (or uses an embargo process) of contaminated or severely temperature-abused food items.
4. Gives adequate attention to the coverage of employee health, employee practices, and "person in charge" *(5)* monitoring.
5. Distinguishes and weighs the significant, repeated violations from minor, isolated violations. Uses good public health judgment and current scientific and epidemiological information in evaluating possible problems. Is able to distinguish "critical items" *(6)* from noncritical provisions.
6. Addresses in a balanced way facility and equipment factors or conditions, housekeeping practices, and areas that present aesthetic concerns to consumers, such as the lack of employee hair restraints. This balance should be made in context with the overall facility, including resources, products produced, and importantly, the inspection time available after finding and resolving the higher health-risk problems.

Reporting

The health officer reports accurate, detailed findings related to code requirements. The report serves as a legal and public record of the visit and reflects well upon the jurisdiction. Other considerations include:

1. Prepares a report that identifies code sections and requirements. Narrative findings are correctly related to specific code sections.
2. Presents findings as fact-witness based, detailed statements written in a clear, objective style.
3. Lists report violations in a descending order of health importance.
4. Writes report observations with the intent of helping manage-

ment understand and resolve problems.

5. Can find and explain Code "Public Health Reasons" *(7)* or identify other scientific documentation or consensus standards, and satisfactorily and constructively explain health relationships, if questioned on debits.
6. Uses the report, when necessary, in legal proceedings. The report withstands challenges brought by defending parties.
7. Uses computer hardware and report-generation software, when available, to facilitate professional reporting.
8. Handwrites a legible report.
9. Is able to prepare reports reasonably free from misspelling and grammar errors.
10. Efficiently writes and submits the report at the time of inspection.

Specialist Skills

By developing interpersonal skills and food protection knowledge, the food specialist achieves professional maturity important in work performance, and equally, for personal confidence and job satisfaction. Professional registration can be considered a major step in this process.

Skill areas include, but are not limited to, verbal and written communication, culinary arts, commercial kitchen design and technology, evidence development, food technology, microbiology, epidemiology, entomology, and the useful application of the "Hazard Analysis and Critical Control Point" (HACCP) concept.

The jurisdiction should have a policy that supports skill development and training.

Staff must be accountable for their good or poor performance in some kind of review process. Field performance can be reviewed and certified in a recognized procedure by an objective authority. It is the author's experience that this leads to better work uniformity and staff professionalism in the jurisdiction.

Personal Comments

If we set low expectations for performance for public health officers, then that is precisely what we get. Mediocrity. Always doing things the quick and easy way.

Politicians may ask, "How can we afford a program with high worker skills and enhanced performance levels? There would be a demand to reward outstanding performance, such as with higher salaries, and there would be some additional time needed to cover and communicate health-risk findings." In response, I suggest that these politicians ask the mother whose child was killed because of hamburger contamination *(8)*, or the consumer who finds half a dead roach in her sandwich, about costs and how inspections should be conducted.

In the 1990's many corporations have had to "re-invent" or "reengineer" *(9)* to better serve clients, meet competition, and utilize modern technology. By discarding obsolete functions, removing autocratic layers of staff, and working as self-directed teams, significant efficiencies have been achieved. Companies then do what they can do best. Government agencies can also streamline. With these savings, performance-oriented employees can be rewarded.

Many government managers are complacent "desk potatoes." We should bring to task more than a few health department bureaucrats for misplaced priorities, inadequate staff performance standards, and unrecognized inspection needs. These health-department managers, most of whom have nice computers on their desks, may ask, "How can we afford such things as field computers or even digital thermometers for staff?" The $1,400 notebook computer, even if it can be cost-justified in a year or so of use, is too expensive; the $140 automatic camera is too expensive; the $14 digital thermometer is too expensive.

You can apply this same mentality to food-group supervisors who have the only computers, are desk bound, and resist change or modern procedures. These supervisors and groups may not survive either in a realistic, competitive world. They could be replaced by private consultants doing efficient, risk-based inspections or by a U.S.D.A. Cooperative Extension industry training program. The scenario is not totally improbable.

There should be a paradigm shift to refocus our priorities and enable highly professional food inspectors to work with industry to resolve problems of common interest. The use of the 1993 Food Code and industry application of the HACCP concept should drive change. Enhanced performance standards would help in efforts to meet the work challenges of a modern world.

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3. U.S. Food and Drug Administration, Food Code 1993 Part 2-2 Employee Health. Much more attention is directed in this modern code to microorganisms such as *Salmonella typhi*, *Shigella* spp., *Escherichia coli* O157:H7, and Hepatitis A virus and the disease transmission potential in retail units. The code also has a detailed Annex Food Establishment Inspection that compliments performance standards.
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6. Ibid. Part 1-2 Definitions "Critical Items" and Preface xvi. The new code is written to clearly identify these more important violation areas.
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13. McKemie, K. M. (October 1993) "First Things First: An Essay on Food Inspection Priorities," Food Conference Bulletin, FDA Prime Connection.

Federal Register

How to Make a Freedom of Information Act Request to FDA

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Current Situation of Food-Borne Diseases in Bahrain: Implications for Prevention and Control

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ABSTRACT

One of the main public-health problems facing Arabian Gulf states, including Bahrain, is the need to ensure an adequate supply of safe and nutritious foods. Food importation in these countries has increased steeply due to the decline in agriculture and the very rapid growth in demand for food commodities. In Bahrain, the severe shortage in food production has made the country highly dependent on food importation (90% of foods consumed are imported), and the country has become among the least self-sufficient countries in the world *(1)*.

Bahrain imports food from various countries all over the world. This creates a great challenge to the health authorities in order to ensure the safety of imported foods, especially in view of the lack of these foods *(2)*. In 1991, the Bahraini Ministry of Health destroyed 882 tonnes and rejected 1,449 tonnes of imported foods because they were unfit for human consumption *(3)*. These figures are relatively high for a country like Bahrain with a population of 508,000 *(4)*.

In Bahrain, while noncommunicable diseases such as cardiovascular diseases, hypertension, diabetes, and cancer are becoming the main causes of morbidity and mortality, foodborne diseases still contribute to substantial numbers of illnesses *(3)*. The World Health Organization (WHO) reported that foodborne diseases are now considered a major public-health problem all over the world *(5)*. Health consequences due to these diseases can be very severe and may lead to death, especially in persons with low disease resistance such as infants, young children, and the elderly. These diseases also have major economic impacts through loss of income, manpower, foodstuffs, medical care and decreases in tourism *(6)*.

Information on food-borne diseases in Arabian Gulf countries, including Bahrain is lacking. The present paper provides such information based on the available data. It reviews the current situation of foodborne diseases in Bahrain, investigates their etiology, and suggests some measures to control these diseases.

Current Situation of Food-borne Diseases in Bahrain

Food-borne diseases may be toxic or infectious in nature and are caused by ingestion of contaminated food. These diseases can be grouped on the basis of the causative agents: bacteria, fungi, viruses, parasites, and chemicals.

Bacterial Food-borne Diseases

Bacteria are a leading cause of food-borne diseases in Bahrain. In 1991, a total of 673 cases of microbial food-borne disease were reported in the country. Of these cases, salmonellosis was the most common type, followed by hepatitis A, shigellosis, typhoid, paratyphoid fevers, and amoebiasis, in that order *(3)*.

The Ministry of Health in Bahrain reported that about 7% of foods examined in 1991 were unfit for human consumption due to bacterial contamination. The main pathogens isolated from these samples were *Salmonella, Staphylococcus, Listeria* and *Bacillus cereus,* in that order *(3)*. A study on suspected food examined from January through October, 1992, in Bahrain, showed that 21% of these foods were unfit for human consumption based on coliform tests. This percentage is three times higher than that reported in 1991. The foods commonly found to be unfit were fresh fruit juices (35%), milk and milk products (28%), and ready to eat foods (12%) *(7)*.

The incidence of salmonellosis decreased by 24% during the period 1990 to 1991. Of all salmonellosis cases, 51% occurred in children below five years of age (Table 1). The incidence rate was the highest among this age group (14/10,000), indicating the importance of prevention and control of salmonellosis among infants and young children. The high prevalence of bottle-feeding and unhygienic preparation of baby foods may be responsible in part for the salmonellosis among children below one year of age. In addition, young children have an incomplete immune system, and thus are more susceptible to bacterial infection.

Food-poisoning outbreaks due to

Table 1 Incidence Rate of Same Food-borne Disease by Age in Bahrain, 1991.

Age (years)	Incidence Per 10,000 Population				
	Typhoid Fever	Paratyphoid Fever	Shigellosis	Salmonellasis	Viral Hepatitis (A)
0 - 4	0.5	-	9.5	14.6	2.8
5 - 14	1.9	0.3	4.7	1.8	9.5
15 - 24	3.2	0.5	1.4	1.5	3.4
25 - 34	3.1	0.3	1.1	4.2	1.5
35 - 44	1.3	0.2	1.1	2.5	0.1
45 - 54	0.2	-	-	2.4	0.2
55+	-	-	1.8	1.5	0.6
Total	1.7	0.2	3.1	4.2	3.3

salmonellosis occur frequently; the most common types of *Salmonella* isolated from food samples are *Salmonella* groups B (31%), Cl (26.5%), E1 (16%) and C2 (13%) *(3)*. Epidemiologic investigations showed that improper thawing of foods, inadequate cooking, inadequate reheating of cooked foods, cross-contamination, and infected foodhandlers are the main factors contributing to *Salmonella* outbreaks in homes and restaurants in Bahrain. The foods mostly involved in these outbreaks are chicken, turkey, and meat *(8)*.

Cases of shigellosis increased by 31% during the same period. The incidence rate was also highest among children less than five years of age (9.5/10,000), followed by children from 5 to 14 years of age (4.7/10,000).

Eighty-six and 12 cases of typhoid and paratyphoid fever respectively were reported in 1991. The reported cases of typhoid increased by 39% for the period 1990 to 1991 and 83% of the cases were imported. The main countries of importation were India (67.7%) and Pakistan (21.1%). Of the total typhoid cases, 81% occurred in the age group 5 to 34 years. However, it is worth mentioning that typhoid fever is no longer considered a public-health problem in Bahrain, and the increase in its incidence in 1991 is mainly due to the increase in reporting cases in this year. All the 12 cases of paratyphoid fever were imported from India (10 cases) and Pakistan (2 cases) *(3)*.

Staphylococcus food poisoning is also a matter of concern, and cooked foods are mostly involved in these cases. In 1991, it was found that *Staphylococcus aureus* were isolated from 90% of suspected cooked foods, indicating that humans are the main source of transmission. In 1985, a food-poisoning outbreak occurred in a primary boy's school in Bahrain. The investigation showed that the sandwiches provided to the school canteen were contaminated with *Staphylococcus aureus*. Egg sandwiches had the highest attack rate (32%), followed by meat (27%), liver (18%), and chicken sandwiches (14%). Furthermore, examination of the foodhandlers showed that one of them had an abcess on his left ring finger, and *S. aureus* was isolated from the lesion *(9)*.

It is a common practice in local markets in Bahrain to sell some food products that are prepared at home. This practice may lead to health hazards to the public. A pilot study was done on the bacteriological quality of fermented fish sauces which were prepared at home and available in the Bahraini market. The total plate count was found to be high in all fish sauces studied. *Staphylococcus aureus* were detected in three out of five samples, while other salmonellae were not detected. It was concluded that *Staphylococcus aureus* may come from unhygienic preparation of fish sauces as well as from ill carriers *(10)*.

Viral Food-borne Diseases

Food can only act as a vehicle for the transmission of viruses. The important viral disease transmitted via food in Bahrain is infectious hepatitis, caused by the hepatitis A virus. About 169 cases of hepatitis A were reported in 1991; of these 62% were among children ages 5 to 14 years, (an incidence of 10.1 per 10,000). In many cases it is difficult to ascertain the food implicated since the disease has a long incubation period, varying from 10 to 50 days, and therefore by the time an outbreak is detected, the food is no longer available for examination. The source of infection in food-borne virus infection is usually human feces. Contamination can occur either directly by means of infected foodhandlers or polluted water *(11)*. In Bahrain, it is widely believed that expatriate foodhandlers (mainly Asians) play a major role in the spread of hepatitis A in the country.

Aflatoxin

Contamination of foods with aflatoxin is a public health problems in many tropical countries. Reports from developing countries *(12,13)* showed that a significant occurrence of aflatoxin has been found in some foods such as nuts, corn, chillies, and cassava. Aflatoxin is produced mainly by *Aspergillus flavus*, a fungus which grows better in warm, moist conditions. Epidemiological studies indicate that ingestion of food contaminated with aflatoxin is associated with the occurrence of liver cancer *(13)*.

Contamination of foods with aflatoxin is a problem in Bahrain. This is particularly true because the country is characterized by warm and highly humid weather during most of the year. Additionally, it is highly dependent on imported foods, which come from various countries all over the world.

A preliminary study *(14)* was done to identify the occurrence and levels of aflatoxin in 80 raw foods

commonly consumed in Bahrain, with particular emphasis on peanuts and pistachio nuts. Only two samples of shelled peanuts and one sample of unroasted pistachio nuts were contaminated with aflatoxin B_1, while all other samples were free from contamination. The levels of aflatoxin B_1 in peanuts were 3.5 and 2.5 ppb in the two samples. This level is below the U. S. FDA permitted level, 20 ppb. In the contaminated sample of unroasted pistachio nuts, the level of aflatoxin B_1 was 100 ppb, which greatly exceeds the guideline level. This raises a concern since aflatoxin B_1 is the most toxic of the aflatoxins. More attention should be given, therefore, to detecting aflatoxin in nuts in this country.

This study demonstrated that the problem of aflatoxin contamination exists in Bahrain. However, at this stage the situation is not necessarily alarming, since only one sample was above 20 ppb. However, the negative results in other foods must be interpreted with caution, since the sample size for some foods was small and did not cover all regions in Bahrain. Therefore, a comprehensive and well-designed study to monitor aflatoxin in various foods is urgently needed.

Chemical Food Poisoning

Chemical poisoning through intake of food is rarely reported in Bahrain, but the available indicators showed that chemical poisoning, especially among infants and young children, is a source of worry to the local health authorities in the Arabian Gulf countries *(2)*.

Foods may be contaminated by harmful metals such as lead, cadmium, and mercury. This kind of contamination can occur during the initial stages of production, and during post-harvest processing, handling, and preparation. A high level of heavy metals such as lead and cadmium have been found in staple foods and water from industrialized areas in Europe and North America *(15)*.

Reports on food contamination with heavy metals in Bahrain are alarming. A study on trace metals in drinking water in Bahrain *(16)* showed that the levels of lead, chromium, aluminum, arsenic, copper, zinc, nickel, and mercury are all below the acceptable levels recommended by WHO. However, there are variations in the concentrations of these metals depending on the source of water. High levels of copper and zinc were found in a small localized area where copper pipes and metal taps are used. A relatively high concentration of chromium was found in tap water. This may be due to the use of galvanized water taps in most houses. The use of metal water tanks may play an important role in the increase in the level of copper and zinc in drinking water. This is particularly true when water from fiberglass tanks is compared with that from metal tanks; it was found that the levels of copper and zinc were higher in the latter source compared to the former.

To prevent and control the heavy metals in drinking water in Bahrain, the study *(16)* recommended replacing the metal tanks with fiberglass tanks, introducing proper legislation for water and waste water, and frequent testing for heavy metals in drinking water. As Bahrain's water distribution system depends on mixing groundwater with desalinated water, a national environmental strategy for controlling these two sources (sea water and groundwater) should be established.

Chemical poisoning may arise due to oil pollution of seafood in Bahrain. The spilling of oil into the Gulf sea has been reported several times. Crude oil contains many compounds of known or suspected to be carcinogenic to man, such as the polynuclear aromatic hydrocarbons (PNAH). It has been alleged that these PNAHs will persist in tissue of marine biota exposed to oil discharges and will be accumulated up the food chain, reaching concentrations presenting a hazard of cancer-induction in humans as consumers *(17,18)*. In Bahrain, the last occurrence of oil pollution, which happened during the recent Gulf War (1990/91), and oil slicks threaten the fishing industry. Several cases of fish contaminated with oil have been reported.

Another source of contamination of seafood is oil-refinery effluents. The petroleum refineries in Bahrain use large volumes of water for oil processing and cooling. This water, in spite of the oil-recovery techniques applied, carries residual oil in the final discharge in addition to residues of other chemicals used in the processing of that oil. The refinery effluents also contain phenols, sulphides, ammonia, cyanide, and heavy metals. The waste water containing all these pollutants, when released into the sea, brings about both localized and widespread destruction of the marine biota and disruption of the ecology through the release of harmful pollutants. Therefore, fish caught in these areas may be polluted with hazardous chemicals. A high level of toxicity near the outlets of the refinery and low levels at the stations situated seaward have been reported *(19)*.

The study *(19)* of effects of the refinery effluents on rabbit fish (Siganus canaliculatus) measured by toxicity tests has found that although certain dilutions of the effluents did not kill the fish, there was an increased concentration of contaminants and heavy metals in the tissues of the fish which could be passed on up the food chain and eventually be consumed by humans leading to severe deleterious results.

Intestinal Parasitic Infection

Intestinal parasitic infection is widespread in developing countries and has an adverse affect on the health of the population, especially of children *(20)*. In Bahrain, few studies have been carried out to estimate the prevalence of intestinal parasitic infection. In 1980, Mobayed, Kamal, and El-Gashy *(21)* found that 36% of children aged 1 to 11 years were infected with intestinal parasites. A more recent study by Musaiger and Gregory *(22)* on 762 school children ages 6 to 20 years showed that 14.3% of these children were infected with intestinal parasites. The results indicated that boys had (15.4%) higher rates of

infection than girls (12.5%). The most common parasites isolated were *Giardia lamblia* (4-7%), *I. trichiura* (3.8%) and *H. nana* (3.4%). *Giardia lamblia* was more prevalent among children ages 16 years and above than in other age groups, whereas *T. trichura* was highly prevalent among children of 6 to 10 years. The prevalence of *H. nana* was higher in the age group 11 to 15 years. The pattern of parasitic infections in Bahrain is very similar to those reported in other Arabian Gulf countries *(23,24)*. This could be attributed to the similarity in the socioeconomic conditions and health status in these countries.

Giardia was the most common parasite prevalent among school children. This parasite is endemic throughout the world. The frequency of *Giardia* in this study may be underestimated since examination of one stool sample may not detect the forms of *Giardia* (or even of other parasites) which are irregularly released in the stool *(20)*.

Trichuris and *Hymenolepis* were the second most important parasites prevalent among Bahraini children. Although *Trichuris* is widespread all over the world, it has been neglected more often than the other intestinal parasites *(20)*, and this has led to a lack of recognition of this infection as a public health problem *(25)*. Intensive infection of *Trichuris* was found to cause a severe clinical syndrome associated with mucoid dysentery and growth retardation in children *(26)*. It is widely accepted that *Trichuris* may be a major cause of chronic malnutrition in young children in developing countries *(20)*. This whipworm is also spread widely among the adult population and it is a common cause of bloody diarrhea *(27)*. These findings suggest the importance of detecting *Trichuris* in Bahrain, particularly among infants and young children.

It was found that *Ascaris* infection alone is not capable of inducing malnutrition unless it is associated with other health problems *(28)*. However, Tripathy et al. (29) showed that malabsorption is associated with *Ascaris* infection, and this indicates the need to detect such parasites in children.

The prevalence of intestinal parasitic infections in Bahrain can be attributed to several factors. A lack of personal hygiene is the most important factor responsible for the higher incidence of parasites in the developing world *(20)*. In some rural areas in Bahrain the hygienic conditions are relatively poor, which leads to a higher prevalence of parasitic infections in these regions. Mobayed, Kamal, and El-Gashy *(21)* showed that parasitic infections were almost double among rural children compared to urban children. This is supported by a study by Musaiger and Aldallal *(30)* which reported that deaths due to infectious and parasitic diseases are higher in rural than in urban areas of Bahrain.

Immigrants also play an important role in spreading intestinal parasites among the local populations. The majority of immigrants in Bahrain come from endemic countries such as India, Pakistan, and Sri Lanka. The Public Health Directorate *(3)* reported that several intestinal parasites were isolated from feces of expatriate food handlers and housemaids who came to work in Bahrain. The main parasites isolated were *Ascaris lumbricoides*, *Trichuris trichura*, hookworms, and *Giardia lamblia*. Reports in other Arabian Gulf countries showed similar findings, as the prevalence of parasitic infections among the immigrants is very high *(31,32)*. In Saudi Arabia, for example, it was found that 44% of Indians involved in catering and domestic work in the Riyadh Military Hospital were infected with parasites *(31)*.

Factors Contributing to Occurrence of Food-borne Outbreaks

Changes in Food Habits

The food habits of the people of Bahrain have changed dramatically during the last two decades, as a result of the increase in income from oil revenue. The consumption of processed and take-out foods has increased steeply. Nowadays the practice of eating out is becoming more popular and thus, people have a greater chance of becoming sick due to eating contaminated foods prepared at restaurants. Moreover, there is a rapid growth of shops and canteens which are providing take-out meals, and many families reheat such meals at home or keep them for a long period before eating. This practice provides the ideal conditions for microbial growth *(8)*.

Food Handlers

Food handlers often have little information about the risks of food contamination or how to avoid it. The work is considered low status and is low paid, which leads to poor motivation *(33)*. The majority of food handlers in Bahrain are low socioeconomic expatriates who came from endemic countries such as the Indian-subcontinent and Far East countries. A high percentage of these expatriates work in restaurants and in homes. The Directorate of Public Health *(3)* reported that expatriate food handlers were involved in many bacterial foodborne illness such as salmonellosis, typhoid and paratyphoid fevers, and food-poisoning outbreaks. In addition, several intestinal parasites were isolated from feces of food handlers and housemaids during their routine medical checkups.

Illiteracy and poor personal hygiene are the main characteristics of food handlers in Bahrain (including Bahraini workers). This has complicated the problems, especially in that the expatriates cannot understand Arabic and this makes the health-education campaigns through various mass media useless. A study on the problems encountered by food inspectors in Bahrain showed that 91% of these inspectors had difficulties in communicating with food handlers, because of language barriers *(8)*.

Another important factor is the increase in the demand for the services of foreign housemaids by Bahraini families. Even unemployed mothers depend on the services of

housemaids to help in home management, preparation and cooking the meals. These housemaids are poorly educated, have little or no information on hygienic preparation of foods and probably play an important role in the occurrence of many cases of food poisoning at home.

Lack of Health Awareness

Ignorance on sound handling, preparation, and storage of foods is common among both food handlers and the public. Most food-poisoning outbreaks which occurred in homes, restaurants, and schools in the country have been due to lack of knowledge about food preparation such as improper thawing of frozen foods, inadequate cooking, keeping the cooked food at room temperature for several hours, and bad personal hygiene during preparation of foods *(8)*.

A study on food sanitation knowledge and practices of 372 Bahraini housewives showed that 13% of them did not cover their hair and 28% did not remove their rings during food preparation and cooking. Moreover, 54% of those housewives thawed frozen food in a water bath and 34% at room temperature. About 60% of those who eat grilled fish did not eviscerate it before grilling. Among the total samples, 18% had at least one episode of diarrhea during the month proceding the survey *(34)*.

Environmental Pollution

Foods can be contaminated due to environmental pollution of drinking water, sea, and air. The Ministry of Health *(4)* in Bahrain reported that 5% of water samples tested in the Public Health Laboratory were unsatisfactory (based on coliform tests). Contamination of tap water may come from leaks in the pipes or contaminated tanks.

Another source of contamination is spring water. Bahrain has many natural springs which are used for swimming, washing, irrigation purposes, and possibly food preparation. These natural springs may pose a health hazard if polluted with pathogenic organisms *(35)*. In 1975, an outbreak of paratyphoid fever occurred in a village in Bahrain. On investigation it was found that this outbreak had originated from one of the natural springs in the village *(36)*.

Unlike deep ground water, spring waters are more easily contaminated by feces of both animals and humans. The bacteriological quality of 12 springs in Bahrain were studied by Khunji, Musaiger, and Mohana (35). It was found that fecal coliforms were presented in 11 of 12 springs studied, and three springs were heavily contaminated with fecal coliforms. All springs may be contaminated with animal wastes (using the ratio of fecal coliforms to fecal streptococci as indicators for human and animal wastes). Neither *Salmonella* nor *Shigella* were detected in the spring waters.

In Bahrain, treated and untreated sewage effluents are dumped into the sea and this can create two kinds of health problems: the risk of contaminating bathing water and beaches and the risk of contaminating fish and shellfish. Effluents treated with conventional methods may still contain large amounts of viruses and parasitic ova and cysts. The coastal water quality at the main beaches of Bahrain was assessed for fecal pollution *(37)*. The results indicated that two out of seven beaches surveyed were polluted, but the pollution did not exceed EEC standards. The performance of three different types of existing sewage-treatment methods was also assessed, and findings showed that a conventional sewage-treatment system was producing the highest chemical and bacteriological quality effluents. The effluents, however, which are intended for reuse, still contained parasites, mostly *Strongyloides stercoralis* larvae. On the other hand, an overloaded waste stabilization-pond system was producing parasite-free effluents.

Inadequate Legislation and Regulations Related to Food Safety

Most outbreaks of foodborne disease throughout the world are caused by failure to observe satisfactory standards in the preparation, processing, handling, and storing of food *(33)*. National food standards are lacking in many aspects related to food safety *(38)*. Adequate legislation and regulations for food handling and processing are a great help in keeping food safe for human consumption. Although Bahrain adopted the Food Hygiene Regulations recommended by the Code Alimentarius Committee of FAO/WHO, the need for regulations to consider the local situations is essential.

Inadequate Training of Workers Involved in Food Inspection

Food and health inspectors usually receive little training through their education. These inspectors are rarely updated about the new trends in food and health inspection. In addition, their training contains little information about the local situation. For example, the majority of food inspectors did not receive any training in implementation of the HACCP system. This system ensures that all foodhandling operations are properly controlled and has proved to be more efficient and cost-effective than traditional systems *(33)*.

Prevention and Control

Despite the improvement in the sanitary and health situation in Bahrain over the past decade, food-borne diseases remain a problem of concern. A number of factors are responsible for the prevalence of these diseases, such as food handling personnel, lack of health awareness, and environmental pollution. It is essential, therefore, to establish an effective program to prevent and control food-borne diseases in this country. To achieve that

measures should be adopted. These measures can be divided into two categories, local and regional measures.

Local Measures

It is well recognized that without an effective food-quality control system, it would be difficult to ensure that food supplies are safe. To obtain an adequate and effective food-safety program in this country the following measures should be taken into consideration:

1. Revising the current Food Law. Unfortunately the Law is far from being comprehensive. In view of the rapid technical development in food processing and handling, more attention should be given to updating the current Food Law, with more emphasis on local situations.
2. Active and effective food-inspection services. Food inspection in Bahrain has concentrated more on general hygienic and sanitation aspects, without taking into consideration many other sources of contamination of foods. This is particularly true given the great limitations in facilities and number of health inspectors. Inspection should focus on storage and preservation of foods, cooking methods, cleaning materials and methods, sterilization and disinfection, kitchen design and equipment and control of infestation. This can be done effectively through adoption of the HACCP system.
3. Improve quality and quantity of analytical services. This can be achieved by training the staff and carrying out more chemical tests such as determining pesticide residues in foods, mycotoxins, food additives, and artificial hormones.
4. Preparation of food standards which are related to local circumstances in Bahrain. Standards relating to levels of mycotoxins in foods, additives, pesticide residues, and heavy metals are urgently needed. Equipment used in preparation and processing should be standardized to avoid any defect in processing unsafe foods.
5. Proper training for both food inspectors and chemists. This should be done in two ways: in-service training to update knowledge and improve skills of these staffs, and overseas training for senior staff to gain skills in specific techniques or advanced methods in inspection and analysis of foods.
6. Revising the current food inspection organization in order to cover a wider aspect of food control and to increase the efficiency of activities.
7. Involvement of other related governmental and private bodies in preparation of food standards, such as the Directorate of Fisheries, Directorate of Agriculture, Nutrition Unit (at Ministry of Health), the Bahrain Society of Engineers, food factories, and others.
8. Adequate educational programs for the public and foodhandlers on different aspects of food safety. This educational program should be an integral part of the primary health-care education approach *(6)*.

Regional Measures

As the Gulf Cooperation Council countries (GCC) have similar demographic, cultural, and environmental characteristics, cooperation and coordination among these countries in food safety are essential. This is particularly true when we know that there are several regional bodies which can participate effectively in supporting the activities to improve food safety programs in the GCC countries. Among these are the Arab Gulf Standardization and GCC Health Council. It is highly recommended to establish a Food Safety Committee for GCC countries. This committee will be responsible for programs to improve food safety in these countries. The main activities of this committee can be suggested as follows:

1. To work as a consultation committee for food safety for the Governments of GCC countries.
2. To propose procedures for evaluating and monitoring of food safety programs in these countries.
3. To coordinate activities related to food safety in these countries, such as laboratory services, food inspection, and legislation.
4. To recommend various kinds and levels of training programs needed for workers involved in food safety at country and regional levels.
5. To review and update the current regulations and legislation related to food safety.
6. To plan and recommend health-education materials and programs for the public and food handlers.
7. To organize regional conferences, workshops, and symposia in food safety.
8. To work as a liaison with other countries.

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Dairy, Food and Environmental Sanitation encourages readers to submit four-color photographs for consideration to be used on the cover of the journal.

Send photographs and/or negatives to:

Editor, *Dairy Food and Environmental Sanitation*
IAMFES,
6200 Aurora Avenue,
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50322-2838

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Updates

National Institute of Standards Announces Contract Awardee

The U. S. National Institute of Standards and Technology (NIST) has announced that it will award a contract to DuPont Food Quality Management Systems (FQMS) as part of its Advanced Technology Program competition. Forty-one grants were presented in four program areas; the DuPont grant is one of 13 in the highly competitive "Tools for DNA Diagnostics" category. The Advanced Technology Program (ATP) competition has recently been refocused to concentrate its funding on specific technologies identified as offering the best opportunities for major economic return. This specialized competition is one of four that has been conducted by NIST this year; in previous competitions, only about 10 percent of proposals have been funded.

The DuPont proposal reflects its goal to develop a cost-effective, automated DNA diagnostic system based on DNA amplification. The system will be sufficiently versatile and user-friendly to enable extensive and routine use of amplification-based diagnostics, with minimal need for special operator skills or specialized laboratory facilities. It will be a PCR (polymerase chain reaction) based system. PCR is the best suited of the DNA amplification technologies for development of an automated system with maximum versatility. The FQMS approach to an amplification-based system is to combine automation and standardization of PCR with detection by computerized fragment size analysis, to provide maximum depth of information. DuPont's intention is to incorporate these technologies into automated systems for microbial testing.

Work on this project is scheduled to begin in January of 1995 and to be completed in a two-year time frame. The amount of the contract award is approximately $2 million. The FQMS Group is part of the Corporate New Business Development Division of the DuPont Company in Wilmington, DE. Its business is to develop automated systems for microbial testing and to offer these systems to the food industry for quality control purposes.

New Officers to the Association of Water Technologies

The Association of Water Technologies (AWT) proudly announces the appointment of its 1994 – 1995 officers: Jack Altschuler, Maram Corporation (President); John Baum, Craft Products Company, Inc. (Past President); Brent Chettle, W.E.S.T., Inc. (President-elect); i.e., Hannigan, Klenzoid, Inc. (Secretary); and Larry Webb, HVC, Inc. (Treasurer).

Elections were held at Water Technologies '94, AWT's annual convention, in Orlando, FL on October 12, 1994. Mr. Altschuler was honored at the annual awards banquet where he received the presidential gavel from Past President John Baum, signifying his one-year term. AWT is an international, non-profit, trade association which represents over 400 regional water treatment companies and suppliers specializing in commercial and industrial cooling and boiler treatments. The Association provides its members, and the water treatment industry, with a variety of products and services designed to improve the performance of the industry, including a quarterly, full color magazine, annual conventions and expositions, spring conferences and exhibitions, and the Certified Water Technologist (CWT) program.

National Dairy Council® Nutrition Expert Named to American College of Nutrition Board

Gregory D. Miller, Vice President of Nutrition Technical Services for National Dairy Council, has been named to the Board of Directors of the American College of Nutrition (ACN). Miller, who holds a Ph.D. in nutrition, is one of eight ACN directors, a body which includes other nationally recognized nutrition experts.

ACN is a prestigious organization of nutrition scientists that seeks to improve and promote the knowledge and application of nutrition through study, research and publishing. It influences health professionals and nutrition educators through its journal and other communications.

The ACN board determines the organization's policy, strategic direction and public messages regarding nutrition and health issues. Miller, who was appointed head of the NDC nutrition research/technical services program in January, 1992, formerly was a senior research scientist for Kraft General Foods. He holds Ph.D. and M.S. degrees in nutrition from Pennsylvania State University and a B.S. degree in nutrition from Michigan State University.

Custom Control Products Adds Baugrud, Borchardt and Tupy to the Staff

Custom Control Products, Inc. recently announced the addition of Jackie Baugrud to the staff.

As Sales & Marketing Manager, Baugrud will be responsible for expanding and developing existing and new markets for CCPI's products and services. CCPI also recently announced the addition of two projects engineers to the engineering team.

As Project Engineers, David Borchardt and Russell Tupy will be involved in all phases of automated control system projects. They will quote on control systems, design the hardware and software, assist with the installation and train and service the customer.

Custom Control Products tailors each system to the particular needs of the customer, paying close attention to incorporating growth potential. CPPI uses only system components that are commercially available anywhere, thereby avoiding the home-grown single source liability.

Daniel O'Sullivan Joins University of Minnesota Food Science and Nutrition Faculty

On October 17, 1994, Daniel O'Sullivan joined the faculty of the Department of Food Science and Nutrition, University of Minnesota, as an assistant professor.

Sullivan came to the University of Minnesota from a research associate position at North Carolina State University in Raleigh, where he worked with Todd Klaenhammer, Ph.D., in the Department of Food Science. O'Sullivan, a native of Ireland, earned his Ph.D. in Microbiology at University College, Cork in 1990.

While completing his doctorate, he was a research scientist at the National Food Biotechnology Center in Cork. In addition to many refereed publications, O'Sullivan has written chapters in five books; made presentations in Canada, the Netherlands, Switzerland, England, and the United States; and participated in research experiences in Spain and the Netherlands, funded by European Community programs.

Dr. O'Sullivan will play a key role in the Department's teaching and research activities in food microbiology and biotechnology.

Awards Nominations

IAMFES

1995

The International Association of Milk, Food and Environmental Sanitarians is proud of its members and their contributions. As a member, you are entitled to nominate deserving colleagues for the IAMFES Awards.

Nomination forms need to be completed and back to the Des Moines office by April 1, 1995.

1. Previous award winners are not eligible for the same award. Check pages 34 and 35 in this issue for a complete listing of past award winners.
2. Current Executive Board members are not eligible for nomination.
3. Candidates must be current IAMFES members in order to be nominated.

Presentation of these awards will be made during the Annual Awards Banquet on August 2.

NOMINATION FORMS MAY BE OBTAINED FROM: (Be sure to tell us for which award(s) you will be making a nomination. Each award nomination form is different.)

Steven K. Halstead, CAE
IAMFES, Awards
Suite 200W
6200 Aurora Avenue
Des Moines, IA 50322

Questions? Call 800-369-6337, 8-4:30 Central time weekdays, or FAX 515-276-8655.

- **Sanitarians Award — $1000 Award and Plaque**
  Recognizes an individual for outstanding service to the profession of the Sanitarian.
- **Educator Award — $1000 Award and Plaque**
  Presented to an educator in recognition of outstanding service in academic contributions to the profession of the Sanitarian.
- **Citation Award — Plaque**
  Recognizes an individual for many years of devotion to the ideals and objectives of the association.
- **Harold Barnum Industry Award — $500 Award and Plaque**
  Recognizes an individual for outstanding service to the public, IAMFES and the profession of the Sanitarian.
- **Honorary Life Membership Award — Plaque and Lifetime Membership with IAMFES**
  For an individual's devotion to the high ideals and principles of IAMFES.
- **Black Pearl Award — Black Pearl, Encased in Glass**
  Recognizes a company for its outstanding achievement in corporate excellence in food safety and quality.

Nominate a deserving colleague or company for one or more of these prestigious IAMFES Awards

Past Awardees

EDUCATOR-INDUSTRY AWARD

1973-Walter A. Krienke
1974-Richard P. March
1975-K. G. Weckel
1976-Burdet H Heinemann
1977-Elmer H. Marth
1978-James B. Smathers
1979-Joseph Edmondson
1980-James R. Welch
1981-Francis F. Busta

In 1982 this award was split into the Educator Award and the Harold Barnum Award (for industry).

EDUCATOR AWARD

1982-Floyd Bodyfelt
1983-John Bruhn
1984-R. Burt Maxcy
1985-Lloyd B. Bullerman
1986-Robert T. Marshall
1987-David K. Bandler
1988-Edmund A. Zottola
1989-Vernal Packard
1990-Michael Stiles
1991-William E. Sandine
1992-William S. LaGrange
1993-Irving J. Pflug
1994-Kenneth R. Swartzel

HAROLD BARNUM AWARD

1982-Howard Ferreira
1983-C. Dee Clingman
1984-Omer Majerus
1985-William L. Arledge
1986-Hugh C. Munns
1987-J. H. Silliker
1988-Kenneth Kirby
1989-Lowell Allen
1990-Roy Ginn
1991-Thomas C. Everson
1992-Ronald Case
1993-David D. Fry
1994-R. Bruce Tompkin

CITATION AWARD

1951-J. H. Shrader and William B. Palmer (posthumously)
1952-C. A. Abele
1953-Clarence Weber
1954-C. K. Johns
1955-R. G. Ross
1956-K. G. Weckel
1957-Fred C. Baselt
1958-Milton R. Fisher
1959-John D. Faulkner
1960-Luther A. Black
1961-Harold S. Adams
1962-Franklin W. Barber
1963-Merle P. Baker
1964-W. K. Moseley
1965-H. L. Thomasson
1966-J. C. Olson, Jr.
1967-William V. Hickey
1968-A. Kelley Saunders
1969-Karl K. Jones
1970-Ivan E. Parkin
1971-L. Wayne Brown
1972-Ben Luce
1973-Samuel O. Noles
1974-John C. Schilling
1975-A. R. Brazis
1976-James Meany
1977-None Given
1978-Raymond A. Belknap
1979-Harold E. Thompson, Jr.
1980-Don Raffel
1981-Henry V. Atherton
1982-None Given
1983-William B. Hasting
1984-Elmer H. Marth
1985-Ralston B. Read, Jr.
1986-Cecil E. White
1987-None Given
1988-Carl Vanderzant
1989-Clem Honer
1990-None Given
1991-Frank Bryan
1992-Ewen C. D. Todd
1993-Robert C. Tiffin
1994-Sidney E. Barnard

SANITARIANS AWARD

1952-Paul Corash
1953-E. F. Meyers
1954-Kelley G. Vester
1955-B. G. Tennent
1956-John H. Fritz
1957-Harold J. Barnum
1958-Karl A. Mohr
1959-William Kempa
1960-James C. Barringer
1961-Martin C. Donovan
1962-Larry Gordon
1963-R. L. Cooper
1964-None Given
1965-Harold R. Irvin
1966-Paris B. Boles
1967-Roger L. Stephens
1968-Roy T. Olson
1969-W. R. McLean
1970-None Given
1971-Shelby Johnson
1972-Ambrose P. Bell
1973-None Given
1974-Clarence K. Luchterhand
1975-Samuel C. Rich
1976-M. W. Jefferson
1977-Harold Bengsch
1978-Orlowe Osten
1979-Bailus Walker, Jr.
1980-John A. Baghott
1981-Paul Pace
1982-Edwin L. Ruppert
1983-None Given
1984-Harold Wainess
1985-Harry Haverland
1986-Jay Boosinger
1987-Erwin P. Gadd
1988-Kirmon Smith
1989-Robert Gales
1990-Leon Townsend
1991-James I. Kennedy
1992-Dick B. Whitehead
1993-Lawrence Roth
1994-Charles Price

HONORARY LIFE MEMBERSHIP AWARD

1957-J. H. Shrader
1958-H. Clifford Goslee
1959-William H. Price
1960-None Given
1961-Sarah Vance Dugan
1962-None Given
1963-C. K. Johns and Harold Macy
1964-C. B. and A. L. Shogren
1965-Fred Basselt and Ivan Parkin
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1971-Wiliam V. Hickey

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1974-H. L. Thomasson and
K. G. Weckel
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1976-A. Bender Luce
1977-Harold Heiskell
1978-Karl K. Jones
1979-Joseph C. Olson, Jr.
1980-Alvin E. Tesdal
1981-Robert M. Parker
1982-None Given
1983-Orlowe Osten
1985-Patrick J. Dolan,
Franklin W. Barber and
Clarence K. Luchterhand
1986-John G. Collier
1987-Elmer Marth and
James Jezeski
1988-Kenneth Whaley and
Paul J. Pace
1989-Earl Wright
Vernon Cupps
1990-Joseph E. Edmondson
1991-Leon Townsend
Dick B. Whitehead
1992-A. Richard Brazis
Harry Haverland
1993-None Given
1994-Ken Kirby

BLACK PEARL AWARD

1994-HEB Company
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SHOGREN AWARD

1972-Iowa Affiliate
1973-Kentucky Affiliate
1974-Washington Affiliate
1975-Illinois Affiliate
1976-Wisconsin Affiliate
1977-Minnesota Affiliate
1978-None Given
1979-New York Affiliate
1980-Pennsylvania Affiliate
1981-Missouri Affiliate
1982-South Dakota Affiliate
1983-Washington Affiliate
1984-None Given
1985-Pennsylvania Affiliate
1986-None Given
1987-New York Affiliate
1988-Wisconsin Affiliate
1989-Georgia Affiliate
1990-Texas Affiliate
1991-Georgia Affiliate
1992-Georgia Affiliate
1993-New York Affiliate
1994-Illinois Affiliate

MEMBERSHIP ACHIEVEMENT AWARD

1986-Iowa Affiliate
1987-Florida Affiliate
1988-Florida Affiliate
1989-California Affiliate
1990-California Affiliate
1991-Illinois Affiliate
1992-Illinois Affiliate
1993-California Affiliate
1994-California Affiliate

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1941-L. C. Frank
1942-F. W. Fabian
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1944-C. A. Abele
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1946-R. R. Palmer
1947-R. G. Ross
1948-W. D. Tiedeman
1949-A. W. Fuchs
1950-M. R. Fisher
1951-K. G. Weckel
1952-H. L. Thomasson
1953-H. J. Barnum
1954-John D. Faulkner
1955-I. E. Parkin
1956-Harold S. Adams
1957-Paul Corash
1958-Harold Robinson
1959-Franklin Barber
1960-W. V. Hickey
1961-John Sheuring
1962-Charles E. Walton
1963-Ray Belknap
1964-John H. Fritz
1965-W. C. Lawton
1966-Fred E. Uetz
1967-P. R. Elliker
1968-A. N. Myhr
1969-Samuel O. Noles
1970-Milton E. Held
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1977-H. V. Atherton
1978-David F. Fry
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1980-Bill Kempa
1981-William Arledge
1982-Harry Haverland
1983-Robert Marshall
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1985-Archie Holliday
1986-Sidney E. Barnard
1987-Roy Ginn
1988-Leon Townsend
1989-Robert Gravani
1990-Ron Case
1991-Bob Sanders
1992-Damien A. Gabis
1993-Michael P. Doyle
1994-Harold Bengsch

Researchers Aim to Destroy *Salmonella*, *Campylobacter* on Poultry

Researchers in Penn State's College of Agricultural Sciences are developing a better way to destroy *Salmonella* bacteria, the most common cause of food-borne illness in the United States.

"Raw animal foods, especially poultry products, often are contaminated with pathogenic bacteria such as *Salmonella*," says Stephen Knabel, assistant professor of Food Science. "Cooking poultry to a minimum internal temperature of at least 165°F makes it safe to eat by killing these bacteria, but we would like to reduce the chance for contamination in case people undercook poultry."

Research indicates that much of the contamination occurs when poultry is processed and packaged. "About 5 percent of live poultry are contaminated with *Salmonella*," Knabel notes. "But after processing, nearly half of the carcasses contain *Salmonella* and almost 100% contain *Campylobacter*, another pathogen. Both spread during defeathering and chilling."

Knabel has teamed up with Stephanie Doores, associate professor of Food Science, to find a way to destroy the microbes during processing. They are determining how quickly *Salmonella*, *Campylobacter*, and *Listeria monocytogenes* die at different pH levels.

Knabel already has demonstrated that using high pH and warm washwater prevents *Salmonella* contamination in eggs. "*Salmonella* were very rapidly destroyed in high pH washwater, with the rate increasing dramatically as the temperature rises above 100°F," says Knabel. "*Listeria monocytogenes* and *Yersinia enterocolitica* also die more rapidly at higher pH levels and higher temperatures. The high pH washwater causes the cytoplasmic membrane of these cells to weaken and burst. "Basically, they just spill their insides and shrivel up like little raisins," Knabel says. "This appears to be an excellent strategy to destroy food-borne pathogens in general. It totally eliminated cross-contamination of eggs during simulated commercial egg washing, and it costs less than irradiation. This strategy also may dramatically reduce pathogens on poultry, and perhaps on beef and swine carcasses."

To find out just how effective the strategy is and whether it will affect food quality, the researchers will artifically and naturally contaminate broilers, then process them using various pH, temperature and chemical water treatments. The birds will be sampled for contamination before processing, after defeathering, after chilling and after refrigerated storage.

"We determine the total bacteria count and also check for the presence of *Salmonella*, *Campylobacter* and *Listeria monocytogenes*," Knabel says. "To determine if the treatments affect product quality, we're also conducting consumer taste tests on baked chicken. We'll refine any treatments that destroy pathogens without affecting food quality."

Knabel also is working with researchers in Penn State's Dairy and Animal Science and Veterinary Science departments to destroy *E. coli* O157:H7 on beef carcasses. "We hope new treatments may be available to processors within a few years," Knabel says.

New Manual, Workshops Help Food Processors Manage Waste

What do apple peels, broccoli stems and whey have in common? They are among the wastes made by food processing companies. In Pennsylvania, nearly 2,500 food processors generate approximately 5 million tons of these wastes each year.

What becomes of those broken chocolate bars, vegetable trimmings, animal fats and other by-products? Too often in the past, say researchers in Penn State's College of Agricultural Sciences, these food processing residuals have ended up in the state's dwindling landfill space. Now Pennsylvania processors have better options.

"Unlike other industrial waste, food processing by-products rarely have toxic chemicals, heavy metals or pathogens," says Dr. Paul Robillard, associate professor of Agricultural Engineering. "They typically aren't a human health threat, and their nutrient and organic content can even make them valuable."

Wastes such as trimmings from vegetable packing plants often are similar to raw agricultural products. "Some of these 'wastes' can be fed directly to livestock," Robillard says. "Many also can be used as fertilizers or soil conditioners."

A new Food Processing Residual Management Manual compiles regulatory policy and principles with a step-by-step guide to evaluating and enhancing food processing waste management.

Compiled by Robillard, senior research technologist Kelli Martin, and Robin Brandt of GeoDecisions in State College, and with assistance from regulatory and industry officials, the Food Processing Residual Management Manual is a

comprehensive guide to managing food processing wastes. It features a step-by-step program review, a technology update, case studies, a comprehensive bibliography, an odor characterization chart, a laboratory listing, a source reduction manual, and a list of regulatory agency contacts.

To help food processors learn more about the manual and new regulations, orientation workshops will be held throughout the state in coming months. Workshops were held in Harrisburg, Oct. 28 and Mercer, Nov. 18. Others will be held in Doylestown, Jan. 27; Wilkes-Barre, Feb. 24 and New Kensington, March 31.

For more information about the workshops or the manual, write to the Pennsylvania Department of Environmental Resources, P.O. Box 8472, Harrisburg, PA 17105-8472, Attention: FPR Publication #2500-BK-DER-1649, or call (717)787-7381.

Mastitis Expert System for Dairy Farms Nears Completion

Pennsylvania dairy farmers will soon have a new tool to help control mastitis, the costliest disease of dairy cattle. A computerized expert system developed at Penn State will be field-tested over the next several months and may be available statewide as early as next year.

"Mastitis is the most expensive cow health problem in the dairy industry," says Dr. William Heald, professor of dairy and animal science. "By cutting milk production, ruining udder tissue and even killing cows, the disease causes estimated annual losses of $200 per cow. That's a loss of about $2 billion in North America every year."

Developed by Heald and other researchers in Penn State's College of Agricultural Sciences, the system can help dairy producers minimize herd udder health problems. Dairy consultants can use it to help their clients develop more effective control programs.

National Dairy Council® Nutrition Education Materials Win Quality Awards

Video and print materials supporting ongoing National Dairy Council nutrition education programs have won four awards for excellence from prestigious organizations this fall. "Eat a Good and Healthy Breakfast Every Day – Day," also known as "E.A.G.A.H.B.E.D.D.," received a Gold Plaque Award from the International Communication Film & Video Festival in the Educational – Child Audience category.

The 13-minute video segment also won a 1994 Award of Excellence in Education from the American Society of Association Executives in the Community Service Education Program category. The program stars Marc Weiner, creator of "Weinerville®," a popular children's program broadcast on the Nickelodeon® cable channel. The video brings the familiar sights, sounds and characters of "Weinerville®" into nutrition education to teach children the importance of eating a healthy breakfast. It is accompanied by a 12-page teacher guide containing ideas for age-appropriate classroom exercises for students in grades three through five.

"The awards represent a 'seal of quality' for nutrition education in video and print media. They will serve to further encourage educators and health professionals to make use of our materials," said Alice Negratti, NDC Senior Vice President.

The development of the above programs was overseen by NDC's Nutrition Education Committee, comprised of staff from UDIA's Nutrition Education Committee, comprised of staff from UDIA's state/regional member organizations.

To order copies of these award-winning materials, or for more information, contact your local Dairy Council. Call 1-800-426-8271 for the number of the Dairy Council nearest you.

General Mills Cereal Case Finds Contractor Guilty

The independent contractor who sprayed an illegal pesticide on General Mills, Inc. oats, resulting in the destruction of millions of boxes of cereal, was found guilty by a federal jury on 13 counts.

Y. George Roggy, 45 years old, was convicted of 11 counts of mail fraud for knowingly billing the company for the wrong spray, and one count each of adulterating food and misusing pesticides. He could face over 50 years in prison and several millions of dollars in fines. No sentencing date was set.

The government contended that Mr. Roggy, of Edina, MN., deliberately used an illegal fungicide, which was cheaper than the authorized spray, apparently because his one-man company was experiencing financial difficulties. His deception lasted over a year and tainted 19 million bushels of oats.

As a result, General Mills was forced to temporarily halt production of some of its best – selling cereals, including Cheerios and Lucky Charms, and destroy millions of boxes of product. The company estimated its loss at $140 million. U.S. Atty. David Lillehaug said Mr. Roggy's conviction shows that "it never pays to tamper with our nation's food supply."

Reprinted from The Wall Street Journal, *November 16, 1994, p. B11.*

Chr. Hansen's Sets New Symposium Dates

Chr. Hansen's Laboratory, Inc. of Milwaukee, Wisconsin, has set April 11 and 12, 1995, as the dates for the second annual Cultured Dairy Products Symposium. The Symposium will once again be held in Milwaukee, Wisconsin, and will feature presentations by industry-leading suppliers, manufacturers, as well as academic and European experts. The 1994 Symposium was termed very successful by the more than 130 participants who benefited from the informative presentations and the lively discussion groups throughout the two day event. Chr. Hansen's will provide background on 1995 Symposium content, topics and speakers as the information becomes available. Please feel free to contact Chr. Hansen's Dr. Bill Watrous at 1-800-558-0802 if you have suggestions, comments or questions regarding program content. As last year's program was quickly filled to capacity, please mark your calendars for April 11 and 12, 1995, and plan to attend.

Food Leaders Meeting to Address Consumer Demands

More than 100 top executives from major American food production companies, trade associations, consumer organizations and government agencies conducted a landmark meeting October 1-6, 1994 in St. Louis to assess consumers' demands and begin charting the future direction of the nation's food industry. The group was seeking to determine what foods American consumers will demand in the future, how those foods will be produced, and how safe and affordable they will be. The results of two major consumer studies will be released at the meeting outlining American public opinion regarding the foods we eat and what consumers will want to eat in the future. The studies are being conducted by FoodWatch and the national 4-H and FFA organizations. In addition, The Gallop Organization presented a summary of their recent consumer polls pertaining to America's food supply. Top executives from companies such as Pet, Inc., Farmland Industries, Purina Mills, Hardee's Food Systems, BASF, Monsanto, Archer Daniels Midland and Merck & Co., will join executives from organizations including the Food Marketing Institute, Project Food Land & People, USDA, FDA, National Livestock and Meat Board, Hudson Institute, National Center for Policy Analysis, Agriculture Council of America and the Animal Health Institute in exploratory sessions and a special town hall meeting to probe consumer opinions in key areas affecting our nation's food production system including:

- Consumers' eating habits today and tomorrow;
- Role of Biotechnology;
- Food safety;
- Role of animals in food production;
- Sustainable agriculture and organic farming;
- Food supply and cost;
- Environment impact of food production; and
- Role of government and industry regulation.

John Stossel of ABC-TV's Prime Time was the moderator of the town hall meeting on October 5 and 6. Also in attendance were more than 100 top youth leaders from the national 4-H and FFA organizations representing all fifty states and U.S. territories. The meeting served as the kickoff of a nationwide campaign to be conducted by the American Agribusiness Ambassadors and the national youth organizations to educate consumers about the future direction of the food industry. "We came away from this meeting with a very clear idea of where our country's food production system was headed in the future," said Edward L. McMillan, president and CEO of Purina Mills, Inc., sponsor of the conference. "With the large amount of media attention focused on our food system today coupled with President Clinton's upcoming town hall meeting with farmers in Iowa this winter, this conference and public education campaign was very timely for the American consumer." Purina Mills sponsored the event as part of the company's 100th anniversary celebration. The company is the largest producer and distributor of animal nutrition products and services in the United States. "Consumers are demanding safer, higher quality and more nutritious foods at reasonable prices, while special interest groups are generating increasing public concern over the way foods are produced," McMillan added. "We at Purina Mills see ourselves as a crucial part of the food industry, and we're extremely interested in learning more about what the consumer knows, wants and needs so that we can continue to develop our animal nutrition programs to enhance the quality, safety and quantity of the food that reaches the American dinner table." Purina Mills is headquarted in St. Louis. Both the national 4-H and FFA organizations are headquartered in Washington, D.C.

Industry**Products**

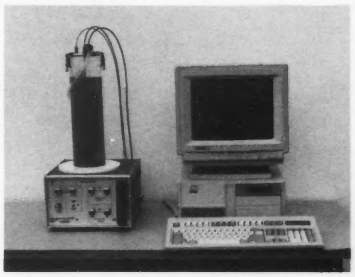
VICAM Introduces Two 24-Hour Rapid Test Kits for *Salmonella enteritidis*, and *Salmonella*

VICAM, has introduced two 24 h rapid test kits, SE Screen/Verify for the detection of *Salmonella enteritidis*, and *Salmonella* (Screen/Verify for the detection of *Salmonella*). VICAM offers the first SE test which is truly specific for the *S. enteritidis* orgamism. VICAM is dedicated to developing rapid, accurate, tests which are easy to use and AOAC approved. SE Screen/Verify and *Salmonella* Screen/Verify are solely being utilized in the environment and egg testing portion of the United Egg Producers "5 Star" Quality Food Safety Program.

Dr. Barb Jackson, Chief Scientist and Director of Research & Development for VICAM, stated "The ability to test for SE and *Salmonella* within 24 h on site is a spectacular breakthrough which will help all of us to more quickly reach the goals of enhanced food safety and confidence. Never before has the technology been available to detect SE and *Salmonella* so quickly and in house. This breakthrough will catapult food safety assurance to new level, while also ensuring confidentiality."

Since 1985, VICAM has contributed to food safety by marketing rapid test kits for the detection of pathogens and agricultural toxins in food products and feeds. These contaminants are routinely monitored by the food industry to ensure food safety. VICAM's products include Aflatest, Fumonitest, Ochratest, and Zearalatest for the detection of fungal toxins. VICAM also markets tests for the detection of *Listeria*, *Listeria monocytogenes*, *Salmonella* and *Salmonella enteritidis*. VICAM – Watertown, MA.

Reader Service No. 328



On-Line Respirometer

New Columbus Instruments' O_2/CO_2 Respirometer, *Envitro-1*, is intended for testing respiration of activated sludge in flow through chamber. Supply of air, and hence oxygen, is precisely measured by air mass flow meter. Incoming air is bubbled through the sludge to assure optimal gas exchange between dissolved gases and those in the head space. The depletion of oxygen and the increase in the CO_2 levels in the container's head space is measured with high precision gaseous oxygen and CO_2 sensors while oxygen consumption is calculated in mg O_2/Liter of sludge/min. utilizing an IBM-PC compatible computer. Results are periodically printed and presented in reasl time graphs.

Due to Columbus Instruments' innovative design, there is no need for a complete seal of the chamber. Also, as the *Envitro-1* system utilizes gas sensors which are not in contact with measured liquid, there is no problem with sensor contamination and clogging associated with dissolved oxygen sensors.

The *Envitro-1* can also be used to measure respiration of a solid sample such as compost. In such application, the only change will be in the design of the measuring chamber, while all other elements (including software, O_2 and CO_2 sensors and air supply system) will remain the same. Columbus Instruments – Columbus, OH.

Reader Service No. 320

A Practical Solution to *E. coli* 0157:H7 Screening

The growing impetus upon the meat industry to protect consumers from a dangerous strain of *Escherichia coli* bacteria has meat processors scrambling to implement new screening procedures. The EHEC-Tek™ test kit offers a practical and efficient method for laboratory testing of ground beef samples. Introduced last year by Organon Teknika, EHEC-Tek™ provides screening for *E. coli* O157:H7 in just 24 h and reduces the need for confirmatory testing.

EHEC-Tek™ utilizes a monoclonal antibody developed by Doyle and Padhye which is specific for both the O157 and H7 antigens. Other *E. coli* screening kits may detect only the O157 antigen, resulting in a false positive rate of

10 to 15%. The highly – specific EHEC-Tek™ reduces that rate to less than 3% and cuts the need for confirmatory testing by two-thirds.

For example, a laboratory performing 35 *E. coli* O157:H7 screens per week with a false positive rate of 12% would be required to run confirmatory testing on as many as four presumptive positives. Similarly, a laboratory could expect to run confirmatory procedures on only one presumptive positive per week with EHEC-Tek™. Since *E. coli* is one of the most laborious confirmatory procedures, this substantially adds to laboratories' overall testing costs. Savings with EHEC-Tek™ can be measured in reduced technician hours, as well as fewer supplies and inventory holding delays.

The assay is capable of detecting one organism in 25 g of raw ground beef. The kit is easy to use as well – requiring less than 30 min of hands-on test time. The simple procedure employs a 20 to 24 h enrichment, followed by assay with the ELISA. Presumptive positives are indicated by a highly – visible color change in less than 2 h, allowing the laboratory to release negative product as early as the second day. Large or small volume laboratories can make efficient use of the EHEC-Tek™ kit. With the test's convenient micro-well plate format, up to 93 samples can be assayed simultaneously.

The EHEC-Tek™ test is based on Organon Teknika's patented enzyme-linked immunosorbent assay (ELISA) technology. This self-contained kit is similiar to other pathogen screening kits produced by Organon Teknika – including Salmonella-Tek™ and g™. The ELISA tests provide reliable, objective results and can be performed using common laboratory equipment. Organon Teknika Corporation is part of the Pharma Group companies of Akzo Nobel. Organon Teknika – Durham, NC.

Reader Service No. 329

The IsoScreen *Salmonella* Detection System

The IsoScreen *Salmonella* is a new, 18 h detection kit for the presence/absence of *Salmonella*. This assay is a basic, direct heterogeneous system which uses a chemiluminescent labeled monoclonal antibody and picks up all known *Salmonella* with just one antibody. Total assay time is less than 18 h with no cross reactivity and sensitivity of 5×10^3 p/ml. There are no auger plates or selective broths needed...only an enrichment broth of Buffered Peptone water is needed. The actual test time after the enrichment broth is 25 min on the CapsureVac system versus the standard method of 24-48 h to grow up colonies on auger plates. This antibody is used exclusively with Stratecon's membrane based equipment with quantitative detection using luminescence.

The CapsureVac System is rapid, portable, flexible and disposable. The system is enhanced with quantitative instrumentation that provides sensitivity via the FotoMax lumino-meter. Stratecon Diagnostics Int'l. – Boston, MA.

Reader Service No. 310

"Trained," Invisible Army of Good Bacteria to Gobble Up Food Processing Waste

Food processors can avoid costly plumbing bills and even shutdowns caused by grease-clogged drains with new DB-X200, a bio-formulated product from Bacteria Concepts Inc. The product uses "good bacteria" – living organisms that consume oils, greases and other organic contaminants from food processing operations and convert them into non-polluting, harmless substances.

Nature's waste degraders, bacteria, are found naturally in our rivers and streams. They consume organic waste products and clean up the water. They are present in the human body, and are used in many food processes. These are not harmful "germs," but "good," helpful bacteria essential to healthy living.

DB-X200 is a scientific blend of multiple strains of naturally occurring active bacteria specially "trained" to digest different organic wastes such as fat, grease, oil, protein, starch, cellulose, detergent and more. The bacteria strains work together, multiplying every 15 min, to clean up excessive organic wastes commonly found in drain lines and grease traps of food pro-cessing plants. The only by-products from this process are water and carbon dioxide – the naturally occurring harmless gas that puts the fizz into soda. And, best of all, DB-X200 has no corrosive effect on pipes! Bacteria Concepts Inc. – Downers Grove, IL.

Reader Service No. 311

Improved GENE-TRAK® *Salmonella* Assay Granted AOAC Status

GENE-TRAK Systems announced today that the improved colorimetric DNA hybridization method for the detection of *Salmonella* has been approved by the official Methods Board of the Association of Official Analytical Chemists (AOAC). The GENE-TRAK *Salmonella* Assay is one of seven colorimetric DNA hybridization assays offered by GENE-TRAK Systems Corporation for detection of food-borne pathogens.

Salmonella, a common food-borne microorganism, can be

present in food and the gastrointestinal tract of animals. When ingested by humans, it is capable of causing serious gastrointestinal disease. Infants, young children, the elderly and immunocompromised individuals are especially susceptible to *Salmonella* infection and fatality rates are highest in these groups. Because of these health risks, *Salmonella* testing is one of the most frequent microbiological assays performed by major food producers and independent food laboratories.

The improved GENE-TRAK *Salmonella* Assay reduces the test's total incubation time to 1 h and 48 min, eliminates several manipulations and still provides the level of performance the food industry has come to expect. The analysis, including the enrichment procedure, is completed in 48 h, as compared with conventional microbiological testing methods that can take 4 to 7 d. GENE-TRAK Systems has demonstrated satisfactory results with a 24 h *Salmonella* Assay for raw poultry and carcass rinse which allows food processors to release their raw materials and finished products into production and distribution channels more quickly. GENE-TRAK Systems is in the process of extending its 24 h claims to additional food types. Gene-Trak Systems – Framingham, MA.

Reader Service No. 312

Automated Workstation for Rapid Diagnostics of Food Pathogens

GENE-TRAK Systems announced that an automated workstation is now available to perform the GENE-TRAK Assays. The workstation automates several steps of the GENE-TRAK® Assays, including the *Salmonella*, *Listeria*, *Listeria monocytogenes*, and *E. coli* assays.

The workstation consists of a water bath, incubation chambers, automatic pipettors, a dipstick transfer device, system controls and software combined into one low cost, bench top unit. Assay steps from hybridization through final color development are performed in an automated "hands off" fashion. The instrument can process up to 67 samples in 2 h and 10 min. Hands on time is reduced from 60 min to 15 min. Gene Trak – Framington, MA.

Reader Service No. 313

bioMérieux Vitek's VIDAS® Automated Microbiology System

bioMérieux Vitek's VIDAS® automated microbiological system utilizes a patented Solid Phase Receptacle and special Reagent Test Strips to quickly screen food samples for pathogens, such as *Salmonella*, *Listeria,* and *Staphylococcal enterotoxin*, in as little as 45 min.

VIDAS utilizes a testing format known as ELFA (Enzyme-Linked Fluorescent Immunoassay), a version of the well-known ELISA technology.

The modular architecture of the VIDAS provides random access testing capability for the laboratory. Different assays can be processed simultaneously or initiated at various times, as designated by the operator.

Virtually any combination of assays can be processed in a single batch. The flexibility of the VIDAS allows QA/QC personnel to mix and match quantities and types of assays as dictated by the lab's workflow.

The VIDAS may be operated as a stand-alone system or in concert with the VITEK® or Bactometer® Systems with the Vitek nerve center computer.

A mini VIDAS® is available for laboratories with smaller testing volumes. bioMérieux Vitek, Inc., – Hazelwood, MO.

Reader Service No. 315

Bacto® Three-Step Gram Stain Set From Difco Saves Time, More Accurate

Difco Laboratories' new Bacto® Three-Step Gram Stain Set achieves far greater accuracy and less procedural variation by combining the decolorization and counterstaining steps into a single step.

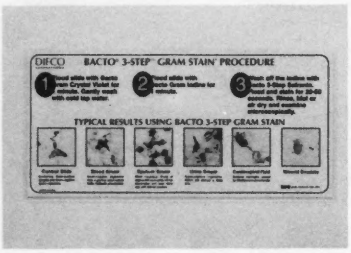
A technological advance over the common four-step gram stain procedure, Bacto Three-Step Gram Stain offers several benefits. A controlled, standardized decolorization minimizes the chance of over-decolorization, increases the accuracy of interpretation, and diminishes variations related to technique. The product saves time by eliminating a rinse and separate decolorization step, and is economical by using three reagents instead of four.

Difco double-filters its gram stains to minimize precipitates and takes other steps to ensure lot-to-lot consistency. The formula does not contain acetone, eliminating the potential for exposure to this hazardous substance.

Bacto Gram Stain comes in

several sizes to fit volume requirements of any laboratory: gallons, 6×250 ml packages, and three- and four-step sets. Gram stain sets are provided in stain-resistant racks for greater convenience. Bacto Three-Step Gram Safranin can be purchased as a separate product. Bacto Stabilized Gram Iodine is also available in the traditional four-step gram stain kit or as a separate component. Difco Laboratories – Detroit, MI.

Reader Service No. 317



Bacto® 3-Step Gram Stain: Free Procedure Chart Available

Difco Laboratories offers a laminated procedure chart for its new 3-Step Gram Stain. In addition to providing the procedure in large, highly legible typesetting, the chart contains color photography of typical clinical specimens stained with the 3-Step Gram Stain.

The 3-Step Gram Stain achieves less procedural variation with results comparable to those of traditional gram stains by combining the decolorization and counterstaining process into a single step. The product saves 25% of the time required for gram staining. Using up to 60% less reagent by eliminating a rinse and separate decolorization step, the 3-Step Gram Stain is economical since it uses three reagents instead of four.

The procedure chart featuring the 3-Step Gram Stain is suitable for mounting on the laboratory wall near the staining sink or near the microscope used for interpretation. Difco Laboratories – Detroit, MI.

Reader Service No. 314

mini VIDAS® Screens for Pathogens in 45 Minutes

The mini VIDAS® is a multiparametric immunoanalysis system from bioMérieux Vitek, Inc. With it, food processors can rapidly screen for pathogens, such as *Salmonella* and *Listeria,* from enriched samples in as little as 45 min. Following extraction of a food sample, a *Staphylococcal enterotoxin* assay can be performed in approximately 80 min.

The mini VIDAS was designed for laboratories with small testing volumes and utilizes a testing format known as ELFA (Enzyme-Linked Fluorescent Immunoassay), a version of the well-known ELISA technology.

One section functions as a compartment for the printer, computer, display screen and keypad. Two other sections are used to process product samples, and can be run independently together for a total of a dozen tests at at time. Results are printed automatically.

For laboratories with larger testing volumes, a larger VIDAS® processes up to 30 samples at the same time. bioMérieux Vitek, Inc. – Hazelwood, MO.

Reader Service No. 319

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New Microscope Objective for High-Resolution Imaging in Water

Carl Zeiss, Inc. has introduced a C- Apochromat 40×/1.2 water objective with unsurpassed optical correction for the high-resolution imaging of specimens in aqueous media.

The use of this objective eliminates refractive index mismatch and the effects of temperature changes on image quality. Compensation covers the range of 24° C to 37° C and corrections can also be made for coverslip thicknesses from 0.14 to 0.18mm. With these features, the C-Apochromat 40×/1.2 objective practically eliminates spherical aberratin when imaging live tissue or cells and markedly improves the sharpness, contrast and brightness of the image.

In fluorescence microscopy, the high degree of chromatic correction (planapochromatic) assures both axial and peripheral co-localization of UV-green-red excitation/emission and exceptionally high transmission in the near-UV and over the full visible spectrum. This makes the C-Apochromat 40×/1.2 the objective of choice for demanding fluorescence applications. Microscope Division, Carl Zeiss. Inc. – Thornwood, NY.

Reader Service No. 321

New Zoom Transmission Electron Microscope EM 906

Up to now, adjusting important imaging parameters on a transmission electron microscope, such as kV, magnification, diffraction camera length and image orientation, could only be selected in fixed settings.

The Zeiss EM 906, is a new type of TEM. Its optimized electron optical hardware and intelligent computerization allow, for the first time, continuous control of all these parameters in real time.

With the EM 906, there is:

- continuous magnification zoom from 40× to 600,000× with no change in image orientation,
- constant image brightness throughout the magnification range,
- continuous diffraction camera length zoom from 180 mm to 1,600 m,
- electromagnetic image orientation in all magnification ranges.

These new features allow optimum adjustment of the image size and orientation to the recording format. Together with the instrument's capability to perform user-defined, computer-controlled operation sequences, the new imaging capabilities of the EM 906 bring about a new level of operator friendliness.

The advanced, multilayer computer technology of the EM 906, together with its optically precise column configuration, are the vital elements that permit on line continuous variation of the image parameters. Brilliant, high-contrast images with excellent resolution are easily obtained with a complete record of all essential information on the micrograph. The capability for image archive interfacing is standard.

Key importance was given to user comfort in the design of the EM 906. Only four controls are needed in normal operation: magnification, focus, stage position (motorized) and photo record. A complete set of instrument data and parameters including operating conditions and specimen positions may be stored on disk for use in a personal data base or for later recall, thereby allowing personalization of the instrument for different users or for dedicated applications. Electron Optics Division, Carl Zeiss, Inc. – Thornwood, NY.

Reader Service No.324

New Basic™ Laboratory Fume Hoods Economically Provide Ventilation Protection in 4-and 6-Foot Widths

Labconco Corporation, offers the NEW Basic Laboratory Fume Hood for a variety of laboratory fume removal needs. Labconco's most economical chemical fume hood is now available in 4- and 6-foot widths. With its 25" depth and 48" height, it is ideal for rooms with lower ceilings and mobile installations.

The Basic 47 and 70 Laboratory Hoods feature utility ports on the side of the hood that allows electrical cords or tubing from equipment inside the hood to safely pass through to outside utility connections. The NEW Basic Laboratory Hoods are factory prepared for up to three service fixtures and two duplex receptacles. Service fixtures and receptacles are sold separately. A movable blower module mounts in the top of the hood, above the hood or at a remote roof location. The blower may be ordered with the hood or separately.

Other features include an automatic by-pass system assuring fume containment and removal, a removable air foil for easy cleaning and loading, a vertical rising tempered safety glass sash, and a two-piece adjustable baffle.

The Basic Laboratory Hood's interior and exterior is constructed of glacier white 16 gauge epoxy coated steel and resists chemical exposure. A polymer film liner may be added as an option for additional corrosion resistance. Labconco Corporation – Kansas City, MO.

Reader Service No. 325

CQuic™ Plus *E. coli* 0157:H7 Test Kit

CQuic™ Plus *Escherichia coli* O157:H7 Test from Sun International Trading Ltd. is a rapid immunoassay for the detection of food-borne *E. coli* O157:H7 pathogens in pre-riched cultures. Using CQuic Plus involves only one step; simple pipette 100 µl of sample solution into the test stick and wait for a positive or negative indication. Testing performance and results require 15 min, which eliminates special training and/or equipment.

This rapid immunoassay is user-friendly and omits hand washing steps and laborious pipetting. CQuic Plus' built-in visual control zone ensures the test's integrity and provides for a definitive interpretation. CQuic Plus also allows for tailoring the number of tests to available sample size. Sun International, Wilmington, NC

Reader Service No.328

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Reader Service No. 349

Business Opportunites

Laboratory and Chemical Supply Company for sale.

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Employment Opportunites

Environmental Health Manager
Multnomah County (Portland) Oregon

The environmental health program serves a population of 600,000, has a staff of 32 and a budget of $1.8 million. Activities include inspection of restaurants, pools, and other facilities, childhood lead poisoning prevention, and vector control.

Applicants must have at least three years of public health field management experience and a background in environmental health or a related public health field. A masters degree is preferred. Knowledge and experience in Total Quality Management systems, excellent interpersonal skills, and strong leadership abilities are required.

Contact (Deadline 12/10/95) Gary Oxman, MD MPH, Multnomah County Health Department, 426 SW Stark Street, 8th Floor, Portland, OR 97204. Telephone (503) 248-3674.

Multnomah County is an affirmative action/equal opportunity employer.

Coming Events

FEBRUARY

·6-9, **Freezing Technology Short Course,** on the UC-Davis Campus. This intensive course teaches the fundamentals of freezing specific commodities and includes hands-on demonstrations. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

·8-10, **Eighth Australian Food Microbiology Conference** to be held in Melbourne. Utilizing a mixture of local and international speakers, drawn from the key areas of the industry, Academia and Research, the aim of this conference is to provide a wide range of topics of interest to the Food Microbiology Industry. In addition, a poster session will be conducted. For more information, contact Kim King, Conference Secretariat, Food Micro '95, GPO Box 128, Sydney NSW 2001, Australia; phone (612) 262-2277; FAX (612) 262-2323.

·8-10, **10th Annual Freezing Technology for the Frozen Food Industry,** The fee is $555 which includes three lunches and one dinner. Enroll in section 943E300. To enroll or request more information, contact Sharon Munowitch, University Extension, University of California, Davis, CA 95616 or call (916) 757-8899.

·12-15, **International Symposium on Computer Mapping in Epidemiology and Environmental Health,** Tampa, FL; hosted by the World Computer Graphics Foundation – The University of South Florida. For more information, call (813) 974-2386.

·13-14, **4th Annual Cheese Symposium to Introduce Product Research Results,** to be held in Burlingame, CA. The conference focuses on the latest developments in cheese science and technology, and introduces the results of dairy products related research. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

·22-25, **Pharmaceutical Technology, Current Good Manufacturing Practice (cGMP) for Quality Control Laboratory Personnel,** to be held in San Francisco Bay Area, CA. This course provides knowledge about, and an understanding of regulations for drugs and finished pharmaceuticals as they relate to quality control, FDA inspections of quality control laboratories, QC responsibility for clinical trial material and the impact on the industry of "U.S. vs. Barr Laboratories, Inc." To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

·22-Mar. 2, **Pharmaceutical Technology, Project Management in Pharmaceutical Development,** East Brunswick, NJ. This course focuses on making project management effective across the spectrum of applications so that product development scheduling and resource utilization are enchanced. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

·22-26, **Food Technology: Flavors: Their Creation, Definitions and Use ,** a short course to provide an understanding of the nature of flavorings, color and colorings. For more information, contact Registrar, The Center for Professional Advancement, P. O. Box 1052, East Brunswick, NJ 08816; phone (908) 613-4500; FAX (908) 238-9113.

·27-Mar. 1, **Pharmaceutical Technology, Current Good Manufacturing Practice (cGMP) for the Pharmaceutical and Allied Industries;** East Brunswick, NJ. Topics covered will include not only the legal requirements for cGMP in the Federal Food, Drug, and Cosmetic Act but primarily the practical "how to" of purchasing, manufacturing, packaging, labeling and QA/QC, as well as training production personnel in cGMP. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

·25-Mar. 1, **AFFI's Western Frozen Food Convention,** Monterey, Cal.; featuring Guy Vander Jagt – For more information, contact AFFI's Convention Office at (415) 697-6835.

·27-Mar. 2, **Food Technology, Sensory Evaluation,** East Brunswick, NJ. For more information contact Registrar, The Center for Professional Advancement, P. O. Box 1052, East Brunswick, NJ 08816; phone (908) 613-4500; FAX (908) 238-9113.

27-Mar. 2, Better Process Control School, a course to be offered by UC-Davis campus. The fee is $475.00 and includes four lunches and the text. For more information or to enroll, call toll-free in California (800) 752-0881. Outside California, call (916) 757-8777.

MARCH

·2-3, **Food Technology, Regulatory Compliance for the Food Industry,** East Brunswick, NJ. For more information, contact: Registry, The Center for Professional Advancement, P. O. Box 1052, East Brunswick, NJ 08816; phone (908) 613-4500; FAX (908) 238-9113.

·2-3, **Pharmaceutical Technology, Writing Standard Operating Procedures to Meet cGMP Requirements,** East Brunswick, NJ. Acquire a better understanding of what the FDA is looking for, methods

used for compiling information, assignment of responsibility for departmental procedures, instruction on technical writing, new plant start-up, and plant revision, or companies experiencing rapid growth or expansion. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

• **2-4, Introduction to Statistical Methods for Sensory Evaluation of Foods,** a course to be offered at the UC-Davis campus. The fee is $575.00 and includes one dinner, two lunches and the course text or manual. For more information or to enroll, call toll-free in California (800) 752-0881. Outside California, call (916) 757-8777.

• **3, The Baking Industry Sanitation Standards Committee 1995 Annual Membership Meeting,** at the Chicago Marriott Hotel. For more information contact the BISSC headquarters, 401 N. Michigan Ave., Chicago, IL 60611; phone (312) 644-6610.

• **6-7, Pharmaceutical Technology, Preparing Clinical Protocols and Managing Clinical Investigations,** East Brunswick, NJ. The purpose of this course is to give participants guidance and workshop experience, along with an understanding of government regulations pertaining to clinical protocols. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

• **6-8, Principles of Cereal Science,** a short course sponsored by American Association of Cereal Chemists will be held in Los Angeles, CA. For more information, contact Marie McHenery, AACC Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121; phone (612) 454-7250; FAX (612) 454-0766.

• **6-8, Sensory Evaluation: Overview and Update,** an additional course offered at the UC-Davis campus. The fee is $55.00, or $1,000 to attend both this and the "Introduction to Statistical Methods for Sensory Evaluation of Foods." For more information or to enroll, call toll-free in California (800) 752-0881. Outside California, call (916) 757-8777.

• **8-10, Pharmaceutical Technology, Practical Considerations in Preparing Investigational New Drug and New Drug Applications (IND/NDA'S),** East Brunswick, NJ. This continually updated course meets the need for advanced information on preparing IND applications and NDAs in compliance with the most recent regulations. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

• **13-15, Pharmaceutical Technology, Drug Product Stability and Shelf-Life,** East Brunswick, NJ. The objective of this course is to explore fundamentals of current principles and practice concerning the stability of pharmaceutical and cosmetic products. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

• **13-15, Food Technology, Confectionery and Chocolate Production,** East Brunswick, NJ. For more information, contact: Registry, The Center for Professional Advancement, P. O. Box 1052, East Brunswick, NJ, 08816; phone (908) 613-4500; FAX (908) 238-9113.

• **13-15, Food Technology, Microwave and RF Technology,** East Brunswick, NJ. For more information, contact: Registry, The Center for Professional Advancement, P. O. Box 1052, East Brunswick, NJ 08816; phone (908) 613-4500; FAX (908) 238-9113.

• **15-17, Pharmaceutical Technology, Stabilization of Protein Drugs, Biologics and Devices,** East Brunswick, NJ. The objective of this course is to present current data relevant to the successful development of stable protein drugs, biologics, and devices. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

• **20-22, Food Technology, Food Irradiation Technology,** Fort Lauderdale, The Center for Professional Advancement, P. O. Box 1052, East Brunswick, NJ 08816; phone (908) 613-4500; FAX (908) 238-9113.

• **21-23, AFFI's Spring Convocation of Committees,** For more information, contact AFFI's Convention Office at (703) 821-0770.

• **23-24, Pharmaceutical Technology, The FDA Investigator Cometh,** East Brunswick, NJ. Recommended actions to be taken before, and after an investigation are outlined in this course. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

• **25-26, Getting Started in the Specialty Food Business,** a course to be offered at the UC-Davis campus. The fee is $345.00 and includes two lunches, social and the course text. For more information or to enroll, call toll-free in California (800) 752-0881. Outside California, call (916) 757-8777.

• **27-29, Pharmaceutical Technology, Contracting the Manufacture and Packing of Pharmaceuticals;** East Brunswick, NJ. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

• **27-29, Food Technology, Food Hydrocolloids,** East Brunswick, NJ. For more information, contact: Registry, The Center for Professional Advancement, P. O. Box 1052, East Brunswick, NJ 08816; phone (908) 613-4500; FAX (908) 238-9113.

• **27-29, Maintaining Quality and Safety of Fresh Cut Produce,** a course focuses on the physiological, biochemical and microbiological factors that influence quality and safety of fresh-cut (lightly processed) fruits and vegetables. For time and free information, call (800) 752-0881. Outside California, call (916) 757-8777.

APRIL

•**3-5, Food Technology, Good Manufacturing Practice (GMP) for the Food Industry,** This is an introductory course in the laws and regulations enforced by the U.S. Food and Drug Administration as they relate to the processing of foods. For more information, contact Registrar, The Center for Professional Advancement, P. O. Box 1052, East Brunswick, NJ 08816; phone (908) 613-4500; FAX (908) 238-9113.

•**3-5, Pharmaceutical Technology, Current Good Manufacturing Practice (cGMP) for the Pharmaceutical and Allied Industries;** San Francisco Bay Area, CA. Topics covered will include not only the legal requirements for cGMP in the Federal Food, Drug, and Cosmetic Act but primarily the practical "how to" of purchasing, manufacturing, packaging, labeling and QA/QC, as well as training production personnel in cGMP. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

•**3-5, Pflug's Microbiology and Engineering of Sterilization Processes;** this intensive lecture problem course is for degreed scientists and technical managers involved in the research, development and manufacture of sterilized food, pharmaceutical products and medical devices. For more information, contact Dr. William Schafer, course coordinator, Department of Food Science and Nutrition, 1334 Eckles Ave., St. Paul, MN 55108; phone (612) 624-4793.

•**6-7, Pharmaceutical Technology, Writing Standard Operating Procedures to Meet cGMP Requirements,** East Brunswick, NJ. Acquire a better understanding of what the FDA is looking for, methods used for compiling information, assignment of responsibility for departmental procedures, instruction on technical writing, new plant start-up, and plant revision, or companies experiencing rapid growth or expansion. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

•**6-7, Pharmaceutical Technology, The FDA Investigator Cometh,** East Brunswick, NJ. Recommended actions to be taken before, and after an investigation are outlined in this course. To enroll or request more information, call toll-free in California (800) 752-0881. Outside of California, call (916) 757-8777.

•**10-12, Food Technology, Food Extrusion Technology,** This course is designed to provide a thorough background in extrusion principles and practice. For more information, contact Registrar, The Center for Professional Advancement, P. O. Box 1052, East Brunswick, NJ 08816; phone (908) 613-4500; FAX (908) 238-9113.

•**23-25, AFFI's Mid-Year Board of Directors Meeting,** For more information, contact AFFI's Convention Office at (703) 821-0770.

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IAMFES Offers the Dairy Practices Council *"Guidelines for the Dairy Industry"*

IAMFES has agreed with the Dairy Practice Council to distribute their *"Guidelines for the Dairy Industry."* DPC is a non-profit organization of education, industry and regulatory personnel concerned with milk quality and sanitation throughout 15 north-eastern/mid-Atlantic states. However, its membership and subscriber rosters list individuals and organizations throughout the United States, Canada and Japan.

For the past 25 years, DPC's primary mission has been the development and distribution of educational guidelines directed to proper and improved sanitation practices in the production, processing, and distribution of high quality fluid milk and manufactured dairy products.

The DPC Guidelines are written by professionals who comprise five permanent Task Forces. Prior to distribution, every Guideline is submitted for approval to the key milk control sanitarian in each of the 15 states which are now active participants in the DPC process. Should any official have an exception to a section of a proposed guideline, that exception is noted in the final document.

The Guidelines are renown for their common sense and useful approach to proper and improved sanitation practices. We think that they will be a valuable addition to your professional reading library.

The entire set consists of 48 guidelines including:

1 Dairy Cow Free Stall Housing
2 Effective Installation, Cleaning and Sanitizing of Milking Systems
3 Selected Personnel in Milk Sanitation
7 Sampling Fluid Milk
8 NE Ext. Publ., Conferences, Short Courses, Correspondence Courses and Visual Aids in Dairying
9 Fundamentals of Cleaning and Sanitizing Farm Milk Handling Equipment
10 Fluid Milk Shelf-Life
11 Sediment Testing and Producing Clean Milk
13 Environmental Air Control & Quality for Dairy Food Plants
14 Clean Room Technology
16 Handling Dairy Products From Processing to Consumption
17 Causes of Added Water in Milk
18 Abnormal Milk--Fieldman's Approach
21 Raw Milk Quality Tests
22 Control of Antibacterial Drugs and Growth Inhibitors in Milk and Milk Products
23 Preventing Rancid Flavors in Milk
24 Troubleshooting High Bacteria Counts of Raw Milk
25 Cleaning and Sanitizing Bulk Pickup and Transport Tankers
28 Troubleshooting Residual Films on Dairy Farm Milk Handling Equipment
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30 Potable Water on Dairy Farms
31 Composition and Nutritive Value of Dairy Products
32 Fat Test Variations in Raw Milk
33 Brucellosis and Some Other Milkborne Diseases
34 Butterfat Determinations of Various Dairy Products
35 Dairy Plant Waste Management
36 Dairy Farm Inspection
37 Planning Dairy Stall Barns
38 Preventing Off-flavors in Milk
39 Grade A Fluid Milk Plant Inspection
40 Controlling Fluid Milk Volume and Fat Losses
41 Milkrooms and Bulk Tank Installation
42 Stray Voltage on Dairy Farms
43 Farm Tank Calibrating and Checking
44 Troubleshooting Dairy Barn Ventilation Systems
45 Gravity Flow Gutters for Manure Removal in Milking Barns
46 Dairy Odor Control
47 Naturally Ventilated Dairy Cattle Housing
48 Cooling Milk on the Farm
49 Postmilking Teat Dips
50 Farm Bulk Milk Collection Procedures
51 Controlling the Accuracy of Electronic Testing Instruments for Milk Components
52 Emergency Action Plan for Outbreak of Milkborne Illness in the Northeast
53 Vitamin Fortification of Fluid Milk Products
54 Selection and Construction of Herringbone Milking Parlors
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57 Dairy Plant Sanitation
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If purchased individually, the entire set would cost $174. We are offering the set, packaged in three loose leaf binders for $125 plus $9 shipping and handling (outside the U.S., $21 for shipping and handling).
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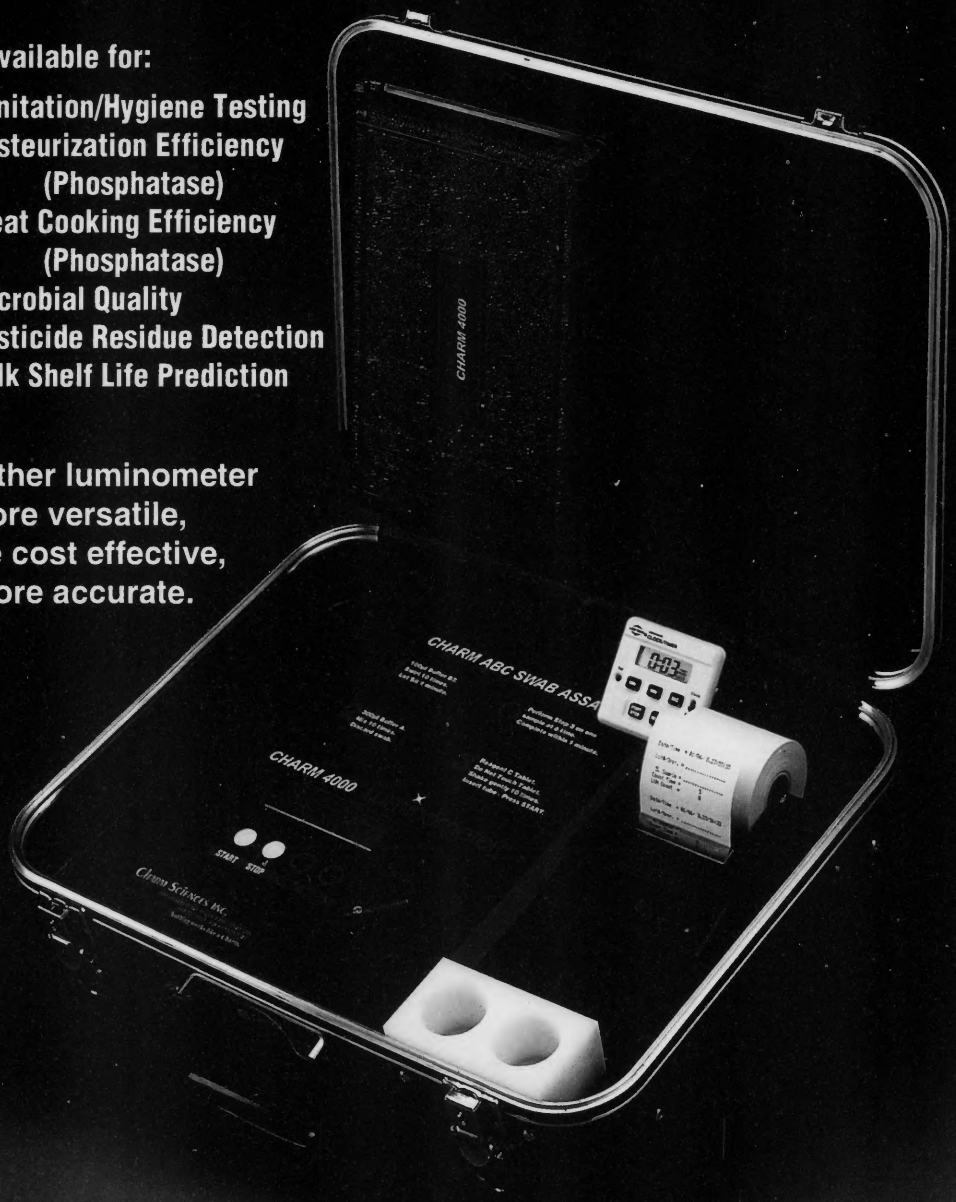

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