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# *Dairy and Food Sanitation*

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*A Publication for Sanitarians and Fieldmen*

- Rebuilding A Dairy Plant in the U.S. Virgin Islands
- Antibiotic Detection Programs
- Safe Storage of Small Amounts of Grains, Edible Seeds and Processed Foods



*A Publication of the International  
Association of Milk, Food and  
Environmental Sanitarians, Inc.*

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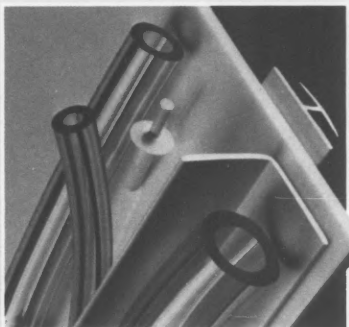
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# PRESIDENT'S PERSPECTIVE

Dear Members of IAMFES:

Well, we asked for it--your votes and candid comments on the proposed name change--and we got it! We are overwhelmed by your response. As of November 15 we had received 876 votes that were distributed as follows: 517 for *International Association for Food Protection*, 265 for *International Association for Milk and Food Protection*, 92 for no change and 2 for the same other name. In fact, at least 12 others voted for one of the three choices but also suggested some other name.

More than 65% of you took time to explain the reason for your vote. Thus, you indicated a genuine interest in the welfare of the Association.

The Executive Board considered your response at the Fall meeting. We concluded that there is a strong opinion that the name should be changed. Since 59% voted for *International Association for Food Protection*, the choice would appear to be clear. However, the Board wants the issues to be fully discussed, and I was asked to communicate the results to you along with an abstract of the factors many persons asked be considered. We hope the affiliates will make the proposed change a matter of discussion. At the Annual Meeting in St. Louis, August 6-11, we expect to finalize plans, deciding whether and how the Constitution, Bylaws and Articles of Incorporation may be amended.

## SUMMARY OF RESPONSES

### *Persons voting for no change:*

- Leaving out *Environment* would lead to exclusion of some potential members.
- Leaving out *Sanitarian* is wrong because many, if not most, members are sanitarians.
- The word *Protection* has a negative connotation.
- Nothing wrong with present name.
- Names suggested are still too long.
- IAFP is too much like IFT.
- Some other name would be better.

### *Persons voting for International Association for Food Protection:*

- Present name too long and this one is concise, simple and meaningful.
- The alternate name is redundant because milk is a food.
- Omitting *Milk* may help attract a broader spectrum of members.
- *Food Protection* is much broader than *Food Sanitation*.
- I'd feel more comfortable publishing in the Journal.
- Present name makes it difficult to write a justification for attending the annual meeting. At first glance it appears to be dairy science oriented.
- Present name indicates emphasis on sanitarians, but members include microbiologists, quality control personnel and others who are vitally concerned with the whole arena of food protection.
- A brief name encompassing a broad spectrum of professionals is preferable to one that highlights each specific group within the society.
- Advocate removing descriptive words, reducing the name to something new members can understand, and preventing laughter from the uninitiated when first introduced to the long name of the organization.

### *Persons voting for International Association for Milk and Food Protection:*

- Dairy Sanitarians started the organization and deserve to continue to be recognized by it.
- Basic sanitation guidelines were often copied or adapted from early 1900's experiences with milk.
- Having *Milk* in the name is a tradition, a "security blanket" for some.
- Despite being a Milk and *Food Program Specialist* in a Division of *Environmental Health* and being in the profession, *Sanitarian*, I agree the present name is no longer satisfactory.

The above are the major points that were made. I've combined and paraphrased and shortened to make them fit this space. I hope I've not done your comments an injustice. Purposely I've not given the number who made each comment thinking that reasonable, thinking persons would prefer to consider the points individually and to weigh them in their own minds, apply them to their own experience and make up their own minds.

Finally, although one hesitates to add to confusion when much of it was eliminated by the simplicity of the ballot mailed--in that only three choices were given--it might be unwise to not share the other suggested names with you. So, here they are:

- |  |  |
|--|--|
| 1. Food Protection International             | 6. Food Protection: an international society         |
| 2. Food Protection Association               | 7. International Association of Food Safety          |
| 3. International Food Protection Association | 8. Association for Food Safety and Quality           |
| 4. Association for Food Protection           | 9. International Association of (or for) Sanitarians |
| 5. Milk and Food Protection International    | 10. International Association of Food Sanitarians    |

**Robert T. Marshall**  
President, IAMFES

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# Dairy and Food Sanitation

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No. 12

December, 1982

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- **Safe Storage of Small Amounts of Grains, Edible Seeds and Processed Foods** 488  
*Stanley E. Wallen, Shripat T. Kamble, Roger E. Gold, Robert E. Roselle, Charles E. Walker*
- **Rebuilding a Dairy Plant in the U.S. Virgin Islands** 492  
*Steven T. Sims*
- **Antibiotic Detection Programs** 498  
*Sidney E. Barnard*

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|                                |     |
|--------------------------------|-----|
| <b>Presidents Perspective</b>  | 485 |
| <b>News and Events</b>         | 500 |
| <b>1983 Officer Candidates</b> | 500 |
| <b>Dairy Quality</b>           | 509 |
| <b>Book Reviews</b>            | 511 |
| <b>Affiliate Newsletter</b>    | 516 |
| <b>Calendar of Events</b>      | 521 |
| <b>Index to Volume 2</b>       | 522 |
| <b>JFP Abstracts</b>           | 525 |

## SAFE STORAGE OF SMALL AMOUNTS OF GRAINS, EDIBLE SEEDS AND PROCESSED FOODS

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*Millions of dollars of grains, edible seeds and processed foods are spoiled every year by insects. Storing small quantities of grains and edible seeds by consumers is becoming increasingly popular. Thus, there is a need to provide the public with information about preventing spoilage of these products.*

### GENERAL FOOD STORAGE PRINCIPLES

How much and what kinds of foods an individual chooses to store will depend on a number of factors, including:

- what products you or your family are willing and able to eat
- how much you typically consume
- what volume and quality of storage space is available
- what products are available for purchase and how much they cost

When selecting foods wholesomeness (i.e., lack of foreign materials, rodent pellets, insects as well as the absence of mold and a low moisture content) is of primary importance. After a high quality product is obtained, it should be stored properly to preserve its nutrition and palatability. The following points should be considered whenever storing foods:

1. *Rotation:* A "first in - first out" rotation system ensures that your food is always acceptable in quality by reducing the chance for insect, rodent or chemical spoilage.

2. *Air:* Most foods contain some fat. While in contact with air, fat may oxidize, producing rancid odors and flavors. As a result the nutritional

value decreases, and it may become slightly toxic. This problem is worse in the presence of light and warm temperatures. To slow the development of rancidity, fill the storage containers, make them as airtight as possible and store them in a cool, dark place.

3. *Light:* Sunlight may bleach food stored in clear packages, destroying the food's pigments, flavor, and texture and causing vitamins to lose their activity. Never store foods packaged in clear glass or plastic containers in a sunlit area, even if the sun hits them for only a few minutes a day.

4. *Heat:* Heat is one of the worst enemies of good food quality. It speeds up chemical reactions that bring about the gradual loss of color, flavor, texture, and nutritional value in stored foods. The rate of quality loss is about twice as fast with each 18°F temperature rise. Thus, food stored at 70°F may keep for 1 year but it will only last 6 months at 88°F. Heat may also cause moisture to generate from food compounds. If one side of a package is exposed to heat, moisture may migrate and produce "sweating" on the opposite side, allowing microbial growth. Fats oxidize sooner, developing rancidity. Insects, mold and bacteria grow more rapidly at warm temperature. Excessive heat may also dry out some foods. Shady, indoor, or even underground storage will help to reduce the influence of heat. Of course, refrigeration is one of the common methods of food preservation.

5. *Moisture*: Most foods are not perfectly dry; high-quality whole wheat and rice contain 10 to 12% moisture. However, a certain amount of moisture helps maintain the quality of many foods. An increase in moisture can facilitate insect, mold, bacteria, and yeast to grow in packaged foods and it may also corrode the containers. A dry storage place and proper packaging will keep the right amount of moisture in and extra moisture out.

6. *Storage in the Home*: In most homes the attic is hot, and lower or basement rooms are cooler. The temperature of outside walls can often vary considerably, depending upon seasonal weather conditions. Food placed next to heating vents can lose quality rapidly, and containers stored near cooling vents can corrode. Thus, select the storage areas that are dry, cool, and fairly accessible for inventory and rotation of the food packages.

7. *Storage Containers*: The best containers are made of glass, metal, or rigid plastic. Wood or clay containers can be used, if kept dry. Containers should retain moisture and natural food odors while keeping out additional moisture, rodents, insects, mold, bacteria, dust, air, and light. Avoid wooden or paper containers in locations where moisture is a problem. Rodents and insects can penetrate wood, cardboard, and thin plastic. In the right storage area, polypropylene and polyethylene bags and containers are safe, but not all plastic materials can be used to store food. Plastic buckets which have been used for food products may be used again, but after many years the plastic may decompose, crack, and emit odors, making it unsuitable for storage. Use metal containers only in a dry area and store glass containers in a manner that they will be protected from breakage.

#### PRESTORAGE TREATMENTS TO KILL AND REPEL INSECTS

Any grain, edible seed or processed food could be infested by insects; however, eggs and larvae aren't easily detected. Eggs may be laid in or on

the seed, and larvae feed on the grain. Insects become visible first as worm-like larvae, and finally as adults. To reduce insect damage there are a number of different measures which can be taken to kill insects before actually storing your grains, edible seeds and processed foods. These measures are given below:

1. *Cold Treatment*: Insects cannot withstand temperatures of 0°F for more than a day or two. Dry grains, edible seeds or processed foods may be placed in a home freezer at 0°F or below for 3 or 4 days. Following this treatment, the products could be removed from freezer and stored in glass jars or metal containers. If the space is available, the products could be left stored in the freezer until they are used. CAUTION: When products are removed from cold storage in summer, some moisture may condense on them. Therefore, do not store them in tight containers until they have a chance to dry.

2. *Heat Treatment*: Insects are killed by heating the food until the internal temperature reaches 150°F for 4 minutes (or 140°F for 10 minutes or 120°F for 20 minutes). Because it is difficult to detect the internal temperature, it is best to heat grains, edible seeds and processed foods at 140°F for about half an hour. Heating to high temperature, or for a prolonged period will reduce seed germination and cause the grains to crack.

Home ovens can be used to heat treat foods such as whole grains, flour, beans, and nuts. Spread the product evenly on cake, cookie, or pie pans to ensure uniform heating.

Raisins and other dried fruits can be heat treated by placing them in a cheesecloth bag and dipping into boiling water for about six seconds. After this treatment they should be blotted dry to prevent subsequent microbial spoilage.

3. *Oil Treatment*: A simple treatment using common cooking oil is an inexpensive way to protect grains and edible seeds from insects. First, place the seeds in a container that has a tight fitting lid. Then add the vegetable oil, close the lid, and agitate (by swirling, rolling, or turning) the container until

all the seeds are covered with a thin coat of oil. There is no need to soak the seeds. Finally, store the treated seeds in a strong, airtight container. Check the stored seeds each month and add more oil if insects have appeared. (Sufficient oil will block reinfestation).

Any vegetable oil is effective, including corn oil, soybean oil, sunflower seed oil, cottonseed oil, sesame seed oil, coconut oil, olive oil, red African palm (pinot) oil, and peanut oil.

The amount of oil required to protect seeds depends on many factors: more oil is needed for smaller seeds, for seeds with rougher or more porous seed coats, and for seeds that are broken or contaminated with dust, husks, or straw. No seed has been found to require more than 20 milliliters (4 teaspoons) of oil for each kilogram (2.2 pounds) of seeds.

Large seeds with smooth, hard seed coats (such as beans, peas, and other pulses) require only 5 milliliters (1 teaspoon) of oil per kilogram (2.2 pounds) of seeds. Wheat and barley which have rough seed coats, and corn with rough germ end on each kernel require 20 milliliters (4 teaspoons) of oil for each kilogram of seeds.

Do not store the treated seeds in cloth or cardboard containers, which absorb the oil. This oil treatment will affect germination or sprouting of the seeds and it may become rancid.

4. *Dry Ice Treatment*: Dry ice can be used to kill adult insects and larvae, but it will probably not destroy the eggs or pupae. Pour a 2 inch layer of grain into the bottom of a container. Add dry ice and fill with grain. Eight ounces of dry ice are recommended for 100 pounds of grain, or 1 pound for each 30 gallons of grain. Seal the containers loosely for 5 to 6 hours; then seal them tightly. Containers must be air tight and capable of being tightly sealed.

Do not use glass containers due to breakage hazard. Another danger with this approach is that moisture condenses around the dry ice, and may result in sprouting as well as mold and bacterial spoilage of the product. For

this reason, caution should be taken when using this procedure.

5. *Pesticide Treatment:* Malathion (premium or "food quality" grade, 57% concentration) is available to consumers. It can safely be applied directly to grains and edible seeds, but make sure to follow label directions. This treatment is not recommended because of potential health hazards resulting from application errors.

Field reports indicate that some individuals have used toxic products such as mothballs or chloroform to kill insects in infested foods. These products should never be used on food intended for human consumption.

6. *Other Treatment:* Bay leaves, hedge apples, and a number of other spices have been used to repel insects; however, they do not work.

#### HOW TO KEEP INSECTS AWAY

To assure that insect-free grains, edible seeds and processed foods remain insect-free, consider the following measures:

1. Thoroughly clean all grains and edible seeds to remove dust and broken seeds. Fanning or sieving will remove most foreign materials. Once you have insect-free food, place it in an airtight container, store it in a cool, dry place and check it periodically for further infestation.

2. Inspect groceries when you buy them. If you find insects, take the package back to the grocer. This effort will prevent further infestation of other packages.

3. When purchasing foods which are attractive to insects,<sup>1</sup> buy only quantities that you can use up quickly, unless you can repackage or freeze them.

4. To store these foods longer, transfer to glass or metal containers that cannot be penetrated by insects. Glass jars with screw-on lids are best.

5. Use older packages before newer ones; opened packages before unopened.

6. Keep storage and counter areas clean. Do not allow cereals, flours, crumbs or food particles to accumulate on shelves or in cracks.

7. Frequently vacuum storage areas, under cushions and in the cracks of upholstered furniture. Infestation may begin wherever food is dropped.

8. Clean under stoves, refrigerators and other large appliances regularly.

9. Check dry dog or cat food and bird seed regularly. Insects may be brought along with these products into your home and attract any already there.

#### ELIMINATING INSECT INFESTATIONS FROM A FOOD STORAGE AREA

Despite high vigilance an insect infestation can still occur. In such situations take the following steps to get rid of the insects:

1. Locate the source of infestation. Check seldom-used packages of foods that may attract insects.

2. Seal infested food packages. Use cold or heat treatment mentioned earlier to kill live insects and discard them in the garbage.

3. Clean the storage area, including shelves, with a vacuum cleaner crevice tool which can reach into cracks. The next best device to use is

a brush or cloth. Do not use soap and water, because that will wash food particles into corners and cracks where they can develop mold. It is also important to clean under and around the refrigerators, stoves, sinks and counters, because these are common breeding places for pantry pests.

4. Sometimes a thorough *insecticide treatment* may be required. There are several insecticide products on the market that are registered for controlling pantry pests. When buying these products look for the names of the following chemicals (active ingredients) on the container:

1. malathion
2. diazinon
3. propoxur (Baygon®)
4. chlorpyrifos (Dursban® and Killmaster®)
5. pyrethrins
6. resmethrins
7. acephate (Orthene®)


#### SAFETY NOTE:

- i. READ, UNDERSTAND AND FOLLOW INSECTICIDE LABEL DIRECTIONS AND PRECAUTIONS.
- ii. Keep insecticide in original containers.
- iii. Do not contaminate foods.
- iv. Keep insecticide out of the reach of children and do not allow children or pets near treated surface until it is dry.
- v. Never use kerosene-based insecticide near flour products, milk, or grains. These will absorb the kerosene flavor if they are returned to the shelves before the kerosene odor is completely gone.
- vi. Diatomaceous (Fuller's) earth is believed to have the same harmful effect on the lungs as asbestos and it should be avoided.

<sup>1</sup>Note: Foods that attract insects include grain and grain-based products like flour cereals, cornmeal, packaged mixes, cookies, crackers and pasta. Others are dried fruits, cured meats, candy and nuts. Spices, especially red pepper, paprika and chili powder, also are attractive to insects.



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## REBUILDING A DAIRY PLANT IN THE U.S. VIRGIN ISLANDS

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STEVEN T. SIMS\*

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Photos by  
 Ronald H. Smith and Steven T. Sims

*Rejuvenating a badly deteriorated milk processing plant after years of neglect can be a tough challenge. When that plant is located outside of the continental United States, many people thought that bringing it to full compliance with U.S. Grade A standards was an impossibility. The owners of Island Dairies, St. Croix, Virgin Islands, are doing the impossible right now.*

### Introduction

When I visited the Island Dairies plant on St. Croix, U.S. Virgin Islands, the new owners had been operating in the old plant and simultaneously remodeling it for less than two months. Since the new owners took over the plant, the milk sanitation rating score has risen over 40 points. Plans for a new milk plant have been drawn. There are five new owners of the plant: two dairymen, two sons of a dairyman, and a local electrical contractor.

David Schuster, one of the owners, is General Manager. Nicasio N. (Sonny) Nico, Jr., an owner, is an electrical contractor who now functions as the Production Manager and Maintenance Engineer. Together, these men with no previous experience in dairy plant operation, have overcome difficulties that would challenge experts.

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\*Senior Regional Milk Specialist, State Programs Branch, Food and Drug Administration, Region II.

Ron Smith also of the U.S. Food and Drug Administration and I were on the Island of St. Croix presenting an FDA milk sanitation and pasteurization training course. This course was being given partly because of conditions which had been observed at this plant the previous year during a "state" program evaluation. Since that time, the milk plant has changed ownership and management and remarkable improvements have occurred.

To learn more about these improvements and why they happen so suddenly and after so many years of inactivity, I went to speak with the new plant management. During my discussions with Mr. Schuster and Mr. Nico, I was able to understand some of their feelings about their successes and difficulties. Our exchanges were taped and excerpts follow:

*Sims:* Mr. Schuster, tell me about the operation of the dairy plant. Why are you doing it? I know you're a lawyer and that you could be doing other things.

*Shuster:* My family has one of the five dairy farms on the Island. My brother and I grew up on the farm and we were like any other kids who grew up on a dairy farm; we knew and learned and worked the ins and outs of a dairy farm. We were both fortunate enough that we were able to leave the Island and go away for an education. I went to business school and got a

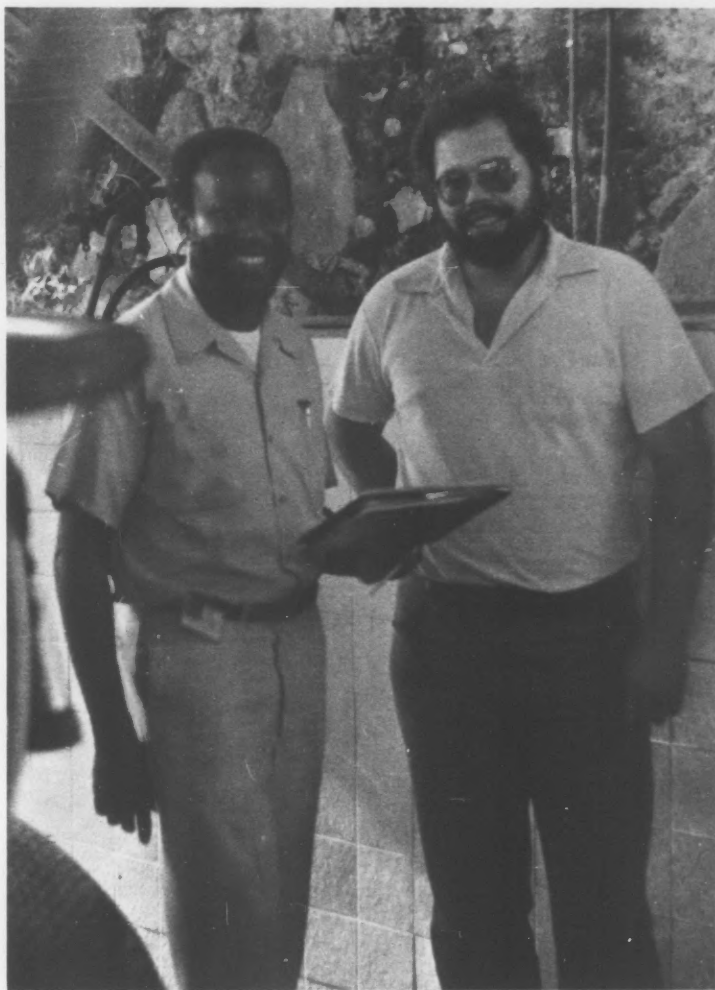
Masters in Business Administration and went to law school. I came back here to the Island because this is where I want to make my home.

The five farmers on St. Croix have always been pretty close. We have been able to work together, and cooperate in whatever manner necessary to foster and develop dairy farming in the Virgin Islands.

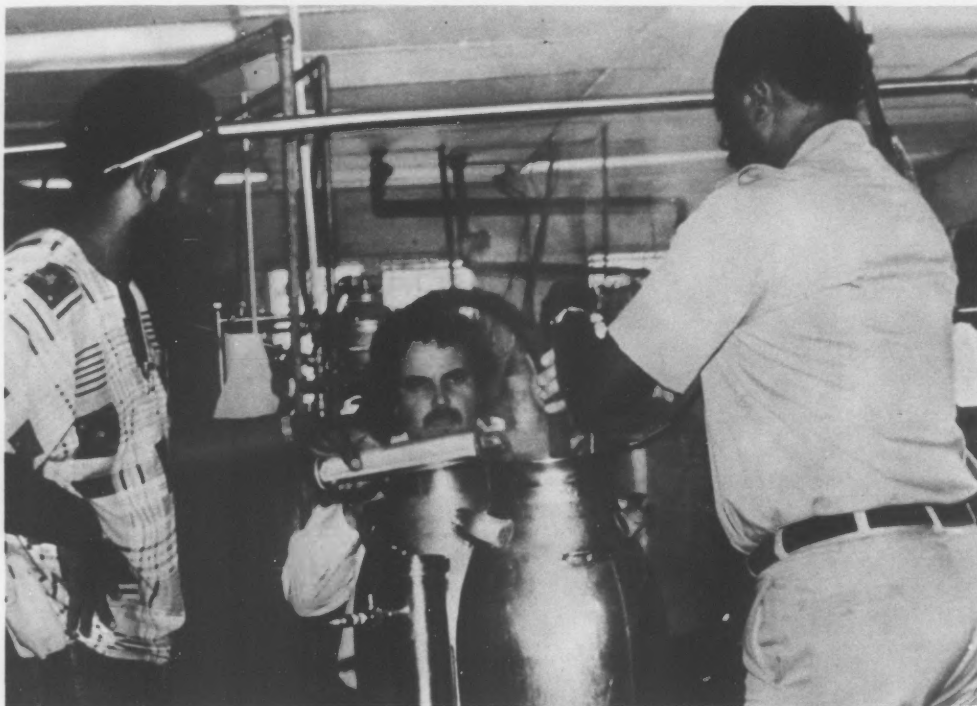
Eight months ago, it became rather obvious to us that there were serious problems with the existing dairy processing plant here, the plant that we are in right now. The owner for his own personal reasons, health, that of his wife, increasing regulatory pressure, had had enough and wanted out. It became apparent to the dairy farmers that, if they wanted to continue, the plant would have to be cleaned up, operated in a proper manner, and to do that they had to take it over; they to find somebody who they thought was capable of running a business like that and fortunately, or unfortunately, I was elected.

When I say fortunately or unfortunately, its a major career change for me. The processing end of it is something with which I really have no previous experience. However, I didn't hesitate that much because of my feelings for farming and for wanting to be involved with the dairy industry.

What we have now, is a company that is owned by two of the dairy farmers, as well as myself, my



*Cooperation is the key word as Sanitarian Shadrach Gill (left) reviews deficiencies of a carousel milking parlor with Plant Owner/Manager David Schuster. The decision was later made with the farmer to remodel and update the parlor.*



*Shadrach Gill, Sanitarian, St. Croix, left; Steven Sims, FDA; and Mr. Henrique Matthias, Sanitarian, St. Thomas, demonstrate "How not to do it" for key Virgin Islands Department of Health personnel. Using live steam to heat water for high temperature short time pasteurizer testing has a high potential for burns.*

brother, and Sonny Nico who is also the maintenance and plant engineer.

The only competition we have here is from a dairy that produces recombinated milk. It is very real competition and there is a significant price differential between the two types of products. Toward that end, I think that we will be producing, in the future, a recombined product of our own, strictly for that segment of the consuming market that can't afford to pay prices of the fresh product.

I don't think that anyone looking at our financial statements would accuse us of price-gouge, though it may appear so on the face of it, when comparing our prices (\$.77 per quart wholesale) to those on the mainland. I could give you a better comparison. Wholesale milk prices here are only 22% higher than the prices of the same product in Puerto Rico. In Puerto Rico, they can raise their own high-protein feed. Puerto Rico, I should add, is a totally regulated system, while we are not, and I think I'm quite proud in saying that we are only 22% above that regulated system in price levels.

*Sims:* What are the problems in running a dairy plant in the Virgin Islands?

*Shuster:* The number one problem is getting qualified personnel in to operate the plant and to do equipment set-up or any modification. We have had a lot of problems getting qualified people down here, even from some of the big, outstanding companies. I think they have a habit of sending somebody's helper down; or somebody who is high up and has forgotten about what he has to do but he wants a vacation on the Virgin Islands. It's a nice way to get him to come down here on a working basis. So, either way we get the short end of the stick.

I was, however, pleased by the recent FDA Milk Training Course. It has educated me to the point where I can spot things or practices that I know some of our maintenance people that are on contract have been doing that are not exactly adequate or proper.

NOTE: The course Mr. Ron Smith and I had just completed teaching was

received with great enthusiasm. The attendees elected to skip lunch, work late on two days, and attended class on a local holiday. Besides regular attendees, dairy farmers and employees of two dairy plants came for selected portions of the program.

We were particularly pleased to see management and plant employees come from St. Thomas Dairies on St. Thomas. They had to stay overnight and modify scheduling so they could attend. This meant we had virtually 100% industry participation in this course.

After the formal course, five key Virgin Islands Department of Health people were given additional practical experience in pasteurizer testing and plant inspection. Informal problem-solving sessions were also held on Saturday morning and Sunday afternoon. Before the course was even over, three pasteurizers were modified, an equipment cleaning problem was corrected, and additional improvements were made on farms and in both plants.

*Sims:* What are your plans for the future?

*Shuster:* Our plans for the future - I would not have gotten involved in this business if I did not believe it to have great potential for future development. I am a little upset and frustrated with what I've got on my hands to start with. Down the road, I can perceive a lot of investment and a lot of going towards new facilities, both at farm levels and the process of plant levels.

*Sims:* Do you anticipate a new dairy plant?

*Shuster:* I've got to be realistic about that. I can't promise the sky, that 12 months down the line we'll be installed in a brand new facility. Funds have got to be generated or found elsewhere to be able to do the job. I do not intend to do a half-way job.

Through the many years I've learned that the best way to do something is to do it right to begin with and in the long run its going to be the cheapest, the best, the most efficient way to do it. I wish I had Mr. Sonny Nico here. By now he'd be telling you

his trials and tribulations of rebuilding this plant.

Let me say this, in no uncertain terms, Sonny Nico is a key person in making this plant work. He was an electrical contractor before we had the good sense to get him into the ownership of this plant. When he first came in as an employee, this plant had so-called 'experts in pasteurization and equipment maintenance down from the mainland', at enormous salaries. Many times it is Mr. Nico who was called in the dead of the night to undo some thing they had done. That's how he got in here. Little by little the previous owner began to depend on him more and more even though these so-called 'experts' were here. Mr. Nico has had no professional training in pasteurization equipment. He just educated himself by studying the books on the equipment and everything involved. I'm saying he has done one hell of a job because he has been able to spot problems that were created by experts. I'm being awfully hard on these outside experts but it's a fact.

Sonny is a perfectionist. He is meticulous about the work he does; it's going to be exact and whatever he does is always going to be neat. If he's going to put a switch on that wall, he is going to put a level on it and that switch is going to be level. That's the way he is.

I realize also that neither Sonny nor I have the product knowledge of the products to be produced. That's one crucial weakness we have.

*Sims:* What do you mean, a product knowledge?

*Shuster:* The actual operation of the plant on a day-to-day basis is to make sure the plant is run efficiently, at top efficiency at all times. To make sure that the sanitation requirements are met. To make sure that the product standards are met. Say, take for instance, butterfat content. In-house testing is going to be necessary to assure quality control. Let's face it, prior to our company, this plant had no quality control person. They never had, and we still don't have the laboratory skills to do even the most rudimentary type of testing.

*Sims:* Are you looking for such a person now?

*Shuster:* Yes, we certainly are.

*Sims:* You may get 5,000 applications from people who want to work in the Virgin Islands.

*Shuster:* We'll look at every last one of them. You can never tell, you know, work in a vacation land. - Go for diving, sailing, windsurfing, etc.

*Sims:* Who supervises the day to day operation of the plant?

*Shuster:* I'm here on a full time basis. Sonny is here on a full time basis.

*Sims:* Do the other owners come in part time?

*Shuster:* No, they come in when necessary, when needed. But I think the general consensus was that if we had too many people directing we'd have a little conflict involved and we felt it would be better if it was left to the two of us.

*Sims:* If you could say something to other plant operators, field people, especially those considering working outside the contiguous 48 states, what would you say to them?

*Shuster:* If you're a plant operator, if you have to do anything, any sort of modification, any building, any sort of expense, or if you're operating a plant, don't let it deteriorate. It may sound a little trite, but I have the unpleasant task of straightening out such a situation. It's not a good thing for the public health or for our financial liability to have something that deteriorates to the point where you're wondering whether you should dig a bomb shelter in back of your plant and maybe blow it up.

You must set up a plant maintenance system to maximize care and minimize replacement. That's particularly beneficial to us since we're separated from the mainland, and acquiring spare parts or getting them here is

difficult and costly. Our every experience indicates that you must maintain and keep equipment in top operating condition, or else you're going to be awfully sorry.

(At this point Mr. Nicasio N. (Sonny) Nico, Jr. entered from the plant wearing coveralls and a broad, friendly smile. After a brief explanation, the interview continued).

*Sims:* Mr. Nico, as a successful electrical contractor on an island exploding with new construction, why are you in the dairy business?

*Nico:* First of all, believe it or not, why I'm doing what I'm doing right now was the result of an emergency situation. The former owner of this business had his maintenance mechanic quit in the middle of just about all problems that you can think of. The place was almost shut down. He called me in and asked me to try and fill the gap and I got the shock of my life when I came in here. I'd been around the plant, but never inside. The first thing that struck me as I went in was that it was not sanitary. I looked at the floors, walls, ceilings, and the outside of the equipment.

I could imagine what the inside of that equipment looked like. I wondered what I was caught up in. I took it as a challenge. At times it was like fighting a losing battle. A simple thing I started to do was to start painting and keeping the surroundings clean. While I was in the process of painting the compressor room, the former owner asked me if I was doing it because we had problems. I said, "No". He said, "Well, why are you painting? I don't see anything wrong with it as it is." I said, "As simple as it looks, paint goes a long way. If the area is clean you can spot if compressors are leaking and tell whether you have all accumulated oil or you have a

fresh leak. The way it is right now, you don't know."

I spent a lot of time trying to get this plant straightened out so that I could go back to my electrical business. I never was able to wiggle out of it. The more I looked, the more that I saw, and the more I started to read and educate myself as to the requirements to run a dairy plant, and the more it scared the hell out of me. And this is why the FDA Milk Training Course was the most meaningful thing that could happen for me, and for the Virgin Islands Department of Health.

What I think it did for ourselves and the regulatory agents, was to make us realize our responsibility to the public, and that the only way we can satisfy this responsibility is by working closely together. But I have long felt that this approach is the key to the success of doing anything. If I'm going to change anything, I call my inspector, Mr. Gill, and say this is what I plan to do. What do you think about it? Jointly, I think we are getting the job done. To me it's the only way that we can do justice to ourselves and to those who depend on our products or services.

I have one comment about the FDA Milk Training Course. There definitely should be a follow-up so that both we and the regulatory agents can see this material again after we have worked to make it part of a system.

*Shuster:* Do you get the feeling that Mr. Nico and I share somewhat similar philosophies? I think one large force that is governing all of us here is a little pride. All of us involved here, in this new business, now take pride in what we do and what we accomplish and we take pride in these Islands. That's why we have taken the bull by the horns. That's why we're here.



*"A warm greeting to you", from the Dairy Industry of St. Croix, U.S. Virgin Islands. Left to right, back row, Charles Schuster, Dairyman - Plant Owner; Robert Schuster, Plant Owner; David Schuster, Plant Owner. Front row, Henry Nelthrop, Dairyman - Plant Owner, Shadrach Gill, Sanitarian; Oliver Skov, Mario Gaspari, and Stacey Lloyd, Dairymen. (Absent when photo was taken, Plant Owner and Maintenance Engineer Micasio N. (Sonny) Nico, Jr.)*

The dairy industry uses a variety of tests to check for the presence of antibiotics and growth inhibitors in raw milk. Penalty programs of regulatory agencies, cooperatives and processors vary from none to permanent loss of market. The purpose is to assure consumers that milk and dairy products are free of antibiotics and growth inhibitors.

The dairy industry has done an outstanding job of keeping antibiotics out of milk and dairy products. Rarely are milk and dairy products available to consumers which contain any detectable level of antibiotics or growth inhibitors.

Costs to test and discard milk are astronomical for the U.S. dairy industry. Dairy farmers dump the milk from treated cows from 2 to 30 days, depending on the treatment used. An average of more than one farm bulk tank has been dumped on one of our 15,000 dairy farms each day in Pennsylvania for the past couple of years. In addition, hardly a week goes by without reports of one or more truck tanks of milk being dumped. Occasionally a raw milk silo tank or trailer load of packaged product are disposed of on the land.

The current estimate of annual losses to the Pennsylvania dairy industry are over \$2,500,000 for discarded milk alone. In addition, more than \$1,000,000 has been spent each year to collect and test samples. This is because the Pennsylvania regulation requires an automatic two day suspension of market for a positive growth inhibitor test and a negative retest before milk can be collected from that

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## ANTIBIOTIC DETECTION PROGRAMS

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### SIDNEY E. BARNARD

Professor of Food Science Extension  
The Pennsylvania State University

farm. On a national basis, the dairy industry is spending more than \$20,000,000 each year in the 50 states to collect and test samples and discard contaminated milk.

Testing will have to continue indefinitely in order to be sure that no milk contains antibiotics. This assumes that the zero tolerance level remains in effect. The reason for all of this testing is that a small percentage of the population react to penicillin and break out in a rash or go into convulsions.

This spring the Food and Drug Administration settled on the test to be used, until something equivalent or more sensitive comes along. All plants with an Interstate Milk Shippers rating must perform the *Bacillus stearothermophilus* disc assay procedure. It is sensitive to less than 0.01 IU. This requires the use of PM agar, 64°C incubation, 1/2 inch discs, 1,000,000 spores per ml. of agar and results read within three hours. Zone measurement must be made to the closest 0.1 mm using calipers. Confirmation of a

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Presented at the 69th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, August 22-26, 1982, Galt House, Louisville, Kentucky.



heated milk sample must employ three discs which are averaged. Zone sizes of 16 mm or greater are considered positive.

Each case of antibiotics in raw milk is a serious problem. However, the incidence is very low. Extensive testing by industry and regulatory laboratories shows that less than 0.02% of farm milk samples contain detectable levels of antibiotics or growth inhibitors. That is very close to perfection when more than 99.8% of farm samples are good. We probably cannot expect to improve on that no matter what steps are taken in the areas of education, testing and penalty programs. Nevertheless, we must all continue to try.

All dairy farmers must be convinced of the impact of antibiotics in milk. A number of cases have involved truck loads or storage tanks of milk valued at up to \$50,000. Dairy farmers cannot rely on dilution and they should never take a chance. Let's assume that the *Bacillus stearothermophilus* test has a sensitivity of 0.01 IU. This is the equivalent of a 100,000 unit infusion in a quarter of one cow, and the milk getting into a 45,000 pound truck load. In other words, the milk from one treated quarter can be detected in the milk from 1,000 cows.

Penalty programs by regulatory agencies vary from none to a two day loss of market. The Pennsylvania program has often been criticized, but has been very effective. No explanations are expected. Every dairy farmer dumps two days' milk, if a bulk tank is positive, even though the next tank full was probably negative.

For processors, positive results on packaged products mean the milk must be removed from sale and dumped. Fortunately, this almost never happens.

Some cooperatives have an incentive program, whereby they pay for one-half the value of the milk, if it has not been collected. However, positive results on a farm bulk tank sample mean an assessment of as much as two times the value of the milk on the first offense. For the second offense it may mean an assessment of up to four times the value of the milk. If it happens for the third time in a year, a cooperative usually has one less member.

Processors buying milk directly from farmers cannot assess a penalty. After the second offense a dairy farmer must usually find another market.

It is a general recommendation that cooperatives and dealers collect and test a sample from every load of milk every day. Where possible with your own laboratory, test a sample and get the result prior to unloading the milk. Use either the Delvo or Charm as a screening test until something less expensive or quicker is developed.

Most people can be trained to run a Delvo test. However, you must follow the directions to get reliable results.

Reading the result involves color comparison. Unless you are color blind, you can tell the difference between positive and negative.

For large plants with a laboratory and trained technicians, the Charm test can be used. It is a detailed procedure which is designed to detect penicillin. Therefore, it has little application in states which have a growth inhibitor regulation. However, modules may be added to a Charm Tester to detect other antibiotics. The test involves addition of radioactive carbon and separation of the precipitate. After standardizing each day, a sample is dried and counted. The number determines sensitivity. For one machine, results above 410 may indicate a negative sample. Results can be available in 30 minutes.

The only official test at this time is the *Bacillus stearothermophilus* disc assay. Using inoculated plates, results are available in less than three hours. Any regulatory action must be based on the results from this test. It is not difficult to show and explain the results to processors or dairy farmers.

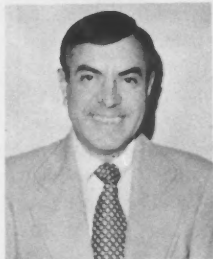
Because antibiotics cannot be removed from milk in a processing plant, by any procedure, the only solution is prevention. Of course, this must be done on farms. You have all seen lists of preventive measures. Here are eight for dairy farmers to follow:

1. Read directions for all medicines and drugs.
2. Keep a record of animal treatment and date.
3. Identify all treated animals.
4. Milk treated animals last or drain and clean all equipment.
5. Discard all milk from a treated cow.
6. Following dry treatment, discard all milk for 30 days.
7. Test milk from all animals, purchased or treated by veterinarian.
8. Test cow or bulk tank samples whenever in doubt.

We encourage all sanitarians and farmers to have a Delvo test kit or anything comparable when it becomes available. At least 10 groups are working on the development of quick tests, which may be used at farms. These will not necessarily be the answer, because of cost and the fact that most milk hauliers will not use them regularly.

The dairy industry has done an outstanding job of providing consumers with milk and dairy products which are free of antibiotics. Continue the testing of all loads on a daily basis. Then it is time to concentrate on efforts to improve the acceptance of milk. For good health, consumers need to drink more milk and the dairy industry has enough milk available. Greater effort needs to be made in the areas of quality, flavor and composition. Aim for 99% plus good samples in these areas, too.

## News and Events



### 1982 Officer Candidates

#### Townsend, Uhlman Run for Secretary Treasurer



Leon Townsend is presently Manager, Milk Control Branch, Department for Health Services, Frankfort, Kentucky. In addition to this position, which he has held for the past 4 years, his 25 years in the field of public health has included positions as Manager, Food Control Branch, Manager, Milk and Food Evaluation Program, Manager, Milk for Manufacturing Program and State Milk Survey Officer. He was also employed as a Senior County Sanitarian with local health departments for 4 and a half years.

Leon is a graduate of Western Kentucky University with a major in Agriculture and Biology and has completed additional education at the University of Kentucky in Agriculture Engineering and has attended many DFA and State sponsored environmental health workshops.

Leon is an active member in the Kentucky IAMFES Affiliate, which he has belonged to for the past 20 years. He served as Secretary-Treasurer for 10 years, during which time the association grew from 75 to over 250 members. He has also served as vice president, President-elect and President. He was chairman of the local arrangements committee for the 1982 IAMFES meeting and chairman of the finance committee for the 1969 IAMFES meeting which were held in Kentucky.

As a member of IAMFES for 21 years Leon has served as a member of the Awards Committee, Finance Committee, Chairman of the Dairy Farm Methods subcommittee on Antibiotics, Pesticides and other Adulterants. He has served as chairman of the Affiliate Council of IAMFES for the past two years and also in 1970, 73 and 74 and has served as the state affiliate delegate to the IAMFES annual meeting fourteen times.

During the time Leon was Secretary-Treasurer of the state affiliate, Kentucky won the C. B. Shogren Award as the outstanding state affiliate of International.

Leon has served as state delegate to the Interstate Milk shippers Conference in 1969, 79 and 81 and also as a member of Council I for six years.

He has served as an officer in Kentucky Lions Clubs and is an active member of the First United Methodist Church, Frankfort, Ky. His hobbies are golf and baseball. He has been married twenty-five years and has three children.

#### HELENE UHLMAN, R.P.S.

Registered Professional Sanitarian  
State of Indiana 1963

Registered Sanitarian  
State of Illinois 1967

Employed with the Gary Health Department in Gary, Indiana.

#### Employment - Past

Milk Co-ordinator-Calumet Region Milk Sanitation  
Local representative for Indiana State Board of Health

#### Vital Statistics

Married with one daughter

Graduated Froebel School

#### Organizations and Affiliations

I.A.M.F.E.S., INC.

Delegate-State of Indiana

Presently-Vice Chairman of Bulk Milk Farm  
Installations

Past Chairman-Committee on Bulk Tank Sampling

Past member-Educational Committee

#### N.E.H.A.

Chairman-Grade A Milk Committee

Chairman-Professional Women's Committee

Member-Walter S. Mangold Committee

Grade A Milk Committee

Placement Service Committee

Administrative Supervisor's Committee

Served as Guest lecturer, speaker and program  
chairman

President-Indiana Association of Sanitarians

Executive Board Member-Indiana Association of  
Sanitarians

Indiana Public Health Association

Member-Indiana Association of Sanitarians

Illinois Association of Sanitarians

Indiana Public Health Association

Professional Women's Association

#### SPECIAL ASSIGNMENTS - past

Served as secretary-Interstate Milk Shipper's Task Force

Chairman-Annual Educational Conference for State  
Sanitarians

#### SPECIAL DISTINCTIONS

Listed in Who's Who in the Midwest-17th Ed.

Listed in Who's Who of Women

## Automatic Testing of Vegetable Oils and Animal Fats

*Unique Instrument Replaces Manual AOM AOCS-Approved Method, Induces Oxidation in Samples, Measures Organic Acids Conductometrically, and Plots Curves; Operates 100%-400% Faster Than Manual Methods, Eliminates Subjective Readings, and Reduces Human Error*

by

Edward Kujawa, Manager, Brinkmann-Metrohm Division,  
Brinkmann Instruments Co., Westbury, N.Y.

Because vegetable oils and animal fats are subject to rancidity induced by oxidation, they must be tested frequently. Tests may be performed after oils and fats are extracted and refined; before they are used (if it is not immediate). If manufactured products containing these materials are stored, they may be tested before shipment.

When antioxidants are used, testing is needed to determine their effectiveness. Where packaging materials are used, testing may be needed to ascertain oxygen diffusion through the packaging material.

Until now, the standard means for determining the freshness, rancidity-proneness or actual rancidity of oils and fats has been the AOM AOCS-approved method. This is an essentially manual procedure which can take up to 40 hours or more (depending on the type of oil or fat being tested). During that time, the technician must perform monitoring tests using reagents. The results of the manual test are necessarily subjective, depending on the perception of the technician in charge.

An instrument for automatically determining the freshness, rancidity-proneness or actual rancidity of oils or fats — never before available — was recently introduced by Brinkman Instruments Co., Westbury, N.Y. The new instrument, known as the Rancimat, is from 100%-400% faster than the manual method and far more accurate, producing data plotted on a point recorder.

The Rancimat determines oxidation levels by measuring conductometrically the organic acids released from treated samples. Once set in operation, the instrument requires no attendance. It is, like the AOM AOCS-approved method, a dynamic technique based on the induction of oxidation in samples. Static tests for determining oil/fat degeneration can only assess the degree of degeneration which has already taken place. Dynamic methods enable the forecast of the future

response of an oil/fat to oxidative influences.

For more information contact:

Martin Wank  
Wank Associates  
71 Glen Cove Rd.  
Greenvale, N.Y.  
11548  
516/621-4060

## Sodium Labeling

Individuals wanting or needing to restrict their sodium (salt) intake will soon find the task a bit easier. Through the voluntary effort of food processors, about 40 percent of all food sold through supermarkets will be labeled as to its sodium content, beginning next spring.

"The sodium labeling effort comes on the heels of recent rising concern over the effects of high sodium diets," said Dr. Al B. Wagner, Jr., food technologist with the Texas Agricultural Extension Service, Texas A&M University System.

Numerous studies have been conducted on the effects of sodium in the diet, but results have been inconclusive, noted Wagner.

"Whether or not sodium is linked to high blood pressure or hypertension has been the basis for many studies," said Wagner. "The Institute of Food Technologists has reported that sodium does not cause hypertension but that the blood pressure of many unmedicated patients with hypertension can be lowered with a low sodium diet (less than one gram per day)."

But the IFT has also stated that people with normal blood pressure do not suffer any ill effects from a high sodium intake since only about 20 percent of the U.S. population has some degree of hypertension, Wagner noted. Of course, individual cases must be considered along with such interrelated factors as genetic background, stress, nutritional status and obesity.

Most Americans get plenty of sodium in their daily diets, said the food technologist. Salt (40 percent sodium) is the main contributor, but other food ingredients such as sodium nitrite, monosodium glutamate, sodium phosphate and sodium ascorbate also add to the total along with a variety of non-prescription drugs and common drinking water. In fact, softened water may contain two to three times more sodium than the same water before treatment, Wagner said.

"Of course, sodium is a necessary part of our diet,"

Wagner noted. "It helps with a host of body functions such as nerve transmissions, oxygen exchange and blood circulation. A person's minimum daily requirement has been estimated at 200 milligrams of sodium or one-half gram of salt."

Beside the obvious function of flavor enhancement, salt and other salt-containing ingredients also play a part in controlling fermentation, adding texture, preventing spoilage, retaining color and enhancing binding properties, Wagner said. So they are important in our lives and should pose no health threat except for a limited segment of the population. For this group, sodium labeling on food products should prove helpful.

## New Device Measures Odors

A new device to measure odors in the air we breathe has been developed by a Texas A&M University team.

Called a butanol olfactometer, the device can be used to measure odor intensity alongside or downwind of odor sources such as refineries, sewage treatment plants, feedlots or similar facilities.

The butanol olfactometer was developed at Texas A&M University by a team led by Dr. Andrew R. McFarland, professor of civil engineering; Dr. Donald L. Reddell, professor of agricultural engineering; and Dr. John M. Sweeten, associate professor and agricultural engineer-waste management with the Texas Agricultural Extension Service and Texas Agricultural Experiment Station.

Design and fabrication were performed primarily by McFarland's Air Quality Laboratory in the Department of Civil Engineering. Odor panelist testing was led by Reddell in laboratories of the Texas Agricultural Experiment Station. The odor meter was field tested at industrial and agricultural odor sources under the direction of Sweeten.

The odor measuring device uses a type of alcohol (n-butyl alcohol or 1-butanol) as the reference odorant, explained McFarland. The method involves determining the concentration of butanol vapor that has the same odor strength or intensity as the odorous air being tested. Human odor observers with proven odor sensory ability make the comparisons between the butanol vapor and surrounding air.

The butanol olfactometer represents the most advanced instrument of this type developed so far, said McFarland. The device improves the accuracy and reduces the time requirement for quantitative odor measurement. Its available range of odor intensity is 0 to 40 ppm (parts per million) butanol in air although many experiments were conducted with up to 80 ppm butanol. An odor

intensity equivalent to 80 ppm butanol is unusually strong in an outdoor environment.

The device has been field tested at poultry farms and other agricultural operations. According to Sweeten, measurements have averaged from 56.6 ppm butanol alongside poultry farms and swine confinement buildings with liquid manure storage systems to only 1.25 ppm butanol at one-half mile downwind of a cattle feedlot.

Poultry houses with dry litter or daily flush systems produced odors equivalent to only 5 to 7 ppm butanol while odor from poultry manure treatment lagoons averaged 20 ppm butanol.

Most of these agricultural odor sources were remote from population centers, Sweeten noted.

He said that data for confined livestock and poultry feeding facilities generally supported the major principles of manure odor control: remove manure frequently, reduce manure moisture content and provide maximum separation distance. Manure storage and treatment facilities such as lagoons, runoff holding ponds and stockpiles produced higher odor intensities than facilities with dry manure or frequent liquid manure removal but produced lower odor intensities than anaerobic (oxygenless) liquid manure storage pits.

In addition to various agricultural enterprises, certain industrial operations also produce significant odors, including oil refineries, petrochemical plants, meat packing and rendering plants, paper mills, creosoting plants and cotton oil mills, noted Sweeten. Surrounding odor intensities from these sources were measured at 1.25 to 56.6 ppm butanol. The major differences with these operations is often public exposure, since most industrial odor sources are in or near population centers.

Field data have shown that this new butanol olfactometer can be used to differentiate between varying degrees of odor intensity with good accuracy, said the Extension engineer. The method appears to have many advantages over most existing methods, including portability to field locations and demonstration of results at hearings and in courts.

The butanol olfactometer was developed and field tested through the sponsorship of the Texas Air Control Board and the U.S. Environmental Protection Agency in an effort to determine its feasibility for odor investigations.

## Food Containers

VOLARA crosslinked polyethylene foam, Types A and E, are in compliance with the Food and Drug Administration's regulations for uses in contact with food, according to an announcement by Lawrence R.

Cochrane, Director of Marketing for Voltek, Inc., 100 Shepard Street, Lawrence, Mass.

"This development opens up an entirely new series of food container and related food applications using VOLARA foams," stated Cochrane.

"We look forward to working with end users, fabricators and distributors throughout the nation in developing new applications," he continued.

VOLARA Type A and E are irradiated crosslinked polyethylene foams featuring an aesthetically appealing, brilliant white, smooth surface with a fine cell structure. In addition, they provide flexibility, product protection through cushioning, non-absorbency and excellent insulating properties. Versatile and sanitary, VOLARA Type A and E foams can be embossed, cut, slit, die-cut, sewn, printed, laminated, thermoformed and pressformed.

These VOLARA foams are ideal for food packaging; fruit and vegetable pallet shipping liners; picnic, ice chest and ice cream carton liners; thermoformed cookie trays, strawberry and confectionary containers as well as closures of many kinds.

Voltek is the largest U.S. producer of crosslinked polyethylene foams. Complete information can be obtained by contacting Sandy Fenwick, Customer Service Representative, Voltek, Inc., 100 Shepard Street, Lawrence, Massachusetts 01843. 617 685-2557.

## Research Contract to Dairyland Food Labs, Inc.

The National Science Foundation (NSF) has awarded a contract for research in the expression of a cloned gene for calf rennet in a microorganism to Dairyland Food Laboratories, Inc., according to an announcement by Gregory M. Farnham, president.

Having already cloned the gene, the firm will investigate the product of recombinant DNA technology in the isolation, purification and characterization of calf rennet produced by *E. coli* or yeast.

When expression takes place, the cloned gene will express or duplicate the rennet enzyme that is contained in calves' stomachs and used to coagulate milk in making cheese.

"Long-term goal of the research," said Farnham, "is to provide sufficient quantities of the cloned enzyme by fermentation for the U.S. cheese industry at a reasonable cost.

"Achievement of this goal will result in improved cheese quality and reduced costs. The technology developed could have further applications in other areas of food processing.

"From the standpoint of our company, this award

from the Foundation is recognition of our talents and strengths in this high technology field."

The grant received by Dairyland Food Laboratories, Inc. was awarded under the Small Business Innovation Research program of NSF. The Foundation invited science-based and high-technology small business firms to submit research proposals under the program. The program is designed to increase the public return on investment from federally-funded research.

Title of the research project is "Isolation of Bovine Prochymosin Expressed by a cDNA Fragment in *E. coli* or *S. cerevisiae*," according to Gerard J. Moskowitz, Ph.D., Technical Director of Dairyland Food Laboratories, Inc. and principal investigator for the project.

Chymosin, an enzyme that is the principal component of calf rennet, is produced by extraction from the fourth stomach of a calf, said Dr. Moskowitz. Over the past 30 years, the supply of available calf stomachs has been insufficient to meet the needs of the cheese industry. Imported microbial rennet is used in the manufacture of 60 percent of the U.S. cheese production. Thus, he emphasized, a national need exists to develop a domestically-produced supply of the enzyme.

Dairyland Food Laboratories, Inc. is a major supplier of rennet to cheese producers. The company is a pioneer in the use of genetic engineering to produce the rennet enzyme.

Dairyland Food Laboratories, Inc., which has its headquarters and plant in Waukesha, is an internationally-oriented company that supplies milk-clotting and flavor-producing enzymes and enzyme-modified food ingredients to cheese and food manufacturers in Latin America, Europe and the Far East as well as the United States and Canada.

## Cereal Chemist Short Course Available

The American Association of Cereal Chemists will hold a short course entitled, "Water Activity and Shelf-Life Testing," January 26-28, 1983 at the Chicago Radisson Hotel, Chicago, IL.

The course is designed to provide technical managers, food researchers, product development scientists and production-oriented personnel with a fundamental understanding of the scientific concepts of water activity, its measurement and its relationship to food stability. Discussions will range from the effects of water on the chemical and microbial stability of foods to practical industrial applications and on-line measurement of moisture content and water activity. From these basic theories and concepts, the course will progress into more sophisticated areas of shelf-life and packaging of low

and intermediate moisture foods.

The short course will be conducted by Dr. Theodore P. Labuza, Professor of Food Science and Nutrition, University of Minnesota, St. Paul, and international authority on water activity and shelf-life stability. Dr. Labuza is a recipient of the Institute of Food Technologists' Samuel Cate Prescott Award for Outstanding Research. He is an author of 120 scientific articles, nine text books, 15 book chapters, four patents and many other science related articles for the popular press.

For details on registration fees and how to register contact Dotty Ginsburg, Short Course Coordinator, 3340 Pilot Knob Road, St. Paul, MN 55121; phone 612-454-7250.

## Food Packaging Symposium

Food packaging regulations are one of the fastest growing areas of new legislation. The complexity of recent research, the size of the potential danger from the migration of even minute quantities of toxic matter into food, and the speed with which new legislation has been introduced, all combine to create a vastly complex array of national and international statutes and codes of practice.

The confusion is worsened by different national legal systems and patterns of food consumption. The result is a series of non-tariff trade barriers, both between EEC member countries and between Europe and the USA. Moves to harmonize legislation are still far from complete. But knowledge of the direction of proposed US and EEC legislation is vitally important to packagers, converters and food and packaging manufacturers alike.

Earlier this year in London, government officials and industry authorities from the USA and Europe met at a unique symposium to discuss the current and future direction of national and international legislation. It was the first time that representatives from the EEC and the US Drug Administration had met for public discussion.

The revised and expanded proceedings of this symposium - forming the most comprehensive and informed collection of papers and supporting information published in the last decade is available from: *Elsevier International Bulletins, Mayfield House, 256 Banbury Road, Oxford OX2 7DH, England. Telephone: Oxford (0865) 512242/3.*

## BISSC Meeting Highlights

The 70th Meeting of the Baking Industry Sanitation Standards Committee was held in the Fairmont Hotel, New Orleans, Louisiana, October 9, 1982.

Mr. William E. Pieper, was unanimously re-elected BISSC Chairman. Mr. Pieper has a long history of service to BISSC, previously representing the Biscuit and Cracker Manufacturers Association on the BISSC Board of Directors for many years as well as serving on many BISSC Task Committees, chairman of Sanitation Committee of the American Society of Bakery Engineers and represents that organization on the BISSC Board of Directors.

Mr. J. Allen Baird was unanimously re-elected BISSC Vice-Chairman. Mr. Baird, is the President of Mrs. Baird's Bakeries, Inc., and Chairman of the American Institute of Baking. He has been active on many Committees and is BISSC Chairman of the important Finance and Marketing & Promotion Committees. He represents the American Bakers Association on the BISSC Board of Directors.

Mr. Raymond J. Walter, Attorney-at-Law and President of his firm Association Management and Counsel, was unanimously re-elected Secretary-Treasurer with Executive Offices at 521 Fifth Avenue, New York, New York 10017.

The Baking Industry Sanitation Standards Committee was organized in 1949, to promote sanitation in the Baking Industry through the development, approval and publication of Sanitation Standards for Bakery Equipment and Machinery. This is a joint effort on the part of six national baking industry organizations namely:

- American Bakers Association
- American Institute of Baking
- American Society of Bakery Engineers
- Bakery Equipment Manufacturers Association
- Retail Bakers of America
- Biscuit & Cracker Manufacturers Association

The members of these organizations, together with sanitation officials as Consultants from the American Public Health Association, International Association of Milk, Food and Environmental Sanitarians, U.S. Food and Drug Administration, U.S. Public Health Service, U.S. Department of Agriculture and the National Environmental Health Association have, to date, painstakingly developed and promulgated forty-two (42) Sanitation Standards for Bakery Equipment. This was first released at Bakery Expo '81 and is widely disseminated. These

Standards are published in a complete booklet. Complimentary copies are disseminated to and made available, without charge, to officials of concerned Government Agencies-Federal, State and municipality. The current book is available to all others for a modest charge of \$10.00 per copy to cover production cost and handling.

The first BISSC member company Registration and Authorization Certifications were officially released October 1, 1966 with 14 Company Registration and 17 Authorization Certifications. As of September 11, 1982 this has increased to 94 company Registrations and 187 Authorization Certifications. Lists thereof have been mailed to all Directors, sponsoring organization executives, registered members, consultants, Health Departments throughout the United States and the Trade Press.

The primary purpose of BISSC and its Office of Certification is to promote sanitation in the baking industry through the development approval and publication of sanitation standards and to promote the public health through the use of bakery equipment of sanitation design. BISSC is not conducted for the financial profit of its members but is conducted for the mutual benefit of its members, the baking industry and the public welfare. Once a standard has been duly developed and approved no one is authorized on behalf of BISSC to interpret the standard.

A "BISSC Promotional Slide Presentation" in a 2 minute version of "A Sign of Our Times" was shown in the BISSC exhibit booth at Bakery Expo '81. This and the longer version are being made available, without charge to bakery organizations, health departments and other interested parties in the bakery industry. For complimentary rental contact Raymond J. Walter, BISSC's Executive Secretary.

The next Regular Meeting of BISSC is scheduled to be held at the Chicago Marriott Hotel, Chicago, Illinois on February 24-26, 1983.

For further information about BISSC, its approved Standards and its Office of Certification, write to the Executive Secretary, Raymond J. Walter, Baking Industry Sanitation Standards Committee, 521 Fifth Avenue, New York, New York 10017.

## Microbiology Workshop

An eight-day intensive workshop on rapid methods and automation in microbiology will be held at Kansas State University July 16-23, 1983.

The workshop, directed by Dr. Daniel Y. C. Fung, an internationally known scientist, will provide hands-on experience in the rapidly developing field of automated

instrumentation and diagnostic kits in applied microbiology.

More than 15 companies will participate in the workshop and will provide the newest instruments and kits for students to use in working with these modern systems. In addition, Dr. N. A. Cox of Russell Research Center, Athens, Georgia, and Dr. Millicent Goldschmidt of the University of Texas will present lectures in diagnostic kits and automated instrumentations.

The course will carry 7.2 Continuing Education Credits of the American Society for Microbiology. Interested persons should contact Dr. Fung at Call Hall, Kansas State University, Manhattan, KS 66506, 913 532-5654.

## Cholesterol in Beef

Cholesterol-conscious consumers, who enjoy eating beef steak, will be interested to know that meat scientists at Texas A&M University have found that there is no significant difference in the cholesterol content of cooked steaks attributable to differences in marbling (the small particles of fat within the lean).

"This finding applies *only* to the marbling and not to the trimmable fat," cautions Dr. Ki Soon Rhee, speaking for the Texas Agricultural Experiment Station research team which included Drs. Thayne R. Dutson, Gary C. Smith, Robert L. Hostetler, and Raymond Reiser.

Consumers are increasingly conscious of the nutritive content of foods, in relation to their health. In this connection, dietary cholesterol level has become an important issue since the publication of "Dietary Goals for the United States" (Senate Select Committee, 1977).

That publication recommended a reduction in cholesterol consumption as a means of preventing heart diseases.

However, Rhee says, there are scientists who believe that at least some of the recommended diet modifications for the prevention of coronary heart diseases are based on assumptions which are not yet adequately tested (National Academy of Sciences, 1980).

While the issue is being debated and still remains unresolved, that segment of the population which is at risk to coronary diseases is advised to control their dietary intake of cholesterol.

In this research eighty beef carcasses were selected, by three highly trained evaluators, to have marbling levels of "Moderately Abundant," "Slightly Abundant," "Moderate," "Modest," "Small," "Slight," "Traces," or "Practically Devoid." This marbling range covers grades from "Prime," "Choice," "Good," and "Standard."

Ten beef carcasses were selected for each of the eight marbling levels and two loin steaks were cut from the

same area of each carcass — one to be analyzed raw and the other after cooking — resulting in a total of 20 steaks within each marbling group.

All steaks were stored at  $-4^{\circ}\text{F}$  until analyzed or cooked. Five steaks in each marbling group were cooked from the frozen state,  $32^{\circ}\text{F}$  in a preheated oven at  $350^{\circ}\text{F}$  to an endpoint internal temperature of  $140^{\circ}\text{F}$  and the other five were cooked to an internal temperature of  $167^{\circ}\text{F}$ .

Each raw or cooked steak was cut into small pieces, frozen in liquid nitrogen, and thoroughly powdered in a blender. Cholesterol content of each steak sample was determined in triplicate.

For raw steaks, no significant differences in cholesterol content were found in the present study among steaks with different amounts of marbling, except that steaks with "Practically Devoid" marbling contained significantly less cholesterol than did steaks with any of the other marbling scores. No significant differences were found between steaks from any of the other seven marbling groups.

When steaks were cooked, however, there were no significant differences in cholesterol content, on a wet weight basis, between steaks of any of the eight marbling groups, regardless of whether the steaks were cooked to an internal temperature of  $140^{\circ}\text{F}$  or  $167^{\circ}\text{F}$ .

The results of the present study suggest, Rhee says, that consumers need not be concerned about the amount of marbling in beef, (trimmed of separable fat), relative to its cholesterol content.

"The finding that uncooked steaks with "Practically Devoid" marbling had less cholesterol than did uncooked steaks with any of the other marbling scores is of little practical significance," Rhee says, "since the incidence of beef with that little marbling is very low.

"Of greater significance is the finding of no significant differences in the cholesterol content of cooked steaks, due to differences in marbling.

"It's also important for consumers to know that the total amount of cholesterol in a steak does not increase due to cooking. In fact, it decreases by the amount that is included in the cooking drip.

"However, since cooking does substantially reduce the weight of a steak, primarily through removal of water, the cholesterol content of the cooked steak is increased in comparison to raw steak, when it is expressed as a percentage of the cooked weight," Rhee concluded.

*Questions should be addressed to Science Writer, Department of Agricultural Communications, Texas A&M University, College Station, Texas 77843.*

## CREPACO Instates New President

H. L. Mitten, President of CREPACO, Inc. announced that he will resign effective December 31, 1982 and that Donald B. Hefner will become President January 1, 1983.

Mitten has been with CREPACO since 1951 and has served in various technical, sales and management positions. He will continue as a director of the company and take an active role in its technical activities until his retirement in 1984.

Donald B. Hefner joined CREPACO in August, 1982 as Vice President - Marketing and Corporate Development. Prior to that, he was a Vice President of Baker-Perkins, Inc. and General Manager of its Food Machinery Division. He is a native of Akron, Ohio and has a B.S. degree in marketing from Kent State University and has completed the Advance Management Program at Harvard Business School.

## Wastewater Treatment Brochure

A semi-technical brochure describes complete, packaged automatic industrial wastewater treatment systems for difficult-to-treat applications from TENCO HYDRO, INC. IL.

Seven different installations are pictured and described, five steps for solving a wastewater problem are discussed, while a complete dissolved air flotation Clari-Float® system including pressurization and chemical feed is illustrated.

The 8-page, two-color manual also includes a discussion and photos of chemical feed systems, controls, flotation and sludge storage or dewatering add-ons to Clari-Float® or existing systems. TENCO HYDRO, INC. IL, 5220 East Avenue, Countryside, IL 60525.

## InternorGa '83

Some 700 exhibitors from 25 countries are expected to participate in the 57th annual "InternorGa," the international hotel and catering exhibition, when it takes place in the Hamburg Exhibition and Congress Center March 11-16, 1983.

Officially titled the International Trade Exhibition for Hotels, Catering, Bakeries and Confectioners, the event



demonstrates a vast array of the latest guest services equipment and techniques. Supporting the exhibition are technical lectures for the hotel and catering trades.

The 1982 exhibition attracted nearly 95,000 visitors. From the United States, 26 manufacturers were represented. Other countries with large delegations included Great Britain, France, the Netherlands, Denmark, Austria and Hungary. Similar participation is seen for the upcoming InterorGa.

Equipment and products displayed in 1983 include industrial cooking equipment, supplies for hotels, restaurants, cafeterias and snack bars, refrigeration systems, food and drink vending machines, ovens and innovative bakery equipment as well as modern store fittings.

The exhibition occupies some 570,000 sq. ft. of space in 13 halls.

Further information may be obtained from the Hamburg Messe and Congress GmbH, Jungiusstrasse 13, Postfach 30 23 60, 2000 Hamburg 36, Federal Republic of Germany.

## *Lasco Introduces New Fiberglass Wall*

A new fiberglass wall and ceiling liner panel, meeting the most stringent requirements of both sanitation and low ratings for fire and smoke in all food processing, storage and service areas has been announced by Lasco Division of Philips Industries Inc. (Anaheim, CA).

Called Lascobard™ Fireblock 20/300, it meets the flamespread and smoke ratings standards for Class I and Class A interior finish materials of all major building and insurance underwriters' codes.

### *Engineered For Sanitary Lining*

Easily cleaned with conventional detergents or steam, the .090-inch thick panels resist impact, abrasion, stains and mildew. They are available in four-foot wide sheets in lengths of 8, 10 and 12 feet, in Sanitary White, as well as in custom-made colors and sizes. Ceiling panels, 2-feet by 4-feet, are also stocked at Lasco plants in California and Kentucky.

The new panel requires a simpler installation technique than methods now in use, according to Lasco, a leading producer of custom-made fiberglass panels for industry. Neither adhesives nor mastics should be used for job-site application. Rather, a fixed pattern of panel spacing and fastening avoids the buckling problems encountered with many fiberglass wall liners.

Fireblock 20/300 is available nationally through authorized distributors and applicators. Further information is available from Lasco, Anaheim, CA 92806.

Can an unborn calf increase the milk production of its dam?

Perhaps, says Robert Bremel, University of Wisconsin-Madison dairy scientist, who is studying a hormone that is linked to udder development.

But the hormone is exceptionally difficult to obtain, so it may be years before researchers clarify its role in milk production.

However, there's some evidence that higher levels of the hormone—bovine placental lactogen, which is produced by the fetus—might increase milk production of the dam.

Similar hormones have been identified in humans and in several species of laboratory animals.

Dairy Herd Improvement records indicate that goats which give birth to twins or triplets produce more milk than those bearing single kids, perhaps because multiple fetuses produce more of the hormone.

Similar observations have been made in laboratory animals.

And researchers at the University of Florida have found that milk production of Holstein and Jersey cows is related to the birth weights of calves.

Milk production of Hostein cows tends to increase as birth weight of calves increases from 70 to 110 pounds. There's little, if any, effect at heavier birth weights.

Bremel says the effects of the hormone on milk production is "purely speculative" at this point.

After four years of research, Bremel can obtain minuscule amounts of the hormone from the placental tissue of slaughtered cows. The seven-step process includes grinding, precipitation, ultrafiltration and chromatographic techniques. Placental tissue contains about 1 part per million of the hormone.

The process increases the concentration of bovine placental lactogen by 4,200 times. Even so, only 5 percent of the hormone is recovered because some is lost at each step of the process. Bremel hopes to simplify the process to increase recovery rates.

Bremel and researchers with the University of Florida have a USDA contract to produce 50 milligrams of the hormone for distribution to other scientists.

For his studies, Bremel has stored about 1,500 pounds of placental material in various freezers around campus. That amount should eventually provide about 400 milligrams of the hormone—about one-thousandth of a pound.

So far, analyses indicate that there are three different forms of the hormone. All forms combine the biological activity of growth hormone (which increases milk production in an established lactation) and prolactin (the hormone necessary for the initiation of lactation).

Different genetic forms are usually characteristic of

hormones. The existence of several forms complicates research but might open up other intriguing possibilities, Bremel says.

New selection methods might eventually result if there are genetic differences among cows. But a cow might just produce several forms during pregnancy, or simply concentrating the hormone might somehow have altered it.

Bremel and University of Florida researchers have found that injecting the hormone in rabbit tissue stimulates milk production. Researchers now know bovine placental lactogen is biologically active, but now must study the hormone in cattle and other species.

To do that, Bremel will obtain antibodies to the hormone from rabbits. He will then use these antibodies in radioimmunological assays to determine levels of the hormone and to learn whether the hormone affects organs other than mammary glands.

"So far, studying the hormone has been like piecing together a very complicated puzzle," Bremel says.

He has made important gains by obtaining pure samples of the hormone. That will help decipher the rest of the puzzle and perhaps unravel more of the biological mechanisms governing milk production, particularly the relationship between a fetus and dam and perhaps the persistency of lactation.

## Dairy Barn Ventilation Systems

Dairy barn ventilation systems need periodic maintenance—like other farm equipment.

"It's not uncommon for a system to perform well for a year or two, then decline in performance," says Donald W. Bates, agricultural engineer with the University of Minnesota's Agricultural Extension Service. A careful inspection may reveal why.

Bates offers these tips:

First, check all fans. Be sure louvers are in operating condition. They often become encrusted with dirt, which restricts their ability to open in response to the pressure created against them by an operating fan. Then, although the fan is running, little air is exhausted.

Clean fan blades and check the fan mouting. At least one fan in any warm livestock building should operate *continuously*. If this is not the case in your barn, check fan thermostats for proper operation.

Try to maintain barn temperature at 40 to 45 degrees F. Remove continuous exhaust from about 15 inches above the floor through a duct built around the continuous fan since air near the floor is cooler and exhaust can be

at a higher rate. "If you don't have a duct, build one," Bates says. "This is a positive step that can bring great benefit at small cost."

Inspect the fresh air intake system. If the barn door slams shut or swings in when the fans are running, not enough fresh air is entering. Intakes—slot or other types—often become plugged after a few years' use. Then air is prevented from entering.

If your barn has no intakes, there's excessive draft through the gutter cleaner openings and other places not intended for fresh air to enter. For a two-story barn with no ceiling on the underside of the joists, drill two-inch diameter holes through the mow floor. Provide protection to keep hay away. For single-story barns, install home-built or commercial ceiling intakes.

"Remember, the barn must be filled to capacity if it's to remain dry," Bates says. Box stalls will cause special problems. Raise calves outside the barn in hutches or in a separate, well-ventilated building. To keep windows dry, attach clear plastic on the inside.

A sure step to reducing respiratory disease is to improve ventilation. Check with your local veterinarian.

For further information, get a copy of M-128, "How to Plan a Mechanical Ventilation System for Your Dairy Barn." Minnesota residents may get free single copies from county offices of the University's Agricultural Extension Service. Or, write to the Communication Resources Distribution Center, 3 Coffey Hall, University of Minnesota, St. Paul, MN 55108.

## Milk is Nutritious

Drinking less milk these days because its price is higher? If so, then you are losing money -- not to mention nutrients, says Mary K. Sweeten, a food and nutrition specialist.

Even with today's higher prices -- and what isn't more expensive? -- milk alone offers greater amounts of calcium, protein and other nutrients than many other foods combined, no matter how many you eat, she says.

For example, to get the all-important nutrient calcium, consumers can turn to dark leafy greens, of course, but it would take enormous quantities to provide just one day's requirement for adults, Sweeten explains.

Two glasses of milk (eight ounces each) provide the calcium an adult needs. Or eight ounces of cheese, yogurt or cottage cheese will do the same, she says.

Calcium is not the only benefit, though. At the same time, those two glasses of milk provide a significant amount of the high-quality protein you need every day.

# Dairy Quality

Reprinted from Capsule Laboratories Newsletter, Dairy Quality Update

## PASTEURIZED MILK MICROORGANISMS

The growth of microorganisms in pasteurized milk can be the cause of serious quality defects. These defects will reduce consumer acceptance and shelf life. Therefore, one of the primary objectives of the dairy quality control program is to reduce contamination and growth of microorganisms in pasteurized milk.

There are two sources of viable organisms in pasteurized milk -- post-pasteurization contaminants and thermophilic microorganisms from the raw milk. Thermophilic microorganisms are those that can survive pasteurization. For purposes of this discussion, the only microorganisms that will be discussed are bacteria.

Post-pasteurization contamination by psychrotrophic bacteria (organisms that are capable of growth at refrigeration temperatures) are the most significant in reducing milk quality. These organisms are not only capable of growth at low temperatures, but will cause quality and flavor defects at relatively low populations (1,5) -- 1-5 million per ml. For the most part, post-pasteurization contaminants are gram negative rods; therefore, when microscopic examination of bacteria from five day or seven day keeping quality tests indicate primarily gram negative rods, one could be quite certain that post-pasteurization contamination is occurring. Sources of these organisms can be soiled equipment and improperly sanitized equipment, or processing malfunctions such as pinholes and cracks in the pasteurized milk storage tanks, condensation on fillers, or other sources. The organisms most commonly responsible for

post-pasteurization contamination belong to the genera *Pseudomonas*, *Achromobacter*, *Chromobacterium*, *Aerobacter*, *Alcaligenes*, and *Escherichia*. It is important to realize that when post-pasteurization contamination is occurring with these organisms, contamination levels as low as *one bacteria cell per container of milk* is sufficient to cause both high five or seven day counts and reduce shelf life. For this reason, coliform tests alone are not adequate to predict shelf life. Coliform-free milk may be contaminated with these spoilage organisms and shelf life can be reduced.

Thermophilic organisms found in pasteurized milk become significant when they are psychrotrophic. These organisms are primarily gram positive rods (spore forming bacteria) and gram positive cocci. Psychrotrophic spore formers have been found in 25 to 80 percent of raw milk samples (2,3,4). These organisms become particularly significant when long shelf life of milk (21 days or more) is required (3). Therefore, with the increased shelf life requirements of pasteurized milk, thermophilic bacteria (particularly spore forming psychrotrophs) become increasingly significant. Raw milk quality becomes increasingly critical.

The table below indicates the type of bacteria, its typical source, and its typical quality defect. By identifying either the type of bacteria or the quality defect, one can get an indication of the source of the organism that is causing quality defects or high five day counts. This table should only be used as a guideline; however, it can be a useful tool for troubleshooting plant problems.

### PSYCHROTROPHIC SPOILAGE

| Bacteria Group  | Most Common Source  | Most Common Quality Defect                   |
|---|---|--|
| Gram negative rods<br>(gram negative psychrotrophs)                   | Post-pasteurization contamination   | Bitter, fruity, unclean,<br>putrid, ropiness |
| Gram positive cocci   | Thermophilic post-pasteurization<br>contamination or environmental<br>contamination | Acid souring, ropiness                       |
| Gram positive rods (psychrotrophic<br>spore formers), <i>Bacillus</i> | Thermophilic  | Sweet curdle, bitter                         |
| Coliforms (gram negative rods)  | Post-pasteurization contamination   | Gassiness, acid production                   |
| Lactic organisms  | Raw milk<br>Post-pasteurization contamination                                       | Acid souring, malty                          |

- (1) Boyd, J. C., C. K. Smith and G. M. Trout. 1955. The role of psychrotrophic bacteria in the keeping quality of commercially pasteurized and homogenized milk. *J. Milk Food Technol.*, 18:32.
- (2) Chung, B. H. and R. Y. Cannan. 1971. Psychrotrophic spore forming bacteria in raw milk samples. *J. Dairy Sci.*, 54:448 (Abstract).
- (3) Grosekopf, J. C. and W. S. Harper. 1969. Role of psychrophilic spore formers in long life milk. *J. Dairy Sci.*, 52:897 (Abstract).
- (4) Mikolajcik, E. M. 1978. Psychrotrophic spore formers. A possible keeping quality problem in market milk. *Am. Dairy Review*, April, 1978.
- (5) Punch, J. D., J. C. Olson and E. L. Thomas. 1965. Psychrophilic bacteria. III. Population levels associated with flavor or physical change in milk. *J. Dairy Sci.*, 48:1179.

### NON-MICROBIOLOGICAL OFF-FLAVORS OCCURRING IN FLUID MILK

To maintain consumer acceptance, a dairy must produce a high quality fluid pasteurized milk product with a clean, fresh taste. However, there are several factors influencing the production of high quality fluid milk and many causes of off-flavors.

There are several types of off-flavors that occur in fluid milk. Many of these off-flavors are microbiologically induced. In addition, there are several non-microbiological off-flavors that can cause severe quality defects and reduce consumer acceptance. Therefore, a good dairy quality control program must recognize and correct these potential problems.

Non-microbial off-flavors have been classified and categorized by Shipe et al. (2). These off-flavors include heat and light-induced, lipolyzed, oxidized, transmitted, and miscellaneous. They are classified primarily on the basis of their cause of origin as shown in Table 1 below:

TABLE - *Categories of off-flavors in milk (2)*

| <i>Causes</i> | <i>Descriptive or associative terms</i>   |
|---------------|---|
| Heated        | Cooked, caramelized, scorched   |
| Light-induced | Light, sunlight, activated  |
| Lipolyzed     | Rancid, butyric, bitter*, goaty   |
| Microbial     | Acid, bitter*, fruity, malty, putrid, unclean   |
| Oxidized      | Papery, cardboard, metallic, oily, fishy  |
| Transmitted   | Feed, weed, cowy, barny   |
| Miscellaneous | Absorbed, astringent, bitter*, chalky, chemical, flat, foreign, lacks freshness, salty. |

\*Bitter flavor may arise from a number of different causes. If the specific cause is not known, it should be classified under miscellaneous.

I. *Heat Flavor*: The kind and intensity of heat flavor in milk is dependent upon the time and temperature of pasteurization or other heat process. There are four kinds of heat induced off-flavors -- cooked or sulfurous heat or rich, caramelized, and scorched. Cooked flavors are caused by

excessive pasteurization (for example, greater than 175°F for 18 seconds). However, this flavor is usually not noticeable after two to three days of refrigerated storage. Heat or rich flavors and caramelized flavors are not normally common problems with commercial pasteurizing temperatures; however scorched flavors can result from a large amount of burn-on in the press.

II. *Light Induced Off-Flavors*: These off-flavors are caused from milk being exposed to sunlight, fluorescent light, or diffused daylight. Increased use of plastic containers has increased the occurrence of light induced off-flavors.

III. *Lipolyzed Flavors*: These flavors are caused by lipase (a milk enzyme) which catalyzes the hydrolysis (splitting apart) of milk triglycerides into free fatty acids and glycerol. Development of lipolyzed flavors can be enhanced by the following: 1) excessive agitation and foaming, 2) temperature activation (cooling milk to refrigeration temperatures), 3) the homogenization of raw milk, 4) mixing the raw milk and homogenized pasteurized milk, 5) the presence of excessive residual detergents and sanitizers, 6) the presence of bacterial lipases, or 7) spontaneous lipolyzed flavor development. Milk from cows occasionally is so susceptible that cooling alone may cause lipolyzed flavors.

IV. *Microbial Off-Flavors*: This subject was addressed in last month's DAIRY QUALITY UPDATE.

V. *Oxidized Flavors*: Oxidized flavors result from the interaction between molecular oxygen and lipids (fat). The production of oxidized flavors can be caused by the following: 1) presence of oxygen; however, oxygen is saturated in milk unless it is removed by a vacuum, 2) contamination of metals -- copper or iron are pro-oxidants and will accelerate the initiation step, 3) presence of other pro-oxidants including sunlight, strong artificial light, and acid, 4) cow's rations -- a common problem is winter rations due to lack of vitamin E (an anti-oxidant).

VI. *Transmitted Flavors*: These flavors arise from the cow's feed or surroundings via their respiratory and/or digestive system to the bloodstream, to the udder, and eventually into the milk. Feed and wheat flavors occur when cows are allowed to consume or inhale strong odors of many common dairy feeds such as silage, green forages, etc. These occur in milk if milking is conducted within two or four hours after the cow's consumption of these feeds. Cowy flavors occur when cows are suffering from ketosis or acidosis. Barn flavors occur when cows are housed in non-ventilated areas and continuously forced to inhale strong odors.

VII. *Miscellaneous Flavors*: This category includes those off-flavors that cannot be attributed to a specific cause. Absorbed flavors occur as a result of milk fat absorbing volatile compounds. Chemical flavors are caused by contamination of milk with such chemicals as cleaners and sanitizers and disinfectants. Flat flavors can result from the addition of as little as 3 to 5% water to milk.

## Book Reviews

*Developments In Food Microbiology-1.* R. Davies, Editor. Applied Science Publishers, Inc., Englewood Cliffs, New Jersey 07631.

This is the first in what is promised to be a series of volumes on recent developments in food microbiology. It joins the other *Developments Series* book which deals with a number of topic areas. This type of publication in the field of food microbiology heretofore has not existed and should be a welcome addition to the literature in food microbiology. The field of food microbiology is sufficiently diverse and active that there should be plenty of subject areas for review of new developments each year.

Volume 1 contains six chapters. The chapter titles are as follows: Microbial Spoilage of Meats; the Nurmi Concept and Its Role in the Control of Salmonella in Poultry; the Bacteriology of Fish Handling and Processing; Thermobacteriology of UHT Processed Foods; Regulation of Lactose Metabolism in Dairy Streptococci; and New Developments in the Rapid Estimation of Microbial Populations in Foods.

Chapter 1 on Microbial Spoilage of Meats deals with the spoilage of refrigerated stored fresh meats only and does not cover other meats. The second chapter discusses the so-called "Nurmi Concept" for preventing or decreasing the infection of poultry by salmonellae. The concept involves the introduction of gut contents from adult birds or cultures of gut contents into newly hatched chicks and turkey poults. The practice is said to make the young birds resistant to  $10^3$  to  $10^6$  infectious doses of salmonellae. In Chapter 3 the bacteriology of fish handling and processing is discussed from the standpoints of spoilage, hygiene and foodborne disease organisms. The fourth chapter summarizes the literature concerning ultra-high temperature (UHT) processing and the resistance of bacterial spores at high temperatures. Chapter 5 describes developments in the genetic and enzymatic regulation of lactose metabolism in dairy streptococci, including a discussion of the role of plasmid DNA in carrying genes responsible for lactose fermentation. The last chapter in the book discusses new methods of estimating microbial populations in foods, which the authors believe will be coming into routine use. These methods include direct cell counts by epifluorescent microscopy, metabolically based techniques such as impedimetric and radiometric estimations, and techniques which directly estimate constituents of microbial cells such as ATP or endotoxins.

The book is interesting reading and will be of interest to most food microbiologists and another means of staying current in the many areas of this diverse field.

**Lloyd B. Bullerman**  
Dept. of Food Science & Technology  
University of Nebraska-Lincoln  
Lincoln, Nebraska

*Meat, Poultry and Seafood Technology—Recent Developments,* Dr. Endel Karmas, Noyes Data Corporation.

The stated purpose of this book is to provide technical information on patent literature. The book contains information on U.S. patents issued since 1974.

The Fresh Meat and Meat Product Technology section covers 235 pages, and chapters discussing patent literature ranging from Immediate Post-Mortem Operations to Packaging Methods. The Poultry Technology section covers 40 pages, and chapters ranging from Post-Mortem Carcass Handling and Processing to Processes in Connection with Serving Poultry. The Fish-Shellfish Technology section covers 128 pages, and chapters discussing patent literature ranging from Processes Related to Color and Flavor of Fish to Miscellaneous Shellfish Products. The book also contains company, inventor, and U.S. Patent Number indexes for easy reference.

The processing and further-processing of meat, poultry and fish and shellfish has changed dramatically since 1974, so this book is a valuable up-to-date reference, especially to research and development groups whose job it is to stay abreast of the rapid technological advances.

**C. E. Lyon**  
Research Food Technologist  
Russell Research Center, USDA  
Athens, Georgia 30613

*Psychrotrophic Microorganisms in Spoilage and Pathogenicity,* Edited by: T. A. Roberts and others, Academic Press 1981; 529 pages.

PSYCHROTROPHIC MICROORGANISMS IN SPOILAGE AND PATHOGENICITY is a comprehensive and exceptional publication on the subject of psychrotrophic microorganisms of concern to the foodservice industry. This text is described by its editors as a "collection of papers presented during the 1980 Symposium of the International Committee on Food Microbiology and Hygiene". I found it far more than just a collection of papers.

This publication is an effective treatment of the subject of microorganisms of public health concern that are capable of significant growth and multiplication at cold temperatures i.e.; below 7-10°C/ 45°F. While it has been recognized for some time that a number of spoilage microorganisms are psychrotrophic it is only recently that certain pathogens have received widespread recognition.

The editors have done an outstanding job of arranging fifty-two papers focused on psychrotrophic microorganisms into a unique reference and at the same time a useful text. **PSYCHROTROPHIC MICROORGANISMS IN SPOILAGE AND PATHOGENICITY** consists of three major parts. Part one provides the reader with the fundamentals of psychrotrophic microorganisms; part two reviews current research activities involving various food products; part three is a state-of-the art presentation of psychrotrophic pathogens.

All public health professionals involved with food sanitation should be knowledgeable of the information presented in this publication. The impact of recognizing that certain pathogens flourish below the magical 45°F that we

have virgously supported in the last few years may necessitate a review of current trends of focusing on temperature control as the major "ounce of prevention" in foodservice operations. This text is recommended as a reference in all graduate and undergraduate schools of environmental health and could easily be used as a text in a special problems course. It should be used by public health officials in reviewing current standards and philosophies concerning temperature control as the major factor in the prevention of foodborne disease.

**Homer C. Emery, Ph.D.**  
*Maj, MSC, US Army*  
*Academy of Health Sciences*  
*Ft. Sam Houston, TX 78234*

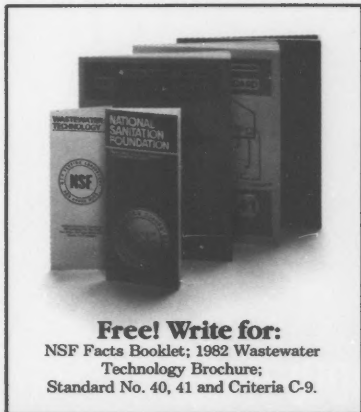


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Wastewater testing facility, Chelsea, Michigan.

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Wastewater testing and equipment evaluation services are provided by NSF at our extensive laboratory in Ann Arbor and our wastewater testing facility in nearby Chelsea, MI. Additionally, our testing capabilities are extended by our teams of chemists who travel to operating field units to conduct on-location testing. Chances are they can help you. For more information regarding NSF Wastewater Technology programs just give us a call and ask for Raymond Thursby. He doesn’t want his grandchildren to drink contaminated water, either!



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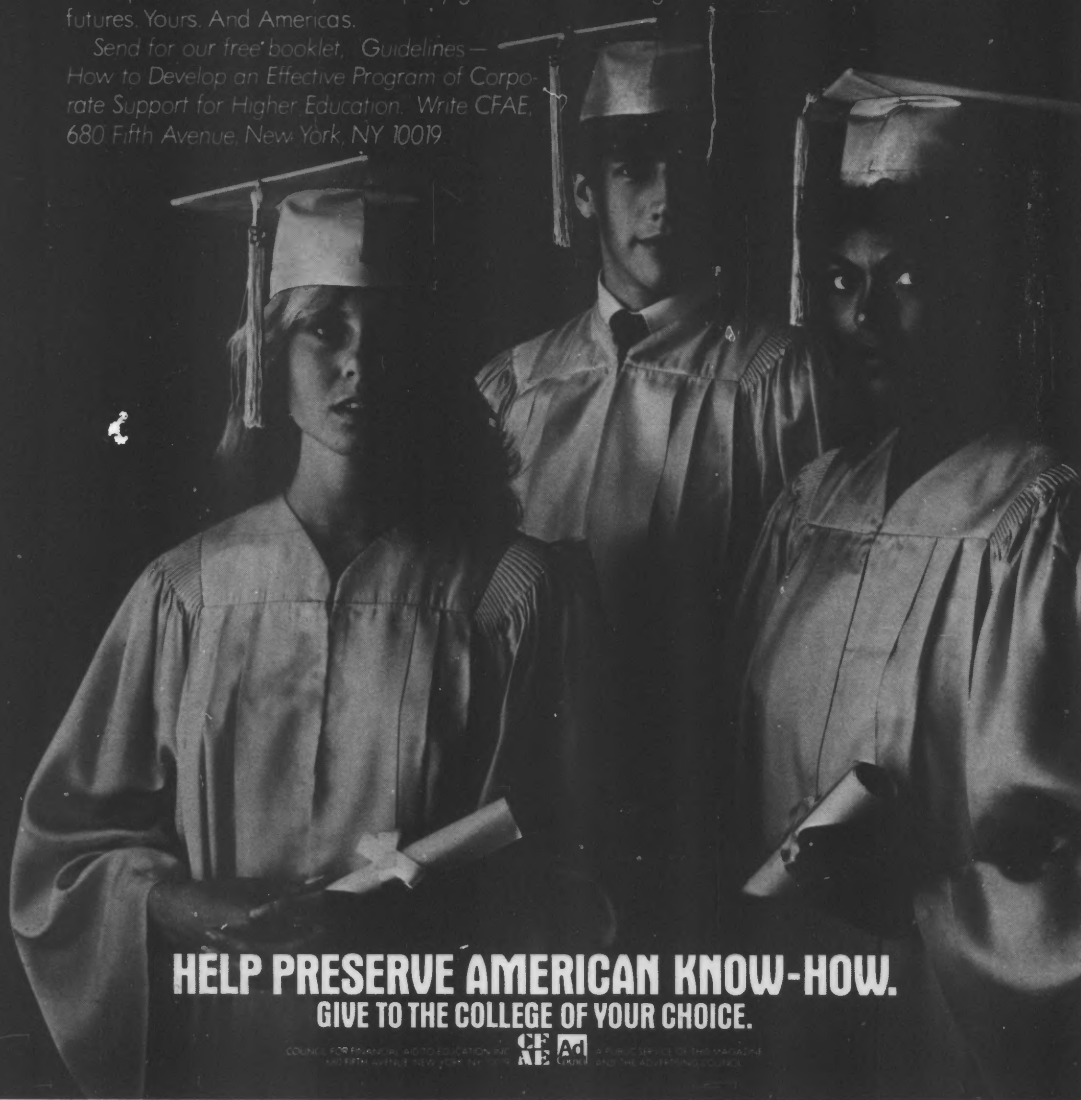
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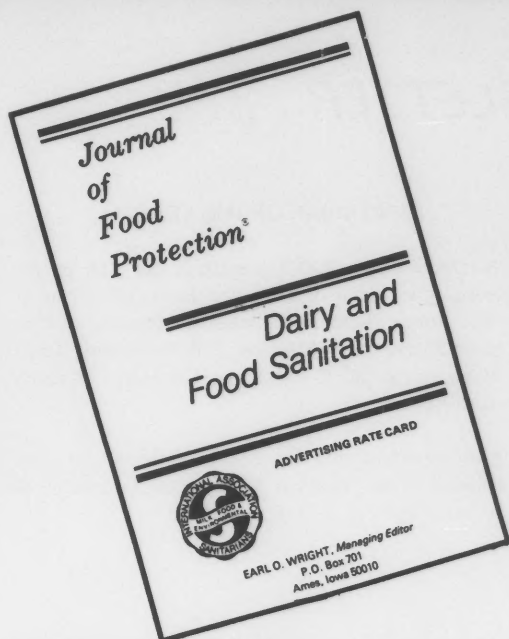
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The circulation of the *Journal* is international and averages 4000 copies per month. *Dairy and Food Sanitation* circulation averages 2500 copies per month.

# AFFILIATE NEWSLETTER . . .

## HEDLIN ELECTED PRESIDENT OF ILLINOIS SANITARIANS

The Associated Illinois Milk, Food, and Environmental Sanitarians (AIMFES) installed Tim Hedlin, Hedlin Dairy Company, as president for the upcoming year.

Other officers elected at the annual fall seminar and business meeting in Elgin, IL were: Carl Zieseemer, Evanston North-Shore Health Department, president-elect; Jerry Kopp, Dean Foods, first vice-president; Kenneth Anderson, Illinois Department of Public Health, second vice-president; Clem Honer, *Dairy Record*, secretary-treasurer; Joe Byrnes, Dart-Kraft, sergeant-at-arms, and Robert Anderson, Federal Food and Drugs, and Dan Biggins, Hillfarm Dairy, auditors.

At the seminar, papers discussing new products from corn and soy-based ingredients, farm computers and electronic weighing, properties of fermented acidophilus milk, consumer quality assurance, and Federal Food and Drug update were presented.

Kathy Hathaway, representing the International Association of Milk, Food, and Environmental Sanitarians (IAMFES) reported on the affiliate news from the IAMFES meeting in Louisville and the association's office.

A milk preference survey also was conducted. Members evaluated the flavor of milk bottled in paper and in plastic. Both samples were purchased from the same store, bottled by the same fluid plant, and displayed the same code date. Chilled samples were identified only by letter labels.

The responses were recorded on a hedonic scale form ranging in flavor values from one to nine, in which one represented "dislike extremely," and nine, "like extremely."

Fifty members participated in the survey. The average response preferred milk bottled in paper, although a few found no difference between the two.

Milk in paper had an average value of 7.14; milk in plastic, 5.10.



Tim Hedlin, Hedlin Dairy Company (c) president; Bob Grossman, Schaumbury Department of Health (l) past president; and Jerry Kopp, Dean Foods Company, (r) first vice president.

## SANITARIAN OF THE YEAR

J. B. Drake was named Sanitarian of the Year by the Wisconsin Association of Milk and Food Sanitarians at their 3rd Annual Joint Educational Conference recently held at the Sheraton Inn, Madison. J. B. is currently Territory Manager for the H. B. Fuller Company, Monarch Chemical Division.

The annual scholarship was awarded to Miss Gail Mezera, a student in the School of Allied Health Professions at the University of Wisconsin, Eau Claire.

The following Indiana sanitarians were recently honored at the Indiana Association of Sanitarians 32nd Annual Educational Conference, held September 20-22 at French Lick Springs Resort in Southern Indiana.

Ted Alexander - Tim Sullivan Memorial Award.

Claude Brozzo - Outstanding Sanitarian of 1982.

Karl Jones - Sanitarian Emeritus.

Rex Courtney, Richard Harlow, George Crofoot, William Gough, and Karl Jones - Life Memberships.



Happy Holidays from the International Office Center, Earl O. Wright, Executive Secretary. Left to right, Kathy R. Hathaway, Associate Executive Secretary; Jeanine Strodman, Circulation Director; Suzanne Trcka, General Bookkeeping.

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Milk Flavor and Quality-As I Find It  
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The Mysteries of Motivation  
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Milk as a Soil

## MARCH 1981

PCB's in the Food Chain and Regulatory Activities  
Tanker Receiving Losses in Fluid Milk Operations  
Making 'Clean is Keen' a Warehouse Motto  
What We Have Learned From Metering Milk  
New York State Experiences with Antibiotic Testing  
Can SPC's Be Misleading?

## APRIL 1981

Yogurt-A Test of Quality  
A Food Poisoning Whodunit  
A Corporate Commitment to Quality Assurance  
PH: Acidity by the Numbers  
The Cost of Dairy Wastewater-Its Disposal and Management

## MAY 1981

Milk and Foodservice Programs: Taking Stock as We Enter the 80's  
Tank Calibration-Procedures and Criteria  
Low-Temperature Dishmachines Save Energy, Money and H<sub>2</sub>O  
A Bacteriological Survey of Water Slides  
Is Cooling of Milk Overemphasized?  
Quality of Juice Drinks

## JUNE 1981

A Local Community's Approach to Inland Shellfish Sanitation  
Insuring Food Quality by Tamper-Proof Packaging  
Prevention of Contamination in Cheese Bulk Cultures  
Microbiological Tests for the Evaluation of Dairy Products-Today and Tomorrow  
Danger Lurks Among the Molds  
Getting Good Preliminary Incubation Counts

## JULY 1981

A Quality Control Program for the Food Industry  
Public Enemy Number One  
Enumeration, Identification of Cultured Product Organisms  
Cleaning of CIP Systems

## AUGUST 1981

Wastewater Pretreatment for the Dairy Products Processing Industry: Regulatory and Economic Aspects  
Milk Safety: An Historical Overview  
Cleaning and Sanitizing Operations  
Food Surveillance and Salvage Following Disasters

## SEPTEMBER 1981

*Yersinia enterocolitica*: A New Problem in Foodborne Illness  
Setting Forth the Right Way to Sell Salvaged Food  
Challenge for the 80's: Controlling Animal Drugs  
Causes of Rancid Flavor in Retail Milk Samples  
Opening Address, 18th National Conference on Interstate Milk Shipments

## OCTOBER 1981

Quality Assurance in Inflight Foodservice Operations  
Regulation: Looking to the Future  
The Dairy Industry's Greatest Asset: Quality  
The Sanitarian's Role in Application of Research and Development findings to Economical Food Production

## NOVEMBER 1981

Eggnog: Its Composition and Quality  
An Assessment: The Future of the Dairy Industry in the Northeast  
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### January

| Vol. 44  | January 1981 | No. 1 |
|--|--------------|-------|
| <b>Research Papers</b>   |              |       |
| Prevalence of <i>Staphylococcus aureus</i> in Meat Samples from Traditional Markets in Benin City, Nigeria and Possible Control by Use of Condiments<br>Ezekiel J. Nwagwu* and Ndaba Uvhai | 4            |       |
| Growth and Survival of <i>Clostridium perfringens</i> in Rare Beef Prepared in a Water Bath<br>Anne M. Smith, David A. Evans and Ernest M. Buck*   | 9            |       |
| Bacteriological Control of Food Equipment Surfaces by Cleaning Systems. I. Detergent Effects<br>D. G. Donmore*   | 15           |       |
| Bacteriological Control of Food Equipment Surfaces by Cleaning Systems. II. Sanitizer Effects<br>D. G. Donmore* and M. A. Thomson  | 21           |       |
| Initial Reaction Intermediates in the Oxidation of Ascorbic Acid by Nitrous Acid<br>Jay B. Fox, Jr., Rosemary N. Fidler and Aaron E. Wasserman*  | 28           |       |
| A Research Note: Potassium Sorbate as a Preservative of Butter<br>Ajay Kaul*, Jasjit Singh and R. R. Bhat  | 33           |       |
| Evaluation of a Prototype Beef Carcass Washer in a Commercial Plant<br>M. E. Anderson, R. T. Marshall*, W. C. Metzger, and D. N. Nisnam  | 35           |       |
| Patulin and Rubratoxin B: Interactions of Toxic and Hepatic Effects and Mutagenic Potential<br>Kaw Kungshelampai, D. K. Sahasrab* and R. P. Sharma   | 39           |       |
| Salt, Water and Oilseed Proteins Affect Brine Content of Sausage<br>R. N. Terrell* and J. A. Brown   | 43           |       |
| Excessive Energy for Food Distribution Associated with Food Shortages<br>Nan Unkshay   | 47           |       |
| Nutritional and Microbial Changes During Production of Tostitos (Fried Plantains)<br>E. J. Alvarez, J. A. Koberger* and R. Applenderf  | 55           |       |
| Evaluation of the Botulism Hazard from Nitrogen-Packed Sandwiches<br>D. A. Kastner*, R. R. Lytt, T. Lilly, Jr., and H. M. Solomon  | 59           |       |
| Microbial Quality of Ground Beef After Simulated Freezer Failure<br>Faitima S. Ali and Frances O. Van Dusen*   | 62           |       |
| Inhibition of Microbial Growth in English Sole ( <i>Parophrys reticulatus</i> )<br>Tah-Mei Chung and J. S. Lee*  | 68           |       |
| Variability and Interrelationship of Various Herd Milk Components<br>E. Groggin, V. S. Puskard*, R. E. Gian  | 69           |       |
| Some Characteristics of Acid Injury and Recovery of <i>Salmonella</i> in a Model System<br>L. C. Blawiechowski   | 73           |       |
| General Interest Paper<br>Yogurt: Nutritional Therapeutic Aspects<br>H. C. Deeth and A. T. Tamplin*  | 78           |       |
| Calendar   | 86           |       |
| National Mastitis Council Program  | 87           |       |
| Index to Advertisers   | 88           |       |

### March

| Vol. 44  | March 1981 | No. 3 |
|--|------------|-------|
| <b>Research Papers</b>   |            |       |
| Prevalence of <i>Staphylococcus aureus</i> in Raw and Pasteurized Milk Used for Commercial Manufacturing of Brazilian Minas Cheese<br>Edson Clemente dos Santos, Constantin Geisgriep* and Thomas B. Furver  | 172        |       |
| Survival and Growth of <i>Staphylococcus aureus</i> in Commercially Manufactured Brazilian Minas Cheese<br>Edson Clemente dos Santos and Constantin Geisgriep*   | 177        |       |
| Potential for Presence and Growth of <i>Staphylococcus aureus</i> in Brazilian Minas Cheese Whey<br>Edson Clemente dos Santos and Constantin Geisgriep*  | 185        |       |
| Inhibition of Growth of <i>Staphylococcus aureus</i> and Enterotoxin A Production in Cheddar Cheese Produced with Induced Starter Culture<br>G. F. Bresnahan, D. R. Redford, A. K. Balbach and L. B. Ireland | 186        |       |
| Determination of Antibiotics in Meat Using <i>Bacillus stearothermophilus</i> Spores<br>M. Hlecha, J. D. Balbach and A. W. Reitel*   | 194        |       |
| Seasonal Concentration of Calcium Bacteria by <i>Crossostreus virgatus</i> , the Eastern Oyster, in Chesapeake Bay<br>David Hummer, B. B. Colwell and Ronald M. Walter*                                      | 201        |       |
| Scanning Electron Microscopy of Microbial Attachment to Milk Contact Surfaces<br>F. T. Zohal, E. A. Zetser* and L. L. McKay  | 204        |       |
| A Research Note: Variation of Laboratory Chemically Making Procedures<br>C. L. Hleba, J. O'Leary, E. B. Aylward, and B. E. Langhale  | 209        |       |
| Growth and Adhesion Production by <i>Aggregatibacter penneri</i> in the Presence of Lactobacilli<br>S. M. El-Gohary and E. H. Marsh*   | 211        |       |
| A Research Note: Thermal Inactivation of L-Glutamic Acid Decarboxylase from <i>Escherichia coli</i><br>Terrance L. Smith, James W. Moran and Lloyd D. Witte*   | 213        |       |
| Cooled Product Temperature and Curing Ingredients Affect Properties of Irradiated Frankfurters<br>R. N. Terrell*, G. C. Smith, F. Holligan, E. Warwick* and Z. L. Carpenter                                  | 215        |       |
| General Interest Paper<br>Design and Performance of Systems for Cleaning Product-Contact Surfaces of Food Equipment: A Review<br>D. G. Donmore*, A. Twomey, W. G. Whitcomb* and H. W. Morgan                 | 229        |       |
| * Asterisk designates author to whom reprint inquiries should be addressed.  |            |       |
| JA Symbol Holders' List  | 241        |       |
| Calendar   | 245        |       |
| Index to Advertisers   | 248        |       |
| Classified Ad  | 249        |       |

### May

| Vol. 44  | May 1981 | No. 5 |
|--|----------|-------|
| <b>Research Papers</b>   |          |       |
| A Research Note: Residual Sulfur Dioxide in some Thai Noodles<br>Amara Kinghate, Chanchai Jaenglawang, Patraporn Chaiyapongkorn, Chawarwan Ballanman, and Manolito Toyed*                                    | 334      |       |
| Enzymatic Cleaving of Cellulose Acetate Membrane Reverse Osmosis Systems<br>W. J. Harper* and M. E. Meedy  | 337      |       |
| Effects of Nitrite and Sorbate on Bacterial Populations in Frankfurters and Thuringer Cervelat<br>Catherine M. Balbach and Norman N. Potter*   | 341      |       |
| Production of Italian Dry Salami. I. Initiation of <i>Staphylococcus aureus</i> in Salami Under Commercial Manufacturing Conditions<br>J. Hestapopoules, C. Geisgriep*, M. J. Fanelli, C. Franti and E. Coma | 347      |       |
| A Research Note: Role of Lipids in Growth and Lipase Production by <i>Rhizopus stolonifer</i><br>Harish Chander, V. K. Bhat* and Om Parkash  | 353      |       |
| Microbiology of Beef Carcass Surfaces<br>G. L. Nerfje and R. T. Naselli  | 355      |       |
| Effect of <i>Flavococcus citreus</i> on Selected Quality Indices of Pressure Shrimp<br>B. J. Alvarez and J. A. Koberger*   | 359      |       |
| <b>General Interest Papers</b>   |          |       |
| Data Structures for Integrating Quality and Cost Factors in a Foodservice Operation<br>John P. Norback* and M. Edson Mathews   | 364      |       |
| Update on Freezer-kill and Selective Enrichment Conditions for Detection of <i>Salmonella</i> in Foods<br>Jean Yves D'Amst   | 369      |       |
| Update on <i>Salmonella</i> in Foods: Selective Plating Media and Other Diagnostic Media<br>William A. Meats   | 375      |       |
| Current Status of Immunofluorescent Methodology for <i>Salmonella</i><br>Bernard M. Thomson  | 381      |       |
| Automation for Rapid Identification of <i>Salmonella</i> in Foods<br>Paul A. Hartman* and Scott A. Minnich   | 385      |       |
| Current Trends in Foodborne <i>Salmonellosis</i> in the United States and Canada<br>Frank L. Bryne   | 394      |       |
| * Asterisk indicates person to contact regarding reprints of paper.  |          |       |
| Errata   | 338      |       |
| Program—IANFES Annual Meeting  | 400      |       |
| Calendar   | 400      |       |
| Index to Advertisers   | 400      |       |

### February

| Vol. 44   | February 1981 | No. 2 |
|---|---------------|-------|
| <b>Research Papers</b>  |               |       |
| Factors Affecting Death of Yeast by Sulfur Dioxide<br>A. D. Ring, Jr.*, J. D. Posing, D. W. Seawash, R. Johnson and E. Mihars   | 92            |       |
| A Research Note: Microbiological Analysis of Alligator ( <i>Alligator mississippiensis</i> ) Meat<br>J. L. Ollinger*, J. E. Kennedy, Jr., E. D. McDonald, and R. L. West              | 98            |       |
| Bacteriological Control of Food Equipment Surfaces by Cleaning Systems. III. Complementary Cleaning<br>D. G. Donmore*, M. A. Thomson and G. Murray                                    | 100           |       |
| Prepress Holding of Liquid (After Silverpress) and Quality of Canned Macaroni<br>Bobbin M. Slaby* and Ruth B. Truss   | 109           |       |
| Hydrolysis of 2-Chloroethyl Palmitate and 2-Chloroethyl Linoleate by Mammalian Enzymes<br>John J. Sullivan* and John L. Majumdar  | 112           |       |
| Mayonaisse, Sandwiches and Salmonella<br>B. Swaminathan*, J. M. Brown, and C. M. Easting  | 115           |       |
| Heat Analysis of Pasty Pack Foods Prepared at a Catering Establishment<br>Frank L. Bryne*, Mary Harvey, and Melvin C. Mump  | 118           |       |
| Antibiotic Susceptibility Patterns of <i>Yersinia enterocolitica</i><br>L. Restani* and W. M. Hill  | 124           |       |
| Survival of <i>Streptococcus faecalis</i> in Beef Loaf and Pastes after Microwave Heating in a Simulated Cook/Chill Foodservice System<br>C. A. Dahl, M. E. Matthews* and E. H. Marsh | 128           |       |
| A Research Note: Evaluation of Media Used in Rapid Methods for the MPN Enumeration of Fecal Coliforms in the Spiced Rack Oyster ( <i>Crassostrea commersoniana</i> )<br>A. Brown      | 134           |       |
| Air-wash Protection in Ethos<br>A. F. Lembo, R. Ranganathan*, M. V. Ramana Rao and L. Krishna Rao   | 137           |       |
| Microbial Quality of Ground and Comminuted, Raw and Cooked Turkey Meat<br>G. A. McKinlay and J. S. Avaw*  | 138           |       |
| General Interest Papers<br>Thermophilic Organisms Involved in Food Spoilage: Introduction<br>Clare B. Denny   | 144           |       |
| Thermophilic Organisms Involved in Food Spoilage: Thermophilic Anaerobes not Producing Hydrogen Sulfide<br>D. B. Adnan  | 148           |       |
| Thermophilic Organisms in Food Spoilage: Sulfide Spoilage Anaerobes<br>Robert V. Spaul  | 149           |       |
| Thermophilic Organisms Involved in Food Spoilage: Acidic Flat-Sour Spoilage Aerobes<br>P. J. Thompson   | 154           |       |
| Thermophilic Organisms in Food Spoilage: Flat-Sour Aerobes<br>Keith A. Ho   | 157           |       |
| Calendar  | 164           |       |
| News and Events   | 165           |       |
| Book Reviews  | 166           |       |
| Index to Advertisers  | 168           |       |

### April

| Vol. 44   | April 1981 | No. 4 |
|---|------------|-------|
| <b>Research Papers</b>  |            |       |
| Development of Microbial Populations in Fermented Wastes from Frozen Vegetable Processing<br>Staney J. Mason  | 208        |       |
| Demonstration of Viral Contamination of Oysters Responsible for an Outbreak of Viral Gastroenteritis<br>M. J. Eyles, G. R. Davey and E. J. Huxley   | 214        |       |
| Proper Control of Retail Case Temperature Improves Beef Shelf Life<br>C. Gordon Coor* and L. E. Jevanish  | 217        |       |
| A Research Note: Effect of Frozen Storage on Fungi in Foods<br>John A. Koberger   | 220        |       |
| General Interest Papers<br>Role of Nitrite in Cured Meat Flavor: A Review<br>J. I. Gray*, B. MacDonald, A. M. Pearson and I. D. Marton  | 262        |       |
| Space Shuttle Food Processing and Packaging<br>C. T. Burstead, M. F. Fabry, R. M. Rapp and R. L. Sauer  | 313        |       |
| Food Contaminants—Viruses<br>Edward P. Larkin   | 320        |       |
| Asterisk indicates person to whom inquiries regarding paper should be addressed.  |            |       |
| News and Events   | 327        |       |
| Calendar  | 328        |       |
| Development of Microbial Populations in Fermented Wastes from Frozen Vegetable Processing<br>Staney J. Mason  | 208        |       |
| Comparison of Tests of Milk Samples taken Conventionally and with an Automatic In-Line Sampler<br>R. T. Marshall* and D. S. Shelley   | 257        |       |
| Inhibition of <i>Staphylococcus aureus</i> growth and Enterotoxin A Production in Cheddar Cheese Produced with Variable Starter Activity<br>G. F. Bresnahan, A. K. Balbach, D. R. Redford and L. B. Ireland | 263        |       |
| Effects of Freezer-kill Media and Their Inactivation Conditions on Isolating <i>Salmonella</i> from Fish Meal<br>S. Karel   | 268        |       |
| Survival of Bacteria in "Soft Foods" at 10-Centigrade<br>Adelle W. Stewart  | 271        |       |
| Rapid Estimation of Microbial Numbers in Fresh Ground Beef by Use of the <i>Limulus</i> Test<br>James M. Jay  | 275        |       |
| Prevalence of <i>Clostridium perfringens</i> in Pork during Processing<br>F. T. Besser, J. A. Carpenter* and J. O. Reagan   | 279        |       |
| Microbial Spoilage of Mexican Style Sausages<br>F. A. Draughn*, M. Elahi and I. E. McCarty  | 284        |       |

### June

| Vol. 44   | June 1981 | No. 6 |
|---|-----------|-------|
| <b>Research Papers</b>  |           |       |
| Effects of Sodium Nitrite, Sodium Nitrate and DL-Alpha Tryptophan on Properties of Irradiated Frankfurters<br>R. N. Terrell*, F. Holligan, G. C. Smith, E. Warwick, and Z. L. Carpenter | 414       |       |
| Growth of <i>Salmonella typhimurium</i> and <i>Staphylococcus aureus</i> in Retail Pumpkin Pies<br>C. Jane Wyatt* and V. B. Guy   | 418       |       |
| Incidence and Growth of <i>Aerobius cressii</i> in Retail Pumpkin Pies<br>C. Jane Wyatt* and V. B. Guy  | 422       |       |
| Effect of Commination Method and Pressure on Restructured Beef Steaks<br>W. J. Conall, S. C. Seideman, J. D. Nichols and N. M. Quinner*   | 425       |       |
| Food Poisoning Potential of Artificially Contaminated Vacuum Packaged Sliced Ham in Sandwiches<br>James E. Steele and Michael E. Sidles*  | 430       |       |
| Microbial Quality of Vacuum Packaged Sliced Ham<br>James E. Steele and Michael E. Sidles*   | 435       |       |
| A Research Note: Minimizing <i>Salmonella</i> Contamination on Broiler Carcasses with Poly (Hexamethylene Hydrochloride)<br>J. E. Thomson*, N. A. Cox, J. S. Bailey and M. N. Islam     | 440       |       |
| Comparison of Micro-ID and Minitek Serology Systems for Rapid Identification of <i>Salmonella</i><br>N. A. Cox*, J. S. Bailey and J. E. Thomson   | 442       |       |
| A Research Note: Minitek Inoculum Broth for Testing Indole Production by <i>Enterobacteriaceae</i><br>N. A. Cox, J. E. Thomson and J. S. Bailey   | 445       |       |
| A Research Note: Bacteriology, Water Activity and Moisture/Salt Ratio of Six Brands of Precooked Canned Bacon<br>Edmund M. Powers*, Daniel Berkevis and George C. Walker                | 447       |       |
| Influence of Potassium Sorbate and Sodium Benzoate on Heat Inactivation of <i>Aspergillus flavus</i> , <i>Penicillium puberulum</i> and <i>Geotrichum candidum</i><br>L. B. Ireland     | 450       |       |
| Effects of Package Temperature and Days of Storage on the Flavor Score of Processed Milk<br>J. J. Janusz*, A. R. Boddie and J. R. Bishop  | 455       |       |
| General Interest Papers<br>Defecitification of Repressed Products<br>P. N. Maheshwari, D. W. Stanley and J. I. Gray*  | 459       |       |
| Microbiological Problems in Dairy Foods in the 1980's<br>Rao Richter  | 471       |       |
| Milk Indole Content as Influenced by Feed Sources and Sanitizer Residues<br>R. W. Hennessy*, J. D. Fox and C. L. Hicks  | 476       |       |
| Complanacter <i>farus</i> subsp. <i>farus</i> : An Old Pathogen of New Concern<br>M. P. Doyle   | 480       |       |

July

Table of contents for July 1981, Vol. 44, No. 7. Includes sections for Research Papers, General Interest Papers, and a Calendar.

September

Table of contents for September 1981, Vol. 44, No. 9. Includes sections for Research Papers, General Interest Papers, and a Calendar.

November

Table of contents for November 1981, Vol. 44, No. 11. Includes sections for Research Papers, General Interest Papers, and a Calendar.

August

Table of contents for August 1981, Vol. 44, No. 8. Includes sections for Research Papers, General Interest Papers, and a Calendar.

October

Table of contents for October 1981, Vol. 44, No. 10. Includes sections for Research Papers, General Interest Papers, and a Calendar.

December

Table of contents for December 1981, Vol. 44, No. 12. Includes sections for Research Papers, General Interest Papers, and a Calendar.

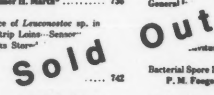
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# Calendar

## 1983

Jan. 10-13--EIGHTH ANNUAL TROPICAL AND SUBTROPICAL FISHERIES CONFERENCE OF THE AMERICAS. Agenda includes topics in seafood quality control, etc. Admiral Benbow Inn, Tampa, FL. Chairman, W. Steven Otwell, Dept. of Food Science & Human Nutrition, University of FL, Gainesville, FL 32611, 904-392-1991.

Jan. 30-Feb. 2--THIRD INTERNATIONAL SWEETENER COLLOQUIUM, The Pointe, Phoenix, AZ. For more information contact: Sugar Users Group, 910 Seventeenth St. NW, Suite 1105, Washington, DC 20006. Phone: 202-296-4250.

Feb. 10-13--ALIMAC '83, Bologna. For more information contact: Senaf, 40127 Bologna Via Michelino, 69.

Feb. 15-16, 1983--FOOD PROCESSORS SANITATION WORKSHOP. Mission De Oro, Santa Nella, CA. For more information contact Paulette De Jong, Food Science and Technology, University of California, Davis, CA 95616, phone 916/752-1478.

Feb. 16-17--DAIRY AND FOOD INDUSTRY CONFERENCE, The Ohio State University. For information contact: John Lindamood, Department of Food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH 43210.

March 14-16, 1983--SECOND NATIONAL DAIRY HOUSING CONFERENCE, Madison, WI. For more information contact: Cathy Ziegert, Meetings Secretary, ASAE, 2950 Niles Road, St. Joseph, MI 49085, 616 429-0300.

March 20-23, 1983--AMERICAN CULTURED DAIRY PRODUCTS INSTITUTE ANNUAL MEETING AND CONFERENCE/KULTURES AND KURDS KLINIC/NATIONAL JUDGING CONTEST, International Drive Holiday Inn, Orlando, Florida. For further information: C. Bronson Lane, ACDPI, P.O. ABox 7813, Orlando, Florida 32854.

March 21-25--MID-WEST WORKSHOP IN MILK AND FOOD SANITATION, The Ohio State University. For information contact: John Lindamood, Department of Food Science and Nutrition, 2121 Fyffe Road, The Ohio State University, Columbus, OH 43210.

March 23-24--IOWA ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS SPRING MEETING, Starlite Village, Ames, IA. For more information contact: Jack L. Schoop, 602 East 1st St., Des Moines, IA 50307.

April 11-13--DAIRY AND FOOD INDUSTRIES SUPPLY ASSOCIATION, 64th ANNUAL MEETING, Boca Raton Hotel and Club, Boca Raton, FL. For more information: Dairy

and Food Industries Supply Association, 6245 Executive Blvd., Rockville, MD 20852, 301-984-1444.

April 13-14, 1983--FOOD MICROBIOLOGY UPDATE. Orange County Cooperative Extension Office, Anaheim, CA. Topics covered include sampling, new trends and methods for detection, enumeration, and identification of microorganisms, microbial aspects of food processing methods, pathogens, and the significance of microorganisms in food. Contact Paulette De Jong, Food Science and Technology, University of California, Davis, CA 95616, 916 752-1478.

April 20-22--SOUTH DAKOTA ENVIRONMENTAL HEALTH ASSOC. ANNUAL MEETING. Howard Johnsons, Sioux Falls, SD. For more information contact: Morris V. Forstine, SD State Dept. Health, 1320 S. Minnesota Ave., Room 101, Sioux Falls, SD 57105.

April 20-22, 1983--FOOD MICROSTRUCTURE ANNUAL MEETING in conjunction with Scanning Electron Microscopy 1983. For more information contact: Dr. Om Johari, SEM Inc., P.O. Box 66507, AMF O'Hare (Chicago), IL 60666, 312-529-6677.

April 26--ILLINOIS ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS SPRING MEETING. For more information contact: Clem J. Honer, 1 S 760 Kenilworth Ave., Glen Ellyn, IL 60137.

April 27, 1983--SOUTHERN CALIFORNIA FOOD PROCESSORS SANITATION WORKSHOP FOR THE FOOD PROCESSING AND FOOD SERVICE INDUSTRIES. Presented by the University of California Cooperative Extension with assistance from industry trade associations and food industry personnel. Inn at the Park, Anaheim, California. For more information contact: Paulette De Jong, Food Science and Technology, University of California, Davis, CA 95616, 916 752-1478.

May 16-20, 1983--INTERNATIONAL DAIRY FEDERATION SYMPOSIUM, Denmark. For more information contact: Canadian National Committee International Dairy Federation, 549 Sir John Carling Building, Ottawa K1A 0C5 Canada, 613-994-9537.

May 23-25, 1983--TRACE ANALYSIS OF FOODS: Flavor Problems and Contaminants. Univ. of MN, St. Paul, MN. For more information contact: Gary Reineccius, Department of Food Science and Nutrition, University of MN, St. Paul, MN 55108.

July 3-8, 1983--67TH ANNUAL SESSIONS OF THE INTERNATIONAL DAIRY FEDERATION, Oslo, Norway. For further information, contact Harold Wainess, Secretary U.S. National Committee of the IDF (USNAC),

464 Central Avenue, Northfield, IL 60093, 312-446-2402.

August 7-11, 1983--IAMFES ANNUAL MEETING, St. Louis, MO.

Aug. 7-11, 1983--23rd ANNUAL MEETING, THE HOSPITAL, INSTITUTION, AND EDUCATIONAL FOOD SERVICE SOCIETY. Fairmont Hotel, New Orleans, LA. HIEFSS Expo '83 will be open on August 9 and 10. For more information contact: Carolyn Isch, Assistant Executive Director, HIEFSS, 4410 West Roosevelt Road, Hillside, IL 60162, 312 449-2770.

Aug. 14-19, 1983--5th WORLD CONFERENCE ON ANIMAL PRODUCTION, Nihon Toshi Center, Tokyo, Japan. For more information contact: The 5th WCAP Conference Secretarial, c/o National Institute of Animal Industry, Tsukuba Norindanchi, PO Box 5, Ibaraki 305, Japan.

Sept. 7-9--SYMPOSIUM ON LACTIC ACID BACTERIA IN FOODS: GENETICS, METABOLISM AND APPLICATIONS. Wageningen, The Netherlands. Organized by The Netherlands Society for Microbiology. For more information contact: Dr. P. M. Klapwijk, Unilever Research Laboratory, P.O. Box 114 3130 AC Vlaardingen, The Netherlands.

Sept. 18-23--SIXTH WORLD CONGRESS OF FOOD SCIENCE & TECHNOLOGY, Dublin, Ireland. For more information contact: Sixth World Congress of Food Science and Technology, Congresses & Exhibition Ltd. 44, Northumberland Rd., Dublin, 4, Ireland.

Sept. 20-22--NEW YORK STATE ASSOCIATION OF MILK AND FOOD SANITATION ANNUAL MEETING. Hotel Syracuse, Syracuse, NY. For more information contact: David Bandler Stocking Hall, Cornell University, Ithaca, NY 14853.

Oct. 22-26--FOOD AND DAIRY EXPO '83, McCormick Place, Chicago, IL. For more information contact: Dairy and Food Industries Supply Association, 6245 Executive Blvd., Rockville, MD 20852, 301-984-1444.

## 1984

August 3-9, 1984--IAMFES ANNUAL MEETING, Edmonton, Alberta, Canada.

Nov. 22-24, 1984--14th ANNUAL SYMPOSIUM ON THE ANALYTICAL CHEMISTRY OF POLLUTANTS, 3rd International Congress on Analytical Techniques on Environmental Chemistry-Expoquimia, Barcelona Spain. For more information write: Av. Reina Ma. Christina Palacio No. 1, Barcelona-4 Spain.

# DAIRY & FOOD SANITATION VOLUME 2

## AUTHOR INDEX

### A

ALVAREZ, R. J., reading scientific literature; is it worth your time and effort, 6; making the most of scientific meeting, 224; formulating microbiological culture media—a careful balance between science and art, 356; quality assurance of microbiological culture media, 360; current good manufacturing practices, 447. book review, 243, 244.

### B

BAKER, K. J., the food service manager training and certification program, 228.  
 BANDLER, D. K., rancidity: an increasingly common milk flavor problem, 312.  
 BARNARD, S., milk memos, 294, 329, 371; antibiotic detection programs, 498.  
 BASHANDY, E. Y., the use of the DHI-SCC program to select cows for bacteriological milk culture and subsequent treatment, early dry-off or culling, 289.  
 BASSETTE, R., book review, 72.  
 BENNETT, R. H., teat dip as a component of coliform mastitis control, 110.  
 BROWN, J. L., fundamentals of cleaning and sanitizing multiuse utensils and food equipment surfaces, 92.  
 BULLERMAN, L. B., book review, 511.

### C

CICHY, R. F., minimizing predicted bacterial growth in a commissary foodservice system utilizing quality assurance tools, 363.  
 COBB, H., maintaining your USPH rating, 64.  
 COLE, P. H., (see Wallen 402).  
 COX, N. A., book review, 72.  
 CUSHMAN, K., (see Hankin, 100).

### E

EDRO, procedures to investigate foodborne illness, 197.  
 EMERY, H. C., book review, 73, 244, 245, 333, 512.  
 ERICKSON, D. E., (see Wallen 402).

### F

FAIG, H. L., a guide to sampling, 405.  
 FARAHNIK, S., a new method of hydrogen peroxide application "nebulization", 136; quality control of UHT processing and aseptic packing of milk, 454.  
 FARISH, C. A., the NSF Seal-its formulation and uses, 53.  
 FUNG, D. Y. C., book review, 73.

### G

GILLESPIE, R. W., plumbing hazards in the food industry, 14; proper pesticide applications in food establishments, 139.  
 GOLD, R. E., (see Wallen, 488).  
 GRAVANI, R. B., training programs: they need not be boring, 96.

### H

HANKIN, L., quality and labeling of cottage and ricotta cheese, 8; quality of milk and patterns of consumption of children in Connecticut schools and camps, 100; quality of sour cream and non-butterfat sour dressing, 232; sodium in foods, 316; fruit content of breakfast cereals, 409; quality of crackers, 444.  
 HANNA, J. G., (see Hankin, 232, 316, 409, 444).  
 HEALD, C. W., checking electronic somatic cell count machines, 276.  
 HEIDER, L. E., (see Bashandy, 289).

### J

JOHNS, C. K., IAMFES history of the seventies, 119, 150.

### K

KAMBLE, S. T., (see Wallen, 488).  
 KAUFMANN, O. W., microbiology in food processing, 18.  
 KUBIK, D. J., (see Wallen, 402).

### L

LAGRANGE, B., the foodborne illness equation, 195.  
 LANCASTER, D. L., maintenance and measurement of product temperature in food service, 146.  
 LECOS, C., NCTR: gazing at the scars that our concoctions may leave behind, 20.  
 LYON, C. E., book review, 511.  
 LYON, G., book review, 245.

### M

MARSHALL, R. T., presidential perspective, 441, 485; presidential address, 462.  
 MATTHEWS, M. E., book review, 246.  
 MCLEAN, L. A., (see Hankin, 444).  
 MILLER, R. W., 1 alert cook + bad can of mushrooms = a total recall, 48; gumshoeing the FD & C Act at the grass roots level, 106.  
 MORSE, R., septic and shigellosis linked in Marion County, 400.

### N

NICHOLAS, R. C., (see Cichy, 363).  
 NICHOLS, M., (see Alvarez, 356).  
 NORRIS, J. G., sanitation in the processing and packaging of raw cider, 143.

### O

OWEN, F., (see Wallen, 367, 402).



**P**  
 PACE, P. J., a common-source outbreak of salmonellosis at a Milwaukee hotel, 190.  
 PALUMBO, S. A., (see Smith, 57).

**R**  
 RAY, B., book review, 73, 332.  
 RICE, D., (see Wallen, 367, 402).  
 RODMAN, V., book review, 333.  
 ROSELLE, R. E., (see Wallen, 488).

**S**  
 SENYK, G. F., assessment of raw milk quality in New York State, 318.  
 SHIELDS, D., (see Hankin, 8, 100, 232).  
 SIMS, S. T., dairy farming in the U.S. Virgin Islands, 449; rebuilding a dairy plant in the U.S. Virgin Islands, 492.  
 SMITH, J. L., microbial injury reviewed for the sanitarian, 57.  
 SNYDER, O. P., quality attributes and retention, 33.  
 STEPHENS, G., (see Hankin, 100).

**T**  
 THOMAS, C. P., (see Snyder, 33).  
 THOMPSON, R., purifying food via irradiation, 50.  
 TROBAUGH, W. S., quality assurance through the preliminary incubation count, 184.

**V**  
 VEBURG, E. J., (see Wallen, 402).  
 VON ELBE, J. H., United States food laws and regulations: an overview, 321.  
 VOORN, R. J., a marketing perspective of dairy product quality, 268.

**W**  
 WALKER, C. E., (see Wallen, 488).  
 WALLEN, S., measurement and reduction of iodine in milk, 367; how to prevent antibiotic contamination of milk and meat, 402; storage of grains, edible seeds and processed foods, 488.  
 WOLFF, E. T., (see Senyk, 318).

**Z**  
 ZALL, R. R., (see Senyk, 318).

maintaining your USPH rating, 64  
 milk consumption patterns, 100  
 milk memos, 294, 329, 371  
 preventing antibiotic contamination, 402  
 quality and labeling of cheeses, 8  
 quality assurance through the preliminary incubation count, 84  
 quality of sour cream and non-butterfat sour dressing, 232  
 rancidity, 312  
 raw milk quality in New York, 318  
 rebuilding a dairy plant, 492  
 teat dip for coliform mastitis control, 110  
 use of the DHI-SCC program, 289

**FDA**  
 bad can of mushrooms, 48  
 gumshoeing the FD & C Act, 106

**Food**  
 sodium in, 316  
**Foodborne Illness**  
 equation of, 195  
 investigation of, 197  
**Food Establishments**  
 cleaning and sanitizing, 92  
 pesticide applications, 139  
**Food Industry**  
 plumbing hazards, 14  
 warehouse organization, 447

**Food Laws**  
 U.S. regulations, 321  
**Food Processing**  
 microbiology in, 18  
 product temperature, 146

**Food Purification**  
 minimizing bacterial growth in a commissary, 363  
 via irradiation, 50

**Food Service Equipment**  
 NSF Seals, 53  
 Food Service Sanitation Notes, 39, 71

**Fruits**  
 cereals, 409

**IAMFES**  
 abstracts of papers presented at 1982 annual meetings, 421  
 affiliate news  
 Illinois, 516  
 Indiana, 257, 516  
 Iowa, 296  
 Connecticut, 330  
 Pennsylvania, 388  
 Florida, 388  
 Tennessee, 389  
 Minnesota, 429  
 Wisconsin, 126, 516  
 affiliate officers, 124, 344, 479  
 committee reports, 69, 205, 327  
 officer candidates, 500  
 presidential address, 462  
 presidential perspective, 441, 485  
 year index, 522

**Literature**  
 making the most of scientific meetings, 224  
 reading scientific literature, 6

**Microbiological Culture Media**  
 careful balance between science and art, 356  
 quality assurance of, 360

**Packaging**  
 nebulization, 136  
 quality control, 454

**Salmonellosis**  
 outbreak at a Milwaukee hotel, 190

## SUBJECT INDEX

**Antibiotics**  
 detection of, 498  
**Chemicals**  
 effects of, 20  
**Crackers**  
 quality of, 444  
**Dairy Industry**  
 checking electronic somatic cell count machines, 276  
 dairy product quality, 268, 509  
 in the Virgin Islands, 449  
 iodine in milk, 367

**Sampling**

a guide to, 405

**Sanitation**

microbial injury reviewed, 57

processing of raw cider, 143

**Septics**

Shigellosis in Marion County, 400

**Storage**

grains and seeds, 488

**Training**

food service managers, 228

programs need not be boring, 96

**3-A Sanitary Standards**

holders, 75, 381

new standards, 249, 253, 297

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## JFP Abstracts

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**Evaluation of an Enrichment-Plating Procedure for the Recovery of *Campylobacter jejuni* from Turkey Eggs and Meat,** G. R. Acuff, C. Vanderzant, F. A. Gardner and F. A. Golan, Department of Animal Science and Department of Poultry Science, Texas Agricultural Experiment Station, Texas A&M University College Station, Texas 77843

*J. Food Prot.* 45:1276-1278

A selective enrichment-plating procedure was tested for the recovery and enumeration of *Campylobacter jejuni* from turkey eggs and meat. Enrichment was in brucella broth with ferrous sulfate, sodium metabisulfite, sodium pyruvate and five antimicrobial agents. Plating was on brucella agar supplemented with equine blood and antimicrobial agents. Incubation of tubes and plates was at 42°C in an atmosphere of 5% O<sub>2</sub>:10% CO<sub>2</sub>:85% N<sub>2</sub>. *C. jejuni* could be recovered from the enrichment broth when calculated initial cell numbers per ml of broth were as low as 0.3 to 3.3

**Examination of Turkey Eggs, Poults and Brooder House Facilities for *Campylobacter jejuni*,** G. R. Acuff, C. Vanderzant, F. A. Gardner and F. A. Golan, Department of Animal Science and Department of Poultry Science, Texas Agricultural Experiment Station, Texas A&M University, College Station, Texas 77843

*J. Food Prot.* 45:1279-1281

*Campylobacter jejuni* was not isolated from fertile turkey eggs or from newly-hatched poults. The organism was present in 16 to 76% of fecal swabs of 15- to 19-day old turkeys from two commercial brooder facilities, and was isolated from litter and drinking water. Extensive cleaning of a brooder house and application of new litter seemed to exclude litter, water, feed and grit as initial sources of contamination. Newly-hatched poults could be raised in a *Campylobacter*-free environment for 19 to 21 d without evidence of this organism in fecal swabs.

**Characterization and Enterotoxigenicity of Staphylococci Isolated from Mastitic Ovine Milk in Spain,** Luis M. Guitiérrez,

Ignacio Menes, María Luisa García, Benito Moreno and Merlin S. Bergdoll, Departamento de Higiene y Microbiología de los Alimentos, Facultad de Veterinaria, Universidad de León, León, Spain, and Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

*J. Food Prot.* 45:1282-1286

On the basis of glucose fermentation and lysostaphin sensitivity, 71 gram-positive, catalase-positive cocci, isolated from mastitic ovine milk in Spain, were classified as members of the genus *Staphylococcus*. Identification at the species level was accomplished by complete characterization of the staphylococcal strains. Fifty-nine of the isolates were classified as *S. aureus*, 1 as *S. simulans*, 5 as *S. epidermidis*, a as *S. haemolyticus* and 5 could not be classified as any accepted or newly proposed species. The number of strains lysed by phages of *S. aureus* of human and bovine origin was 8 and 40, respectively. The phage pattern most frequently found was 78 (34 strains). Fifty of the *S. aureus* strains belonged to biotype C. Forty-nine of the *S. aureus* strains and 2 of the unclassified ones produced enterotoxin: 46 produced enterotoxin C, 2 produced enterotoxin A, 1 produced enterotoxin D and 2 produced both enterotoxins A and C. Forty-one of the 46 enterotoxin C producers belonged to biotype C, and 31 of these were lysed by phage 78.

**Destruction of Aflatoxin in Corn with Sodium Bisulfite,** Winston M. Hagler, Jr., James E. Hutchins and Pat B. Hamilton, Department of Poultry Science, North Carolina State University, Raleigh, North Carolina 27650

*J. Food Prot.* 45:1287-1291

The ability of sodium bisulfite to destroy aflatoxins B<sub>1</sub> and B<sub>2</sub> in naturally contaminated corn containing about 2350 ppb of B<sub>1</sub> and 450 ppb of B<sub>2</sub> was investigated. Under certain conditions, complete destruction of aflatoxin B<sub>1</sub> was achieved. Aflatoxin B<sub>2</sub>, on the other hand, was resistant to sodium bisulfite and never over about 50% was destroyed. Moisture, sodium bisulfite level, time, as well as temperature had significant effects on aflatoxin degradation. Moisture levels of over 50% (wet weight basis) had a strongly adverse effect on the aflatoxin-bisulfite reaction. The most effective treatment involved soaking whole-kernel corn in a 10% sodium bisulfite solution for 72 h, removing the solution and incubating the corn in sealed plastic bags at 50°C. Complete destruction of aflatoxin B<sub>1</sub> was achieved by 21 d. Sodium bisulfite exhibited antimicrobial activity in corn comparable to that of propionic acid, indicating possible utility as an effective mold inhibitor in stored corn at up to 40% moisture. Feed consumption by young chickens was unaffected until feed containing over 20 g of sodium bisulfite/kg was presented.

**Sulfite-Inhibition of *Enterobacteriaceae* Including *Salmonella* in British Fresh Sausage and in Culture Systems**, Jeffrey G. Banks and Ron G. Board, School of Biological Sciences, University of Bath, Claverton Down, Bath, BA2, 7AY, England

*J. Food Prot.* 45:1292-1297

Of the sulfite (600 µg/g) added to British fresh (breakfast) sausage, ca. 26% was lost irretrievably and a further 24% bound reversibly during manufacture. Residual free sulfite prevented growth of *Enterobacteriaceae* at 4, 10 and 15°C but not at 22°C storage, whereas these organisms grew and caused souring of unsulfited sausage at all storage temperatures. The number of viable cells of *Salmonella virchow* did not change during storage of unsulfited or sulfited sausage meat at and below 9°C, whereas extensive growth occurred in unpreserved sausage meat at 15, 20 and 25°C. Growth in sulfited sausage meat occurred only with storage at 25°C, a temperature at which the most extensive sulfite loss and binding occurred. *Enterobacter cloacae* and *Escherichia coli* became the numerically dominant *Enterobacteriaceae* in sulfited sausage, whereas *Enterobacter agglomerans* and *Hafnia alvei* did so in the absence of sulfite. The sensitivity of members of the *Enterobacteriaceae* to sulfite in broth culture correlated well with the relative abundance of these organisms in the sulfited or unsulfited product. Sulfite-induced stasis of *Enterobacteriaceae* other than *Enterobacter agglomerans* maintained for upwards of 20 h at 30°C was released when the residual free sulfite was bound with acetaldehyde or neutralized with hydrogen peroxide. In contrast, the 8 serotypes of *Salmonella* tested could not be released from growth stasis with these agents, and death ensued after 25 h at 30°C.

**Comparative Antimycotic Effects of Selected Herbs, Spices, Plant Components and Commercial Antifungal Agents**, Muf-tah A. Azzouz and Lloyd B. Bullerman, Department of Food Science and Technology, University of Nebraska-Lincoln, Nebraska 68583-0919

*J. Food Prot.* 45:1298-1301

The antifungal effects of 16 ground herbs and spices, 4 other plant materials, 3 commercial antifungal agents, tannic acid and 2 experimental mold inhibitors were tested against seven mycotoxin-producing molds. Of the 26 substances tested, cloves, cinnamon, mustard, allspice, garlic, and oregano at the 2% level in potato dextrose agar, completely inhibited growth of all seven mycotoxigenic molds for various times up to 21 d. The remaining compounds either caused little or no inhibition. Powdered pomegranate peel was a good inhibitor against four *Penicillium* species. Potassium sorbate at 0.3% was highly effective against all seven mold strains. The antifungal antibiotic, natamycin (pimaricin), was also highly effective. Combinations of different levels of potassium sorbate and cloves showed an enhanced or possible synergistic inhibitory effect on growth of all seven molds tested, indicating the possibility of using spices and commercial antifungal agents together in small amounts to obtain antimycotic activity.

**Relation of Code Dates to Retail Milk Supply**, Lester Hankin and Donald Shields, Department of Biochemistry & Genetics, The Connecticut Agricultural Experiment Station, P.O. Box 1106, New Haven, Connecticut 06504 and Dairy Division, Connecticut Department of Agriculture, Hartford, Connecticut 06511

*J. Food Prot.* 45:1302-1305

Milk from major dairies in Connecticut was examined three times over a 2-year period for flavor and bacterial counts immediately after bottling and after storage at 40 and 45°F to the end of the code period. The first two test periods were when processors established their own code periods which ranged from 7 to 14 d, but most were 9 to 12 d. The third test period was after a uniform code period of 10 d became effective, and some processors petitioned for an increase to 12 d. There was no marked improvement over the 2-year test period in keeping quality for milk stored at 40 (4.4°C) or 45°F (7.2°C) to the code date (last day of sale). In each test, all samples met bacterial standards after bottling but most did not meet the standard after refrigerated storage to the end of the code period. The amount of milk available to consumers meeting keeping quality and bacterial standards was calculated. In each test, after storage at 40°F over 90% of milk available for sale met keeping quality standards, but only 28 to 42% met bacterial standards. After storage at 45°F, 55 to 87% of milk available for sale met the keeping quality standard but less than 10% met the bacterial standard. Conclusions were that increasing the length of the code period would not be advantageous to consumers.

**Effect of Temperature, pH and Sodium Chloride Concentrations on Production of Staphylococcal Enterotoxins A and B**, Jose Luiz Pereira, Sonia P. Salzberg and Merlin S. Bergdoll, Laboratoire de Microbiologia, Departamento de Ciencia de Alimentos, FEA, UNICAMP, 13100 Campinas, S. P., Brazil and the Food Research Institute, University of Wisconsin-Madison, 1925 Willow Drive, Madison, Wisconsin 53706

*J. Food Prot.* 45:1306-1309

*Staphylococcus aureus* strain S-6 was used to produce enterotoxins A (SEA) and B (SEB) by the sac culture technique using casein hydrolysate medium, NZ-Amine NAK, enriched with thiamine and niacin, under the following conditions: incubation temperatures of 20 to 45 °C, pH values of 4.5 to 9.0 and NaCl concentrations of 0 to 25%. The highest enterotoxin production was obtained at the optimum growth conditions, 39.4°C and pH 7.0. Production of the two enterotoxins was completely inhibited at 20°C, above 45°C, at pH 4.5 and by 12% NaCl. Increases in the NaCl concentration resulted in a decrease in enterotoxin production, with a more pronounced effect on SEB production than on SEA production. Production of the enterotoxins in 4% NaCl was not observed at pH 6.0 and 6.5 after 18 h of incubation at 37°C. The results show no major differences with those obtained using a different strain for each toxin, indicating that the behavior is inherent to the specific enterotoxin and not to the strain that produces it.

**Potassium Sorbate Inhibition of Microorganisms Isolated from Seafood**, Yuh-Mei Chung and J. S. Lee, Department of Food Science and Technology, Oregon State University, Corvallis, Oregon 97331

*J. Food Prot.* 45:1310-1313

Microorganisms isolated from seafood showed various degrees of sensitivity toward potassium sorbate (PS). At pH 7.0, PS concentration of 0.53% completely inhibited growth of *Moraxella* sp., while 2.73% was needed to inhibit *Arthrobacter* sp. *Pseudomonas* I sp., which was relatively resistant to PS (inhibitory concentration = 1.62%), was not affected by 0.3% PS after freeze-thaw treatment (-78°C for 8 min and 20°C for 20 min), but showed a delay in onset of logarithmic growth for up to 20 h after heating at 50°C for 5 min. The inhibitory effect of PS on sub-lethally injured *Pseudomonas* I was greater in basal medium (Minimum Broth, Davis) than in a rich medium (tryptone-peptone-extract, TPE). *Alteromonas putrefaciens*, which was sensitive to PS (inhibitory concentration = 0.74%), was also sensitive to freeze-thaw and mild heat. The lag period for quick-frozen cells was extended by 14 h in the presence of 0.05% PS. Heating at 45°C for 10 sec was sufficient to cause complete inhibition of growth by 0.05% PS in MBD, and 8 h delay in the onset of logarithmic growth in TPE. Selective and inhibitory effects of PS, therefore, could be further enhanced in frozen or heat-treated seafood.

**Incidence of Salmonellae in Lymph Nodes, Spleens and Feces of Sheep and Goats Slaughtered in the Riyadh Public Abattoir**, Nassim H. Nabbut and Habeeb M. Al-Nakhli, Animal Production and Health Section, Regional Agriculture and Water Research Center, Ministry of Agriculture, P.O. Box 17285, Riyadh, Saudi Arabia

*J. Food Prot.* 45:1314-1317

During the period July, 1980 to June, 1981, 618 samples consisting of mesenteric lymph nodes, spleens and feces, collected from 307 sheep and goats slaughtered in the Riyadh Public Abattoir, were examined for salmonellae. Salmonellae were recovered from 14.7% of 307 lymph nodes, 4.7% of 192 feces and from 0.8% of 119 spleens. Among the 23 serotypes recovered, the most common was *Salmonella typhimurium* followed by *S. newport*, *S. havana*, *S. bovis-morbificans*, *S. reading*, *S. braenderup*, *S. eastbourne*, and *S. poona*. Other less common serotypes were also encountered. Lymph nodes and feces from slaughtered animals may be a source for contamination of the red meat and other edible parts of the carcass with salmonellae. Consumption of contaminated meat or meat products either raw or undercooked may cause *Salmonella* food poisoning in man.

**Psychrotrophic Bacteriophages for Beef Spoilage Pseudomonads**, G. Gordon Greer, Agriculture Canada, Research

Station, Lacombe, Alberta, Canada T0C 1S0

*J. Food Prot.* 45:1318-1325

A total of 40 beef spoilage pseudomonads was used as bacterial hosts for the isolation of psychrotrophic bacteriophages (phages) from spoiled rib steaks. Thirty-eight homologous phages, lytic for 25 of these hosts, were isolated and purified. An additional 12 bacterial isolates were susceptible to heterologous phage lysis and only three of the bacteria examined were resistant to lysis by any of the phage tested. On the basis of heterologous cross-sensitivity to phages, the meatborne *Pseudomonas* strains and 4 identified ATCC *Pseudomonas* hosts were differentiated into 37 distinct phage lysotypes. In addition, *Pseudomonas* phages were found to inhibit bacterial growth in tryptic soy broth by significantly extending the lag phase under psychrotrophic conditions (7°C). However, the incubation of bacteria with phages resulted in the selection of phage resistant bacterial mutants.

**Effect of Stress and Resuscitation on Recovery of Indicator Bacteria from Foods Using Hydrophobic Grid-Membrane Filtration**, M. H. Brodsky, P. Boleszczuk and P. Entis, QA Laboratories Limited, 135 The West Mall, Unit 2, Toronto, Ontario, Canada M9C 1C2

*J. Food Prot.* 45:1326-1331

The effects of stress and resuscitation on selective enumeration of coliforms, *Escherichia coli* and enterococci in mechanically deboned raw poultry meat and in dried foods were studied using a hydrophobic grid membrane filter (HGMF) technique. The effects of four different stresses, sublethal heating, freezing, acid pH and drying, were examined on 25 to 30 samples per indicator organism for each type of stress. Counts obtained with resuscitation were compared statistically to direct selective counts for each series of samples. Also, both the direct and resuscitative HGMF results were compared to a 5-tube most probable number method for coliforms and *E. coli* and to a spread plate method for the enterococci. The use of appropriate resuscitation procedures not only produced a significant increase in counts over the direct HGMF procedure, but also yielded HGMF results that were statistically equivalent to those obtained by conventional methods.

**Methods for Recovery of *Campylobacter jejuni* from Foods**, Norman J. Stern, Meat Science Research Laboratory, Beltsville Agricultural Research Center, U.S. Department of Agriculture, Beltsville, Maryland 20705

*J. Food Prot.* 45:1332-1337

The triangular relationship between *Campylobacter jejuni*, foods and disease in humans has been well-documented. Many studies

have revealed that *C. jejuni* causes at least as many cases of human gastroenteritis as does *Salmonella* sp. Foods are an important vehicle in human infection, and raw milk is most frequently implicated. Other animal products also serve as potential sources of infection. *C. jejuni* has been found on the carcasses of poultry and other domestic animals throughout the world. The organism is microaerophilic and various methods for establishing appropriate growth conditions, such as the Fortner principle, atmosphere replacement and adding of supplements to encourage growth of *C. jejuni*, are available. Methods developed for use in clinical laboratories lack the necessary sensitivity and selectivity, and therefore have limited use in detecting small numbers of *C. jejuni* in foods. In one enrichment method for detecting *C. jejuni* in foods, washings are filtered and centrifuged, the sediment is suspended in the enrichment broth and the suspension is incubated under a constant gas flow at reduced oxygen levels. Following incubation enrichment broth is filtered and plated onto selective media. In another recently developed method, food samples are directly added to an enrichment broth with antibiotics and incubated under a microaerobic atmosphere before selective plating. Butzler's, Skirrow's and Campy-BAP selective media use several antibiotics to which *C. jejuni* is resistant. The plates are supplemented with horse or sheep blood, depending upon the specific formulation. The optimum temperature for growth of *C. jejuni*, about 42°C, may also be used for selection. It is now possible to recover 0.1 to 1 cell of *C. jejuni* per 10 to 25 g of food sample from among  $10^6$  to  $10^9$  indigenous bacteria. After a characteristic colony is isolated, the key criteria for presumptive identification

of *C. jejuni* by phase-contrast microscopy are darting, corkscrew motion and a comma to spiral shape.

**Incidence of Foodborne Disease in The Netherlands: Annual Summary 1979**, H. J. Beckers, Laboratory for Zoonoses and Food Microbiology, National Institute of Public Health, P.O. Box 1, 3720 BA Bilthoven, The Netherlands

*J. Food Prot.* 45:1338-1341

Data on the incidence of foodborne disease in 1979 are presented. A total of 163 incidents affecting 604 ill persons were analyzed. In 42 incidents, the etiology was established; microorganisms appeared to be the main causative agents. *Salmonella* was responsible for 8 of these incidents (20 cases), *Staphylococcus aureus* for 7 (28), *Clostridium perfringens* for 11 (24) and *Bacillus cereus* for 6 (29). In 9 incidents (15 cases), illness resulted from ingestion of chemicals. About 60% of the episodes were associated with only two food items—meat and meat products (30%) and Chinese food (28%). Mishandling of food in foodservice establishments resulted in about one third of the incidents, and mishandling at home in another quarter. Cases of foodborne disease recorded by the Ministry of Public Health included infections from *Salmonella* (6174), *Yersinia enterocolitica* (116) and *Campylobacter* (202). However, these could not be analyzed further due to a lack of epidemiological information.

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