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Dairy and Food Sanitation®

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

Maintaining an Effective Farm Inspection Program

Kansas State University Food Science Graduate Program Receives USDA Grant

Irradiated Foods Report

Alkaline Phosphatase Activity in UHT Milk

Biotechnology in Food Processing Conference Oct. 7-9

Small Farm Food Production

72nd IAMFES Annual Meeting
August 4-8, 1985
Nashville, Tennessee

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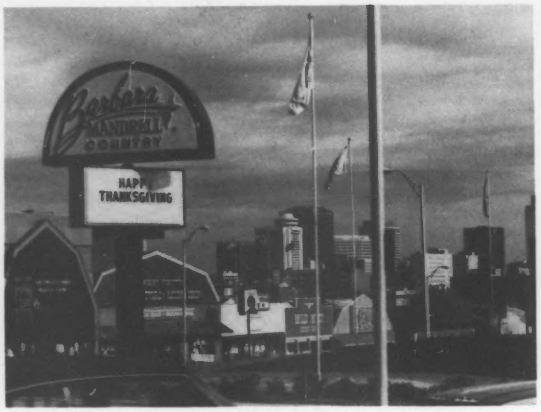

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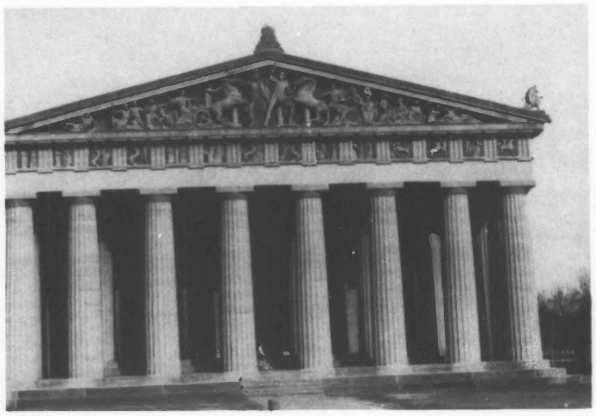

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Dairy and Food Sanitation

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Maintaining an Effective Farm Inspection Program

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The maintenance of an effective dairy farm inspection program has been an ongoing problem. With today's economic conditions, this maintenance becomes even more difficult. If a farm inspection program is to be successful, industry, regulatory and the dairymen have to work together. An effective inspection program involves cooperation, education, information, attitude and then regulation. The industry field service representatives are the most visible link to the producer. They must work closely with regulatory personnel in support of all programs to be sure producers are kept well informed. Regulatory inspectors must use good judgment and be fair and uniform in the enforcement of rules and regulations. Effective farm inspection programs hold the key to the future success of the dairy industry and must be effectively maintained.

Introduction

Maintaining the sanitation standards required of milk production facilities on a year around basis is a problem which has plagued the dairy industry for decades. Now with the price of milk falling and the seeming lack of federal government interest in the state of the dairy farm economy, it becomes even more difficult to maintain the cooperation necessary for the success of a good farm inspection program. Many of the producer attitudes toward inspection reflect how they think of government programs in general, which is usually not with reverence. It also reflects on the dairy plant because it is their name that appears on what is now a dwindling milk check. A typical producer response has been, "Why should I do more for less?" We can all understand their feelings, but the standards set forth for the production of milk have to be met if we are to maintain product integrity and the quality of finished goods so necessary to successful marketing.

There are a number of ways to address this problem. The interpretation of each may vary depending upon which side of the fence you are sitting. What will work for regulatory may not necessarily work for industry. However, neither can approach the problem independent of the other. I am sure if you were to ask those involved what it takes to maintain a successful inspection program, they would list cooperation, good attitudes, distribution of information, continuing education, better communication and federal and state regulations as the important elements. It can be very difficult to separate one of these elements from another as they are so interdependent. In developing ideas for maintenance of a good farm inspection program, an attempt to address each element must be made along with the generation of some ideas to pull the whole program together.

Cooperation

No farm inspection program can be successful without cooperation between all individuals and organizations involved. Cooperation must be built around the producer, for it is the producer who represents the common ground to which all parties must relate. The industries' fieldservice representative is most visible to the producer. In many cases, these individuals have the greatest effect on a producer's overall philosophy toward milk inspection. If an industry farm call only means sitting around the kitchen table discussing the news of the day or how desperately the plant needs their milk, then interest in the production facilities begins to take a back seat. Every visit to that farm should include some type of inspection of the milk production and storage facilities with a written or at least a verbal report to the producer. Just passing through and leaving a couple of pieces of candy or other mementoes of the visit on the bulk tank is not adequate. Field service representatives need to work with the regulatory people in their district to understand what is

required of a milk production facility. Uniformity must exist throughout if a good atmosphere of cooperation is to develop. Field service must support regulatory and vice versa so the producer does not get the feeling of being pulled in two different directions. One of the best ways to show this type of cooperative attitude is through inspection follow ups which indicate to the producer your interest in their operation and the importance of maintaining compliance on a year 'round basis. Everyone involved in the inspection process must believe in and understand the inspection program but, most of all, be willing and able to support and justify its application.

How can we maintain this cooperative attitude? Field service and regulatory inspection personnel should hold regular meetings to discuss mutual concerns and any problems which may exist. This can be as formal as an advisory committee or as informal as meeting for coffee. It should be a time to exchange ideas and to discuss changes in regulations and for the promotion of uniform interpretations. In states where industry sanitarians carry out inspection requirements as well as doing field service, it becomes very important to maintain uniformity within, as well as between, milksheds. If this commitment does not exist, then the door is open for the inspection process to become a solicitation tool and for the entire program to break down. Field service personnel should encourage producers to accompany regulatory people on their inspections whenever possible. Producers should be made to feel at ease asking questions and requesting justifications for items marked out of compliance. Too often they are told to stay away or to keep their mouth shut because the inspector will only take it out on them later. Inspectors also have to be responsive as well as responsible for what they mark on an inspection sheet. Reasons for and justification of all marks should be part of any good inspection program. The use of the reason, "Because it's in the regulations" has no place in this program. Inspectors must explain all items out of compliance and this should be done in writing on the inspection sheet or better yet on a separate "call sheet" to be left with each producer. Copies of these sheets should also be returned to the field service representative responsible and not just to the plant or marketing organization where they may be misplaced. In cases where special or immediate attention is necessary, a bright colored sticker could be attached to the sheet to serve as a flag for the field service staff's attention.

Education

This type of cooperation leads us right into the element of education. If producers are to cooperate fully, they have to be kept informed. They need to understand what is required and why, but even more importantly what changes have been made in regulations or interpretations that could have an effect on their next inspection. It is difficult for state regulatory agencies to inform and educate each producer concerning these changes. Some states make use of a periodic "newsletter" which they mail to all milk producers while others may use State University Extension releases which are sent to farmers across their state. When such services don't exist, regulatory agencies must rely on plants and field service personnel and make them aware of these changes, asking that they inform and educate their producers within a reasonable time.

Changes in an inspection program never seem to be well received at the farm level. Many times it is the way this information is delivered. The statement, "The government says we have to do it so do it," is used more than it should be usually because it's the easy way out. Some feel there is no use explaining because the producer wouldn't understand anyway. This may unfortunately be all too true. Producers don't understand the dairy inspection programs because no one has ever taken the time to explain them and that dairyman surely doesn't want to appear stupid by asking.

The Pennsylvania State University Extension Service has recently made available an audio-visual presentation which does an excellent job of explaining dairy farm inspection programs. Enforcement agencies as well as industry should consider using presentations of this type to develop a better understanding among producers. Equipped with this type of background, it becomes much easier to explain and justify new changes in regulations and interpretations. Educated and informed producers tend to develop a more positive approach toward producing high quality milk and toward working with those involved in helping them keep it that way.

Education is not a one-time program. It has to continue. Producers, like all of us, tend to forget what they have learned after a period of time, particularly if this knowledge is not used on a regular basis. Continuing education is a main function of University Extension programs and their services should be utilized whenever possible. Many extension services have helpful publications relating to dairy farming and quality milk production. They also have audio visual programs suited for producer meetings such as creamery or cooperative annual meetings. There is probably no better time to address a large group of producers than at an annual meeting. We have found these to be an excellent opportunity for conducting continuing education-related activities.

Many cooperatives or marketing organizations also have periodical publications which lend themselves well to educational information addressed to a specific group or region. On the other hand, there are national publications such as "Hoard's Dairymen" which can cover more general information. We need to encourage these publications to include more articles dealing with farm inspection issues and programs. It is too easy to consider inspection routine and figure everyone knows all they want to know about it, or to rationalize that no one wants to read about a seemingly unpopular subject. If we persist in avoiding continuing education types of activities which can effectively reinforce farm inspection programs and attitudes toward them, then we can expect a continuing decrease in compliance.

Information

Misunderstandings or conflicts usually develop because producers have not been properly informed. The Interstate Milk Shippers Program (I.M.S.P.) is one of those misunderstood areas which could be used to help the industry and the producer rather than be the creator of friction that it all to often becomes. The producer is quite frequently brushed aside during a survey. The survey's purpose is seldom explained and often producers are not made aware of the results except if it fails and most producers don't understand what that means either. They may be told the "Feds" are coming and to "Get the place shaped up." As a result, an air of panic usually ensues and this tends to carry over to every farm inspection from that point on. Producers need to have the I.M.S.P. explained to them so they realize what the difference is between a survey and a regular inspection. Items found out of compliance during a survey need to be explained in such a way that the importance of their correction becomes obvious. Since no I.M.S.P. inspection sheet is left on the farm, we have found that a follow up letter from the regulatory agency in charge of the I.M.S.P. has been very helpful. This letter should indicate the score and those items found out of compliance should be described in an understandable way. Often times we will include University Extension bulletins which address these concerns in more detail. We have also found it useful to discuss the purpose of scoring 90 or above and that an inspector will check back with them or that they can contact their field service representative if they have questions or concerns about the survey. When producers score 100 they are sent a personal letter of congratulations which expresses our appreciation of their efforts.

Producers also need the same type of feedback from routine inspections. Items that are marked out of compliance need to be explained in writing with enough detail to facilitate their correction. Many regulatory inspectors feel they should not be involved in the correction of violations. They feel their job is to mark what is wrong and it's the producer's job to correct it. This type of philosophy automatically establishes a barrier. If we expect to get cooperation, then we must also cooperate. This means discussing ideas on how to correct items out of compliance and offering suggestions that have worked for other producers with similar problems. States which utilize industry sanitarians to conduct enforcement inspections take for granted that this is being done. It may or may not be but if not, the producers quickly lose the sense of importance in making corrections because there is no one left to follow up. That is, until an I.M.S.P. survey or check rating comes along and then it's too late. For this reason, all regulatory agencies must take the responsibility of seeing that any information relating to farm inspection programs does reach the producer. These agencies must also take every opportunity to keep producers well informed through every means possible. Clear, well explained inspection sheets, I.M.S.P. survey follow up, dedicated cooperative personnel and an industry willing to work at keeping their producers well informed are the keys to maintaining a good farm inspection program.

Attitude

Throughout this discussion it has been apparent that proper attitudes must exist if a farm inspection program is to be successful. Many items go into establishing good attitudes about both people and programs, but people are the key. Not everyone is cut out to be a sanitarian or field service representative. It takes a special type of person to start with and a good training program to complete. A good dairy background and the skill to communicate have to be there. It is also helpful to look for people who understand that it isn't easy to be a dairy farmer in today's economy. These skills will establish a good base attitude, and the additional skills must come from a solid training program which teaches the rules and regulations but more importantly, the justification and importance of each one and how to apply them in a fair, uniform manner. We have found that this process takes from three to six months and must include extensive on-the-job training. During that time we are not just developing skills, we are developing attitude. Regulatory agencies have a tendency to spend more time training personnel than does industry and yet it is usually the field service representative who has the greatest influence on a producer's attitude about farm inspections. Many states have a field service certification program to test the competency of industry sanitarians. These are usually just that, testing programs and often fail to include any significant amount of cooperative training. Uniformity in understanding and attitudes can never be adequately developed unless regulatory agencies and industry undertake a joint farm inspection training program. We have used such training in establishing a Manufacturing Grade farm inspection program and it has really paid off. The hostile attitudes which many people predicted would develop never have and cooperation between producers, industry and regulatory has been excellent. It involved training, but at the heart of its success has been attitude.

Regulation

Every good inspection program has to first establish a set of rules and regulations. If we are to maintain an effective farm inspection program, however, we should really regulate last. Without proper cooperation, education, information and attitude, we will never be able to apply rules and regulations in a manner which can be accepted as fair and uniform. There must be education and then regulation. It will never be effective the other way around.

The trend in our country today is away from government regulation so our programs must be perceived to

be moving in that direction. A farm inspection program will never again be accepted as a policing type activity. It is not easy being a milk producer in today's economy and dairymen are looking for help and not more regulation. Most believe in the need for a good inspection program, but it must be a program that in their eyes is both fair and uniform. We need to work with all producers to indicate to them that our goals are just the same as theirs. The aim of the producer is to sell more milk at the best possible price but in order to achieve that goal, it means producing milk of the best possible composition and quality. A cooperative farm inspection program will go a long way toward accomplishing that goal.

The role of regulatory has changed over the years. It no longer can be just a watch dog for the health and safety of the public. It has to be concerned about consumer issues such as product flavor, composition, nutrition, and truth in labeling. It has to be tuned to industry's concern for product quality, sales and marketing. Consideration of these issues must now become an essential part of every inspection program.

Conclusion

Producers, field service representatives and regulatory inspectors may each view their role a little differently. All have to be aware that only through cooperation, education and finally regulation can future farm inspection programs be successful. Field service representatives will continue to be the most visible link to the producer. Their interest in and attitude toward farm inspection will remain the important key to the maintenance of an effective farm inspection program. Field service representatives must rely on regulatory agencies to keep them up to date on all changes in rules or regulations so they can be sure their producers are properly informed. Regulatory personnel have to stay tuned to the economic conditions which exist in the dairy industry in their area as well as nationwide. All inspection personnel must use good judgment, be understanding and be cooperative. It can't work any other way.

Farm inspections have been viewed as a dreaded necessity for too long. These inspections hold the key to the future success of the dairy industry and they must be maintained and utilized in an effective manner.

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Alkaline Phosphatase Activity in UHT Milk

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Whole milk was processed at 149°C/3.4 s and 149°C/20.3 s by UHT steam injection. Milk was packaged aseptically in a Brik Pak filler and stored at 20, 24, 30, and 40°C. Alkaline phosphatase (AP) activity monitored for periods up to 193 days was sporadic and inconsistent. Milk processed at 149°C3.4 s exhibited extensive AP activity to 125 days at 30°C. The same milk stored at 20, 24 and 40°C exhibited substantially lower levels of AP activity. With minimal activity (less than 2 units) occurring through 110 days.

INTRODUCTION

Alkaline phosphatase (AP) activity in heat processed dairy products has public health implications. Its presence nominally indicates improper heat treatment of the dairy product or contamination by raw milk. This enzyme is associated with the phospholipids particles of the fat globule membrane referred to as microsomes (Morton, 12). Phosphatase reactivation in commercially processed cream was first reported by Fay and Barber (6). They attributed the positive phosphatase to the reactivation of normal milk phosphatase. They did not find any evidence of bacterial phosphatase. Brown and Elliker (3) obtained rather variable results with flash pasteurized cream observing greater phosphatase activity as post processing storage temperatures increased.

Wright and Tramer (13) were the first to note phosphatase reactivation in commercially sterilized milk and were able to duplicate this phenomena in their laboratory.

Lyster and Aschaffenburg (11) heated milk in thin 5 ml tubes for 45 s in boiling water and showed 1% reactivation after heat treatment.

Murthy et al. (13) reported reactivation in milk heated at 87.8°C to 121.1°C for less than 1 s. They analyzed samples for 120 minutes after processing and determined that the maximum phosphatase reactivation occurred in products heated at 104°C and incubated at 34°C. Edmondson et al. (5) reported phosphatase reactivation in whole milk and concentrated milks 3:1 heated at 141°C for 7 s. Samples were analyzed for six days at room temperature with an equivalent activity of 15% with raw milk. Samples stored at 4°C showed insignificant activity.

During prolonged storage of UHT milk many chemical and enzymatic reactions occur (9). Preliminary work done over a 6 mo storage period using three different tank trucks of milk on UHT steam injected milk processed at 138, 143 and 149°C for 7 and 20 s revealed no AP activity above 2 units (Hansen and Earley, 7). The same milk processed at 149°C for 3.4 s were checked for 6 mo randomly and found to have positive AP activity (above 2 units). The importance of such reactivation is that milk with a positive phosphatase test could be removed from the store shelf.

Research reported in the paper was undertaken to determine the effects of total heat or holding time on AP and its reactivation at different storage temperatures. Since we know from the previous 6 mo study that at longer holding times there was no reactivation at room temperature. In reviewing the literature on phosphatase reactivation in dairy products, it was found that studies were limited to laboratory heat treatments. Analysis for phosphatase activity was limited to several hours after processing and for as long as 6 days after processing. It was our goal to test phosphatase reactivation under commercial UHT conditions for up to 200 days on short holding times to determine the degree of reactivation and the optimum temperature for reactivation.

MATERIALS AND METHODS

Whole raw milk was preheated at 78°C and then heated by UHT steam injection at 149°C/3.4s (UHT-I) and 149°C/20.3 s (UHT-II). Milk was cooled in a No Bac Aro-Vac (Cherry-Burrell) to 76°C, further cooled in a tubular cooler to 20°C, and aseptically filled in a Tetra Brik Model AB3-250.

Samples from UHT-I were stored at 20, 30, 40°C and samples from UHT-II were stored at ambient temperature (24 + 2°C). AP activity was determined according to the AOAC procedure for milk (1). Triplicate analyses

were carried out on a semi-weekly basis using three different cartons for each sampling period for 193 days on UHT-I samples stored at 20, 30°C (UHT-I_{20}, UHT-I_{30}); for 140 days on UHT-I samples stored at 40°C (UHT-I_{40}); and for 110 days on UHT-II samples stored at 24°C (UHT-II_{24}). The standard deviation for the three different containers analyzed ranged from .03-.38, 0.0-.47, and .04-.57 for 20, 30 and 40°C storage temperatures.

RESULTS

Alkaline phosphatase activity in all UHT samples varied from carton to carton. In UHT-I milk it followed no distinct pattern throughout 113 days' storage varying from 0.5-1.95 ppm of phenol (Figure 1). Activity rose slightly between 120-170 days, approaching 2 ppm of phenol but then decreased. If above 2 ppm of phenol it is regarded as a positive phosphatase after this time. Probability that a milk sample would have a positive phosphatase test and should be removed from the store shelf between 120-190 days was between 0.20-0.40. Mean AP activity never reached the level of 2.0 ppm phenol. Mean AP activity during storage was 1.14 ppm phenol. In Figure 2 the UHT-I milk exhibited high levels of AP activity especially between 40-126 days storage. During this time 80% of the samples possessed AP activity higher than 2.0 ppm phenol with a mean value of 2.35 ppm phenol. After 130 days, AP activity decreased with time and remained below the 2.0 ppm phenol level except for the 170 day test period when mean AP activity was 1.19 ppm phenol. For the entire storage period it was 1.70 ppm phenol.

Milk from UHT-I_{40} (Figure 3) exhibited the lowest AP activity of any UHT milk analyzed. The highest value during the 140 days storage was 0.96 ppm phenol, with a mean of 0.54 ppm phenol.

Figure 4 shows AP activity in UHT-II milk. The highest value reached in 110 days was 1.27 ppm phenol, with a mean of 0.83 ppm phenol. Lowest level was approximately .48 ppm at 105 days. Levels fluctuated between .48 ppm and 1.27 ppm.

DISCUSSION

The variations observed in the AP analyses limit the preciseness of the conclusions. However, it is most obvious that AP activity in UHT milk depends on holding time as well as storage temperature and time. The ability of natural AP to reactivate during storage is another factor related to activity in the final package. Ashton and Jackson (2) revealed UHT milk that AP activity in UHT milk varied between cartons from the same milk and that

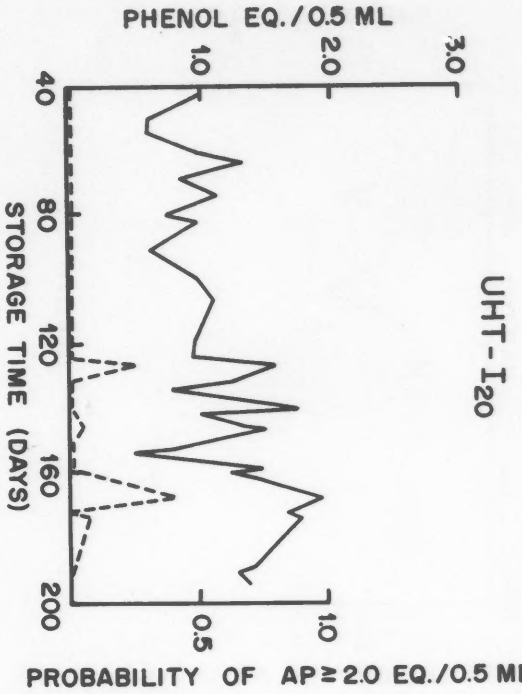

Figure 1. *Levels of phosphatase activity of UHT processed milk (149°C/3.4 s) stored at 20°C.*
dashed line = probability of AP > 2.0 Eq/0.5 ml
solid line = phenol Eq/0.5 ml

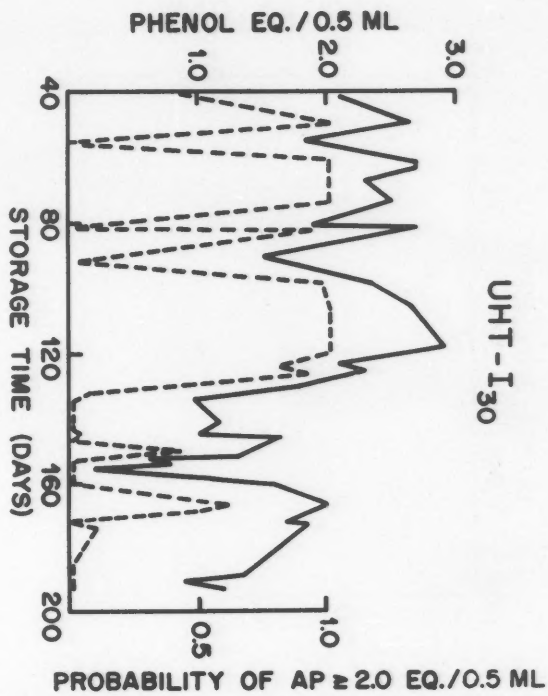

Figure 2. *Levels of phosphatase activity of UHT processed milk (149°C/3.4 s) stored at 30°C.*
dashed line = probability of AP > 2.0 Eq/0.5 ml
solid line = phenol Eq/0.5 ml

the inconsistent reactivation appeared to be random. Burton (4), Wright and Tram (14), reported that the reactivated enzyme is identical in chemical form to the original enzyme, and its reactivation is enhanced by free SH groups and retarded by oxygen and lower storage temperatures.

Activity was substantially higher in UHT milk stored at 30°C compared to that stored at 20 and 40°C. It was only in the UHT milk held at 30°C that AP activity exceeded the "positive" limit of 2.0 ppm phenol. Activity in the same UHT milk stored at 20 and 40°C was minimal, never approaching 2.0 ppm phenol. Ashton and Jackson (2) determined that 14-15°C were the critical temperatures for significant phosphatase reactivation. Gondon et al. (5) observed AP reactivation at 30°C in commercial UHT milk from three different dairies.

Process residence time also appeared to affect AP activity in UHT milk. The milk processed for 20.3 s, stored at 24°C showed less AP activity than the same milk processed for 3.4 s, stored at 20°C. The higher storage temperature should increase AP activity since it is closer to optimal activity temperature (34°C). The lower AP activity in the milk stored at 24°C was apparently due to the 20 s hold time. This agreed with results of the previous year (8) in which all samples processed at 138, 143, and 149°C and held for 7; and 20 s never had AP activity above 1 unit of phenol. The same milk processed at 149°C and held for 3.4 s had positive AP activity.

The significance of high levels of AP activity in UHT milk is twofold. Should activity attain high levels (as in the UHT milk stored at 30°C) the milk could not be sold under current regulations. This may mean present regulations would have to be changed for UHT dairy products. It may be necessary to eliminate the phosphatase test as a requirement for UHT sterile dairy products. Also, the development of AP activity in UHT milk held for short holding times suggests the possibility partially confirmed with lipase that protease, lipase, and oxidases may also reactivate. Hansen et al. (8) reported that acid degree values increased faster in UHT milk processed at 149°C and held for 3.4 s than the same milk held for 20.3 s. Loney, Bassette, and Claydon (10) reported that free fatty acids increased rapidly at 37°C in concentrated UHT milk and only slightly at 20°C. Thus, enzyme reactivation may become a potential problem in UHT products processed for a short residence time and stored near 30°C.

CONCLUSIONS

Alkaline phosphatase activity develops during storage of UHT milk and its extent depends upon storage temperature, process temperature, and residence time. After 50 days' at 30°C, UHT milk (3.4 s) developed AP activity in excess of 2.0 ppm and, therefore, would be unmarket-

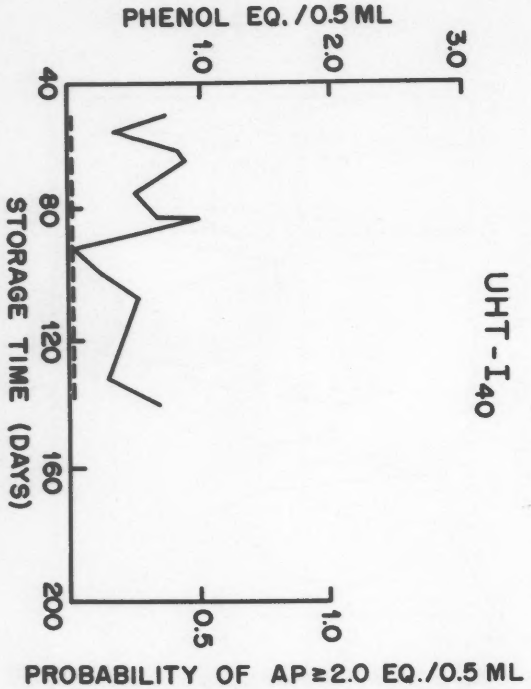

Figure 3. *Levels of phosphatase activity of UHT processed milk (149°C/3.4 s) stored at 40°C.*
dashed line = probability of AP > 2.0 Eq/0.5 ml
solid line = phenol Eq/0.5 ml

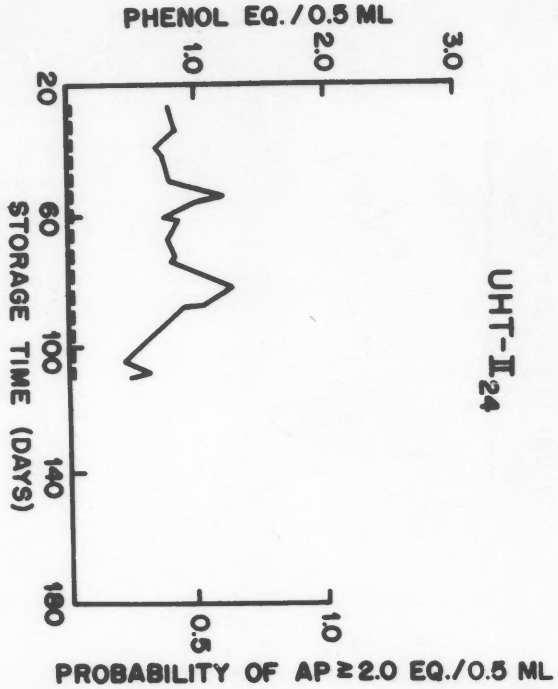

Figure 4. *Levels of phosphatase activity of UHT processed milk (149°C/20.3 s) stored at 24°C.*
dashed line = probability of AP > 2.0 Eq/0.5 ml
solid line = phenol Eq/0.5 ml

able under present regulations. AP activity in UHT milk (20.3 s) was below the 2.0 ppm for 110 days at 24°C. Although AP reactivation presents a potential problem for UHT milk, it may be overcome by employing a long residence time process.

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KSU Food Science Graduate Program Receives USDA Grant

The interdisciplinary Food Science Graduate Program at KSU received a $93,394 grant from the United States Department of Agriculture under the Food and Agricultural Sciences National Needs Graduate Fellowship Program administered by the Agricultural Research Service through its Higher Education Programs. The grant, which is renewable, will be used to support 6 Ph.D. fellowships in Food Science with stipend of $15,000 per fellow per year. It is expected that these new fellowships will attract outstanding students to KSU to be trained in multi-disciplinary programs. The grant is for developing scientific expertise in characterizing and processing cereal and animal products. The project directors are Daniel Y.C. Fung, (Animal Sciences and Industry) Chairman of the Food Science Graduate Program, and Larry E. Erickson, (Chemical Engineering) Secretary of the Program.

The Food Science Graduate Program currently has 46 faculty members and 43 graduate students pursuing their M.S. and Ph.D. degrees. This program was initiated in 1966 and has granted 128 M.S. and 67 Ph.D. degrees to date. Participating departments include Agricultural Economics, Agricultural Engineering, Agronomy, Animal Sciences and Industry, Biochemistry, Biology, Chemical Engineering, Dietetics, Restaurant and Institutional Management, Foods and Nutrition, Grain Science, and Horticulture from 4 Colleges (Agriculture, Arts and Sciences, Engineering, and Home Economics).

For more information contact Daniel Y.C. Fung, Food Science Graduate Program, Call Hall, Kansas State University, Manhattan, KS 66506. Telephone (913)532-5654.

Biotechnology in Food Processing Conference October 7-9

Biotechnology in the Food Processing Industry, an international conference sponsored by the Department of Food Science and Nutrition, University of Minnesota, will be held at the University Radisson Hotel, Minneapolis, Minnesota, on October 7-9, 1985.

The purpose of this symposium is to provide an opportunity for researchers from academia, government, and industry to explore the present and future applications of biotechnology in the food processing industry. It is essential to determine how various elements of the food processing industry can best take advantage of evolving areas of high technology, and how the adoption of these technologies will affect the industry from technological, economic, and regulatory standpoints.

Cost of the conference which includes lunches, a banquet, and a reception is $495.

For more information contact Lynette Marten, (612)373-0725.

Imitation Cheese Nutrition

It may look and even taste like cheese, but these days, only the label will tell you what you're eating.

Under Food and Drug Administration (FDA) regulations, a dairy product which does not meet the relevant standard of identity must be called "imitation," says Texas A&M University Agricultural Extension Service nutritionist Mary K. Sweeten.

But if the product substitutes for and resembles another food and is not "nutritionally inferior" it does not have to be called imitation, she adds.

Some cheeses are labeled as imitation simply because of a change in ingredients from real cheese. For example, some grated Italian style cheeses which contain added whey fall into this category.

Another class of "imitation" cheese is the non-dairy product, made from vegetable oils, sugars, a protein source such as sodium caseinate and other ingredients.

Some of these products, like imitation cream cheese, are not nutritionally equivalent to the products they imitate, says Sweeten. They must be labeled imitation, may be marked "non-dairy product," and may bear a nutrition label.

An "imitation" label also appears on a popular and economical category of substitute cheeses which have been fortified to contain the same amounts of protein and the 19 other ingredients for which U.S. Recommended Daily Allowances have been established, say the nutritionist.

The nutrition labels on these products indicate that they are equal to or better than natural cheese in providing protein, vitamin A, riboflavin and calcium. These products may be equivalent in fat content to natural cheese.

For consumers, the labels on packages of imitation cheese can be confusing, Sweeten maintains. The FDA requires full ingredient listing but nutrition labeling is not normally required.

Shoppers may have even more difficulty identifying imitation cheese in processed foods, she says, since the processor does not always have to state on the label that imitation cheese is being used.

For example, if a pizza is called "cheese" pizza and the processor uses imitation cheese, the word

imitation must be stated on the label. When a pizza is called "mushroom pizza," that means mushrooms are the primary topping ingredient and any cheese used is secondary, so the imitation label does not have to appear.

When the cheese is genuine, the word cheese will appear in the ingredient listing, Sweeten says. But the only way a consumer can identify imitation cheese in many processed foods is to look for sodium caseinate and vegetable oil, its two primary ingredients, on the ingredients listing.

Irradiated Food May Appear On American Menus Soon

To most Americans, irradiated food probably sounds as appetizing as a picnic on Three Mile Island.

But the truth is that irradiated foods don't glow in the dark, are nutritionally sound and are likely to appear at your local grocery soon. These foods are exposed to radiation that can prolong their shelf lives and destroy harmful microbes.

University of Wisconsin-Madison food virologist Dean Cliver predicts that Americans will soon become more familiar with irradiated foods. After 40 years of tests, the Federal Food and Drug Administration (FDA) now allows irradiation of spices and has proposed allowing irradiation of fresh fruits and vegetables. Food irradiation got a boost earlier this year when the widely used pesticide EDB was banned and food processors began looking for an alternative.

Irradiated foods are already common in Japan and Europe. Irradiation could also solve some of the food storage problems of developing countries, according to Cliver, who served on the two most recent international expert panels on the safety of irradiated food. The United States is one of the last industrial countries to allow irradiation of food.

"I think it's partly American 'nuclear phobia,'" Cliver says, "But it's also due to the fact that the United States is the best-fed country in the world. We could afford to drag our feet, while other countries didn't have as much food to waste."

Part of the reason Americans fear irradiated food is that they don't understand what radiation is and what it can do for food.

Food irradiation is not a panacea. Basically, gamma radiation can solve specific problems in specific foods. For example, it can prevent sprouting in potatoes and onions, kill trichinae in pork, and extend the shelf life of a variety of foods. It could replace banned EDB in citrus fumigation, and it could substitute for anti-sprouting chemicals like maleic hydrazide, which has been shown to suppress the immune systems of mice.

The gamma rays used to treat food are essentially little bundles of energy - photons - that pass through a substance, destroying everything in their paths. The higher the level of radiation, the more photons applied. The more photons, the smaller the target they can destroy. Thus, low-level radiation can efficiently kill only relatively large "enemy" targets. These large targets include insects, trichinae, and the germinal centers that cause onions and potatoes to sprout.

Cliver says that this target analogy explains why vitamins, which have relatively small chemical structures, are noticeably destroyed at only high levels of radiation.

It takes high levels of radiation to destroy small targets like viruses. High level radiation can also preserve meat for long periods of time without refrigeration. Cliver cites one group of irradiation researchers who irradiated steaks and then cooked them several weeks later on a camping trip.

More importantly, irradiation could help preserve raw foods in developing countries where food is scarce and transportation and storage facilities are inadequate. Currently, one-quarter of the world's food is lost to pests and spoilage after harvest.

The FDA is proposing allowing food irradiation of up to 100 kilorads or 100,000 rads, the standard measure of the effects of radiation.

By comparison, the average chest X-ray packs a punch of 0.250 rads.

A rad, according to Larry DeWerd of the Midwest Center for Radiological Physics, "is enough energy to lift a mosquito 100 centimeters - you can see we're not talking about a lot of energy."

The international expert committee endorsed doses up to 1 million rads, and Cliver says tests show that levels up to 5 million rads are safe. Cesium-137 and cobalt-60 are probably the radiation sources that would be used. Radiation from these sources is already used to kill germs in food for astronauts and people with suppressed immune systems, and to sterilize hospital supples like disposable syringes.

Most designs for industrial food irradiation show pallet-loads of food moving down conveyor belts to a sealed box, where the food is exposed to radiation. Food can also be irradiated in its final packaging, which helps avoid recontamination.

None of the tests have found residual radioactivity in irradiated foods. In fact, Cliver says that this is one of the problems in regulating radiation.

"If you can't pull food off the shelf and tell that it's been radiated, how do you regulate it?" he asks. Chemical preservative levels can be tested to determine whether the food contains unacceptably high levels. But since irradiated food isn't

radioactive, it's difficult to tell whether it's been treated."

Other research, including work done by Cliver, studies whether viruses and other living organisms that survived irradiation were mutated into dangerous forms. Cliver and the other investigators found no evidence for this theory.

Despite the apparent advantages of irradiated foods, Cliver says they won't catch on in this country unless they fill a need. He recommends raising the proposed FDA irradiation levels to allow the higher doses necessary to extend shelf life and to reduce the bacteria in food. The more food processes irradiation could be used for, the more economical it would become.

"Ultimately," he says, "it comes down to price. You're not going to sell any irradiated food if you can't feed the U.S. population cheaper than without it."

Small Farms Key to Boosting Global Food Production, Scholars Believe

Gradual but widespread increases in productivity on small farms are crucial in meeting "massive" food deficits in less developed countries, a new study concludes.

Unless agricultural development helps provide productive employment for a large portion of the rural work force, even substantial increases in food production will leave many households with inadequate nutrition.

John W. Mellor, director of the International Food Policy Research Institute, and Prof. Bruce F. Johnston of the Food Research Institute at Stanford reach these conclusions in "The World Food Equation: Interrelations Among Development, Employment and Food Consumption," recently published in *The Journal of Economic Literature* at Stanford.

Their findings contrast sharply with agricultural development based on rapid modernization of large, capital-intensive farms, coupled with capital-intensive industrialization fostered in many developing countries.

"The creation of large operational units, whether for group farming or by private landowners, creates strong pressures to make excessive investments in labor-displacing mechanization," they warn.

Noting that agriculture is the dominant economic sector of most developing countries, they observe that "efficient production based on labor-using, capital-saving technologies depends on decentralized decision-making and the incentive which owner-cultivators or tenants have to exercise initiative and judgment because of their direct interest in the outcome."

Agriculture can play a central role in generating both jobs and consumer demand, they note.

Poor people tend to spend a very high share of any income improvements on food. This means that "major reduction in poverty will bring massive increases in food consumption that will carry per capita consumption well beyond the lower levels of energy intake now prescribed by international agencies as minimum requirements," they state.

As incomes exceed a threshold level, much of the increased demand is directed toward meat and other livestock products, boosting demand for cereals to feed animals.

Achieving high levels of food production and employment "is not only desirable on social welfare grounds but also represents a strategy capable of achieving faster overall growth," they declare.

"Direct, welfare-oriented approaches seem likely to have adverse effects on efforts to achieve rapid and broadly based development."

The "most common barrier" to sustained progress in less developed countries is the tendency to allocate too much capital to industry and unproductive elements of the public sector, rather than to agriculture. Within agriculture itself, the tendency is to favor large-scale, capital-intensive investments, rather than those which produce more jobs and income for the poor.

When national policy fosters rapid growth in employment, demand for food will grow rapidly. Lower population growth rates then are likely to further accelerate growth in per capita income.

"The organizational requirements for rural development are so complex that they require allocation of substantial responsibilities to private sectors and to local organizations," they note.

Government initiatives in such areas as health, nutrition, family planning, and agricultural research also are crucial. "They not only directly increase human welfare but they also enhance the effectiveness of the labor force and restrain its growth in size." This is essential to increase real wages and accelerate income growth for poor people.

"The poor suffer particularly from the large and probably increasing instability of food supplies and prices," they add.

"Trade flows of agricultural commodities from developed to developing countries can be expected to continue to grow rapidly."

Changes in production of food staples occur rather slowly over time, they explain. Demand for additional food rises rapidly in the early stages of economic growth, then recedes to practically zero in mature economies.

In developing countries, high growth rates in per capita income are likely to be associated with high growth rates in domestic food production. If this occurs simultaneously in the bulk of the developing

world, the result could be "at least some intermediate term increase in the real price of staple foods at the global level."

Between 1961 and 1976, they note, 16 developing countries with the fastest growth rate in staple food production more than doubled their net imports of food staples.

As a group, their staple food output grew at the extraordinary pace of 3.9 percent annually, yet domestic production declined from 96 to 94 percent of total food consumption.

The most striking example is Taiwan, which used to be a substantial net exporter of cereals to Japan. Widely cited as a success story in agricultural development, it switched from being a small net exporter in the early 1950s to importing about 60 percent of its total cereal consumption in 1980.

Diet, Cancer Link Growing, Says Cancer Researcher

Several organizations have now concluded that scientific data on the relationship between diet and cancer are strong enough to warrant the development of dietary guidelines to lower cancer risk according to Dr. T. Colin Campbell, Senior Science Advisor to the American Institute for Cancer Research.

To date, the available data "strongly suggest that a diet enriched in plant products reduces cancer risk," said Dr. Campbell, a cancer researcher and professor of nutritional biochemistry at Cornell University. Cancer risk, he said, "increases with high intake of dietary fat and protein, and low intakes of food rich in vitamin C, vitamin A (as beta carotene), vitamin E and dietary fiber."

Dr. Campbell's status report on diet, nutrition and cancer summarized the studies that have been undertaken since the first major conference on the subject was held in 1975. One of the most exhaustive of the studies, completed by the U.S. National Academy of Sciences in 1982, found enough of a link to "formulate interim dietary guidelines that are both consistent with good nutritional practices and likely to reduce the risk of cancer," said Dr. Campbell, who served on the NAS committee responsible for the report.

He said that of those guidelines, "the two that will have the most likely impact on consumers in the marketplace were the recommendations 1) to reduce dietary fat intake from the current level of 40%-45% to 30% of total caloric intake and 2) to emphasize the importance of including fruits, vegetables and whole grain cereal products in the daily diet."

Among the research activities currently being funded by the American Institute for Cancer Reseach - for which Dr. Campbell serves as Senior Science Advisor - and other organizations are studies on vitamins A, C, and E and the trace mineral selenium on various population groups; a survey of hypotheses on the relationships between lifestyle factors and cancer incidence; and a study of the effect of multiple dietary risk factors on selected cancers in the People's Republic of China.

At this point, Dr. Campbell said, there appears to be consistent evidence within various studies indicating a positive relationship between nutrition and cancer. It is hoped that within the coming decade, conclusive data "will enable the American public to make the appropriate modifications in their dietary practices with confidence to reduce cancer risk," he added.

James Jezeski Honored At Retirement Dinner

Dr. James J. Jezeski, Associate Professor in the Department of Human Nutrition and Food Sciences at the University of Florida, was honored recently with a retirement dinner. He will become a Professor Emeritus at the University of Florida.

Jezeski, an extension dairy technologist with the UF's Institute of Food and Agricultural Sciences (IFAS) since 1978, is known for his work with state and national dairy science associations and with the dairy industry. In his research area of dairy products quality and dairy sanitation, Jezeski concentrated on organisms that cause foodborne illness and spoilage and on organisms used to produce fermented dairy products.

Jezeski remained at the University of Minnesota after receiving his Ph.D. in 1947, becoming a full professor in 1959. He served as professor and Coordinator of Environmental Studies at Montana State University from 1969 until 1973 when he moved to the Monarch Chemicals Division of the H. B. Fuller Company. He served as Director for Research and Development there until joining IFAS in 1978.

He is a member of various professional organizations, including the International Association of Milk, Food and Environmental Sanitarians, Inc., the American Dairy Science Association, the National Mastitis Council, the American Academy of Microbiology and the American Public Health Association. He is a member of Sigan Xi, Gamma Sigma Delta and Phi Tau Sigma. He has authored over 100 papers and publications.

The products included herein are not necessarily endorsed by Dairy and Food Sanitation.

Babson Bros. Co. Announces New Liquid Dispensing Electrobrain

• Babson Bros. Co., builders of SURGE Dairy Farm Equipment announces the introduction of the new liquid dispensing Electrobrain to the product line. In 1953, Babson Bros. pioneered the first automatic pipeline washing system for cleaned-in-place pipeline milking systems.

The liquid dispensing Electrobrain is an automatic pipeline washer which automatically meters and dispenses liquid detergent, acid and sanitizer. With the use of the liquid dispensing Electrobrain, the dairyman has a consistent and accurate washing routine to ensure a sanitary pipeline and help him produce a quality product.

Vacuum is used to pull the precise amounts of liquid sanitation products into the dispensing reservoirs. Each of the translucent reservoirs has measurement markings so the dairyman can see precisely how much liquid product will run through his pipeline. Two safety shut-off valves prevent over-use of sanitation products. The liquid dispensing Electrobrain has direct siphon from anywhere in the milkroom.

The new Electrobrain has the capability to draw the liquid sanitation supplies from any size containers. The dairyman does not have to fill each reservoir before the next washing.

It is estimated the liquid dispensing Electrobrain can save the dairyman up to 550 hours of labor a year. The number was figured on two washings a day at 45 minutes each for 365 days per year.

For more information contact your local SURGE dealer or write to Babson Bros. Co., 2100 S. York Road, Oak Brook, Illinois 60521.

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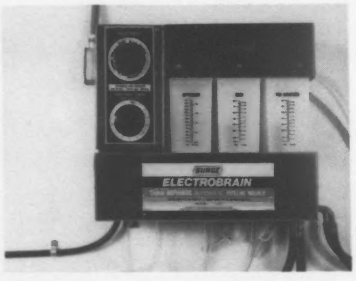

Babson Bros. Co.'s Liquid Dispensing Electrobrain can save up to 550 hours of labor a year

Self-Cleaning Water Filter Available From the Andale Company

• A new high capacity, self-cleaning water filter manufactured by Doucet is now available from the Andale Company, in Lansdale, PA. Of special interest to industrial users, utilities, and power stations, the Doucet Hydromat Filter is located directly in a river or stream, and is automatically cleaned by the velocity of the current.

The Hydromat has been widely used with great success in a broad range of industrial and process water cleaning applications for years in Europe.

For more information contact: The Andale Company, 135 E. Hancock St., Lansdale, PA 19446 or call 215-368-1611.

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Microwave Laboratory Service Available From Cober Electronics

• Cober Electronics, Inc. of Stamford, CT announces its newly created microwave laboratory service specifically formed to meet the needs of food producers. This service provides meat processors, those involved with sausage, meat and chicken products, and high production food manufacturers, with the ability to test and develop new products/processes and find better ways to make their present products. The laboratory utilizes a special test and pilot microwave facility at Cober Electronics which is staffed with both food and electronics scientists. Customer materials are processed with an objective of improving productivity, product quality and developing new methods.

This service is in response to the growing U.S. companies who want the latest techniques in this highly competitive market. For more information contact: Vincent J. Gaccione, Marketing Manager, Cober Electronics, Inc., 102 Hamilton Ave., Stamford, CT 06902 or call 203-327-0003.

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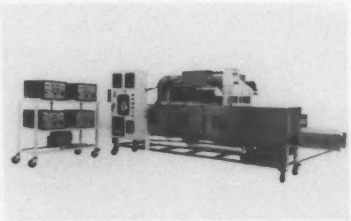

Cober Electronics Microwave Laboratory Service

Aroma Recovery System From Schmidt-Bretten

• Karl Duerwald, President of Schmidt-Bretten, Inc. has announced the development of a Plate Evaporation System with Aroma Recovery capabilities. The "SIGMASTAR" has concentration capacities of up to 100,000 lbs./hr. of water removed. The Plate Evaporator can be combined with a sophisticated Aroma Recovery System to recover a high quality aroma concentrate. Several dozen Sigmastar Systems are presently in use in the food industry to date. According to Mr. Duerwald "new levels of aroma quality and quantity as well as superior concentrate are being realized".

Information on the Sigmastar Aroma Recovery System and Schmidt-Bretten's extensive line of Heat Exchangers is available by writing Schmidt-Bretten, Inc., 1612D Locust Avenue, Bohemia, New York 11716.

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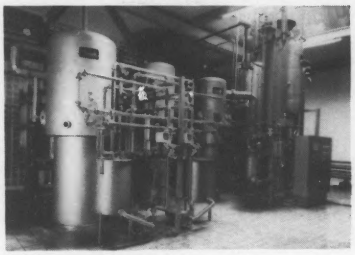

Sigmaster Aroma Recovery System

New Sanitary Tri-Clamp® Fittings Catalog By Tri-Clover

A new 20-page Catalog TC-185 specifies and describes the Tri-Clamp system of stainless steel, quick-couple fittings, adapters, valves and other components for sanitary CIP and take/down processing lines. It replaces Catalog TC-180 published by Tri-Clover Division in late 1979.

New products introduced in this version include:

• A full line of 1/2" and 3/4" mini or fractional size fittings in both Tri-Clamp® and Tri-Weld® style. Construction is 316L stainless steel.

• A heavy duty three-segment Tri-Clamp style. It is designed with stop hinges to promote easy, fast alignment of lines.

• A new line of pipe hangers and supports.

• A new range of materials of construction for Tri-Clamp gaskets is specified as to elastomer and thermoplastic characteristics.

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Published for the Society for Applied Bacteriology

Editor

Professor M. Sussman *Department of Microbiology, Medical School, The University, Newcastle-upon-Tyne NE1 7RU, England*

The Society for Applied Bacteriology launched the *Journal of Applied Bacteriology* in 1954 and since that time the journal has grown in size, in prestige and in the subject matter covered. It has established an international reputation with readers and authors; indeed each number of the journal contains papers from worldwide sources. The Society's interest in the systematics and ecology of groups of microorganisms is reflected in the journal, which publishes five types of article:

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Food Science Facts
For The Sanitarian

Robert B. Gravani
Cornell University
Ithaca, NY

FOOD DETERIORATION AND SPOILAGE BY INSECTS AND RODENTS

Throughout history insects and rodents have competed with humans for food and shelter. They have also effected the health and peace of mind of many people.

It has been estimated that insects and rodents destroy more than $1 billion worth of stored food annually in the U.S. Not only do these pests cause food to deteriorate and spoil, but some insects and rodents harbor diseases that can be transmitted to humans and domestic animals.

INSECTS

Insects are particularly destructive to cereal grains, fruits and vegetables. It has been estimated that insects destroy 5 to 10% of the U.S. grain crop annually. Insects do not destroy food by consuming great quantities of it, but once they damage the integrity of a product, further deterioration may result from invasion by bacteria, yeasts and/or molds. A small insect hole in a tomato may not be a severe problem, but this can lead to bacterial invasion which can spoil the entire tomato.

Insects such as moths, weevils and beetles infest a variety of stored food products such as grains, flour, cereals and cereal products, beans, peas, dried fruits, dates, spices and nuts. Most stored product insects are small and can enter the food plant or establishment quite easily. After entering they can hide in cracks and crevices and attack foods. Infestation may occur anywhere food is stored - in the field, processing plant, during transportation in trucks, rail cars and ships, in warehouses, retail stores, food service establishments and homes. The common stored product pests will be briefly discussed below.

Moths, although there are many moths, there are three common moths that attack stored products.

1) *Indian Meal Moth* - 3/8" long; reddish brown; copper luster.

Seldom attacks sound kernels but prefers milled cereal products such as flour, breakfast foods, meals, dried fruits, nuts and powdered milk. Spins a web as it grows.

2) *Mediterranean Flour Moth* - 3/8" long; grayish.

This insect prefers flour and meal, but also attacks grain, bran, cereal products and many other foodstuffs. It also produces a web.

3) *Angoumois Grain Moth* - Small, buff or yellowish brown in color.

This moth is capable of destroying sound unbroken grain kernels and attacks all cereal grains, in the field and in storage. The moth develops inside the kernels of grain. It is commonly seen in corn cribs and wheat bins.

Weevils, most weevils have elongated beaks or snouts and can be easily differentiated from other beetles. There are two weevils that attack grain and are of primary importance in the U.S. These insects develop inside a single grain of rice or a kernel of corn.

1) *Granary Weevil* - Blackish to chestnut brown; 3/16" long and often smaller.

Primarily found in the Northern States and feeds on a variety of grains including rice, corn and wheat. It does not fly.

2) *Rice Weevil* - 3/32" long; reddish brown to black.

It is considered the most important grain pest and feeds on a variety of grains. It can fly.

Beetles, a variety of beetles attack stored foods and many of these insects are capable of penetrating packaged foods. They usually enter through cracks, tears, rips, or poorly sealed packages. Most common stored product beetles are 1/8" long, and have a reddish brown, brown or black hard shell.

Some of these pests include the saw-tooth grain beetle, confused flour beetle, drug store beetle, dried fruit beetle, lesser grain borer and the cadelle. These insects feed on a wide variety of foods such as cereals, grains, macaroni, dried fruit, spices, nuts and others.

Stored product pests and other insects flies, cockroaches, etc.) enter food processing plants, warehouses, retail stores and other places where food is stored because they are attracted to:

- Food
- Water
- Light
- Shelter
- Odors
- Color

They may enter with foods such as fruits and vegetables by hiding in natural openings. They may also be transported into buildings, in raw foods, ingredients, packaging materials, trucks, rail cars, or by employees. The opportunities for entrance are unlimited.

A good quality assurance program coupled with an effective sanitation program are of primary importance in controlling insects in food establishments.

Insects can be controlled by:

- Preventing infested materials from entering a food establishment.
- Thoroughly inspecting all food products, ingredients, packaging materials, etc. when they are received.
- Regularly checking and inspecting food storage areas.
- Being aware of structural problems that will allow insects to enter (broken screens, open windows and bay doors, etc.)
- Avoiding spills and by cleaning and disposing of spilled product quickly and properly.
- Regular and frequent cleaning of machinery (inside and out), equipment and utensils as well as areas under bins, sacks, bags and other containers where food is stored.
- Practicing proper temperature control.
- Rotating stock and keeping materials that furnish food or harborage moving through your operation.

Frequent inspection of the facilities will often uncover insect infestation. Infestations can be recognized not only by the presence of insects, but through tell tale signs such as webbing, clumped together food particles, holes in packaging, holes in food, insect feces, strange odors and many others.

Through employee awareness, food deterioration and spoilage by insects can be prevented.

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Dairy Quality

by Darrell Bigalke, *Food & Dairy Quality Mgmt., Inc., St. Paul, MN*

POST PASTEURIZATION CONTAMINATION CASE HISTORY #2

Last month's *Dairy Quality Update* discussed a common problem - post pasteurization contamination leading to fluid milk spoilage. This problem resulted in a dairy losing many of its customers and suffering an economic hardship. The problem was identified as a gram negative psychrotrophic contaminant originating from a crack in the cooling section of the HTST. This month's *Dairy Quality Update* discusses another case history concerning post pasteurization contamination leading to fluid milk product defects.

A dairy in the east was faced with consumer complaints and short shelf life of fluid milk products. Plant management had a concern that the business and the quality reputation that the company had enjoyed were diminishing. With these concerns in mind, plant management decided to procure Capsule Laboratories' consulting service to assist in solving this quality problem.

A food industry specialist from Capsule was sent to the plant. The consulting service began by tabulating and examining all available data. Examination of existing data revealed:

1. No coliforms were present initially in the product.
2. The initial Standard Plate Counts were quite low - generally less than 500 ml.
3. Raw milk supplies appeared to have adequate microbiological quality.
4. Fifty percent of the products examined showed high seven day counts, however, all five day counts were less than 500/ml.
5. Further tabulation of the data indicated that only homogenized milk samples showed high seven day counts.

Additional tests were conducted by Capsule Laboratories and indicated the following:

1. Fruity, bitter and unclean flavors were found as a common quality defect.
2. Microscopic examination of bacteria from colonies from high seven day plates indicated gram negative rods. These organisms were no doubt psychrotrophic since the organisms were not found on five day plates but were found on seven day plates.
3. The plant water, sweet water, glycol, and compressed air were examined for microbiological contaminants. The plant compressed air supply indicated a few gram positive rods, however, the other environmental sources did not indicate possible contamination.

Since the data available indicated that post pasteurization contamination was the cause of quality defects, a line sampling sequence analysis was initiated. Capsule Tru-Test Samplers were installed at the HTST, pasturized storage tanks, and at a location above each filler. Fifty ml samples were taken from each of these locations, incubated for seven days, and the microbiological population determined.

Plant sanitation audits were conducted. The sanitation audits indicated:

1. Adequately clean product contact surfaces.
2. Minor problems with cracks and pitted areas in gaskets.
3. Adequate plant housekeeping.

The plant processing procedures were also reviewed. Receiving temperatures, storage temperatures, fill temperatures, HTST temperatures and pressures, and other processing parameters were examined. Results of the processing survey did not indicate the contamination problem. However, since the microbiological data indicated that all the homogenized milk samples had high seven day counts, flow of homogenized milk was followed closely. It was found that all homogenized milk was placed in pasteurized storage tank No. 2. Therefore, pasteurized tank No. 2 was examined closely for sanitation or engineering defects that could result in the post process contamination. However, door gasket, agitator, tank walls, etc. were adequately cleaned and the swabbed test indicated no microbial contamination. In addition, the tank was examined for cracks, however, none were found.

After thirty days of line sampling (twice a day) data was tabulated and micro-organisms from colonies from high 7 day plates microscopically examined. Eighty percent of the samples taken from the suspect tank showed high seven day counts. In addition, all package samples taken from tank No. 2 showed high seven day counts.

Microscopic examination of high seven day plates from these samples indicated gram negative rods. With this in mind a 1/4" hole (wheep hole) was drilled on the outside wall of tank No. 2. Milk solids and other organic material was found between the walls of the tank. This indicated that apparently there was a crack in this tank. It was speculated that there was a hairline crack in this tank that would only open from the pressure of the milk of a full tank.

With the evidence available, it was decided to discontinue use of this tank. The discontinued use of the tank resulted in a drastic reduction in incidences of high seven day counts and product spoilage.

No doubt a low level post process contamination was occurring in this tank due to a crack. However, the low level contaminant had a fast growth rate resulting in product defects.

Next month's *Dairy Quality Update* Newsletter will discuss some thoughts on the "cost of quality".

The Fall '84 Newsletter of the New York affiliate describes several interesting cases investigated by County Health Agencies in that state. The following are taken from that Newsletter.

SALMONELLA OUTBREAK AT A DAY CAMP

Acting on a hospital reported positive *Salmonella* specimen from a child, the Dutchess County Health Department investigated a *Salmonella* outbreak at a children's day camp. It quickly became evident that all of the cases were confined to a smaller group that traveled on a day trip from Poughkeepsie to Coney Island. Thirty-one persons were ill, 3 staff and 28 children.

A picnic lunch prepared at the day camp consisting of chicken, potato salad, fruit and Kool-Aid was prepared the day before the trip and was refrigerated in large containers overnight. It was not known how long the potato salad was at room temperature after preparation and before being placed in the refrigerator. The initial interview revealed that this time may have been almost eight hours; though in subsequent interviews the time was reduced to only two or three hours. Workers who had finished preparing the chicken helped the workers who were still preparing the potato salad. An opportunity for cross contamination existed. Another contributing factor was the fact that the food was transported in the luggage compartment of the bus for the four hour trip. Combined with the very slow cooking in the large container, this time allowed the opportunity for bacteria growth.

Incubation periods averaged 36 hours while duration averaged 120 hours. Predominant symptoms were nausea (100%), diarrhea (87%), vomiting (87%), fever (65%). Potato salad was the suspect vehicle though the attack rate for chicken was also highly significant.

A long list of specific recommendations, based on HACCP was presented to the day camp and will help prevent future outbreaks. *NYSMFS Newsletter - Fall '84.*

STAPHYLOCOCCUS AUREUS OUTBREAK AT A CATERED EVENT

The Suffolk County Health Department reported a classic outbreak caused by *Staphylococcus aureus* in August, 1984. The outbreak occurred at a catered fire department picnic resulting in 27 ill of 104 interviewed (26%). Predominant symptoms were nausea (70%), diarrhea (63%), cramps (63%), and vomiting (33%). The median incubation period was 7 hours with modes at 3, 4 and 5 hours.

The vehicle of transmission of this outbreak was Virginia ham. A very thorough food preparation review confirmed that both temperature abuse and long holding times contributed to the outbreak. Four separate pans of the sliced ham were served: the last being held at bacterial incubation temperatures in insulated carriers for the longest time. Differences in holding times for the pans of ham may explain the low attack rate (26%). Preparing food two days ahead of use, improper cooling and inadequate reheating were also involved. Two food preparation workers had cuts on their hands and were observed using excessive hand contact while preparing food.

Laboratory tests indicated the presence of *S. aureus* in one ham sample of greater than 600,000 colony forming units (cfu) per gram and sausage (720,000 cfu/g).

The caterer was preparing meals for nearly 300 people for the picnic and clearly did not have adequate refrigeration and hot food holding equipment.

Editorial Note: Catering operations have been implicated in nine outbreaks in 1983. Data for 1984 has not been totaled yet, but several outbreaks related to caterers have been reported. Catering operations should be among the first feed service operations involved in Hazard Analysis: Critical Control Point (HACCP) inspection method; this will enable food programs to identify caterers who overextend their operations before an outbreak occurs. Inspections of catering operations must be done during hours of operation, which might well necessitate evening or weekend work. Several of the 1983 outbreaks were linked to caterers operating without a permit and unknown to the local health department. Attempts must be made to identify such caterers and either get them under permit or closed. - *NYSMFS Newsletter Fall '84.*

MAJOR INSTITUTIONAL OUTBREAK MIDDLETOWN PSYCHIATRIC CENTER

An outbreak of *Clostridium perfringens* foodborne illness that is believed to have claimed three lives occurred at the Middletown Psychiatric Hospital in Middletown, New York. Of 382 patients on a special 'chopped' food diet, 225 (59%) became ill with diarrhea (explosive onset) beginning around 4:30 AM on 6/24/84. Only one patient of 491 on a regular diet developed diarrhea. Consumption of the 'chopped' 6/23/84 dinner meal consisting of a cold meat salad of ground beef, chopped onions, celery and mayonnaise was statistically linked to becoming ill.

A sample of the ground beef salad submitted to the New York State Health Department labs contained $2x10^7$ *C. perfringens* and $6x10^3$ *Bacillus cereus* per gram. Stool specimens from victims contained up to 10^7 *C. perfringens* per gram.

Ground beef was cooked in steamed kettles the day before the meal and refrigerated while hot in plastic wrap covered 18 gallon bowls. No temperatures were taken during the chilling process. On the day of the meal, the chilled beef was mixed with other ingredients to make a salad.

Both *C. perfringens* and *B. cereus* are spore forming bacteria and spores from both species would be expected to survive the cooking process used for the ground beef. Since *C. perfringens* can grow at a higher temperature than *B. cereus*, it is hypothesized that it started multiplying first in the cooling ground beef and may have reached

high numbers before the beef cooled enough to allow *B. cereus* to grow. Slowly cooling the beef in a large mass and preparing it so far ahead of serving are the main factors which contributed to the outbreak. Covering the bowls with plastic wrap would further contribute to improper cooling. Covering the bowls with plastic wrap would further contribute to improper cooling. Procedures for rapid cooling were implemented that will prevent similar outbreaks from occurring.

All three of the deaths occurred in elderly patients with other serious health problems that explain the unusual fatalities from this usually mild food-borne disease. - *NYSMFS Newsletter Fall '84.*

FDA CODE INTERPRETATIONS

Two interesting code interpretations have been received recently from the U.S. Food and Drug Administration which might help settle some old and periodically recurring arguments. The first responds to the question, 'Must employees wash their hands after handling money and before touching food or food contact surfaces?' The FDA interpretation of the code states that 'It is not necessary that they wash their hands each time they handle money.' This decision is based on a 1973 study of bacteria counts on bills and metal coins which found low numbers of organisms (bills - 1.5 to 167/cm^2, coins 20 to 413/cm^2). The Treasury Department's Bureau of Engraving and Printing further stated that 'Specifications for currency paper require that it contain fungicidal agents having germicidal characteristics...which retain their effectiveness throughout the life of currency in circulation'. Additionally, 'The inks used...on currency also contain ingredients which inhibit the growth of bacteria.'

The second interpretation deals with the question, 'Is it acceptable to use bar soaps for handwashing?' There are studies done by liquid soap manufacturers which claim that bar soaps can act as fomites during 'in-use' periods and there are studies by bar soap manufacturers that refute these claims. Liquid soap has occasionally been found to be contaminated with disease-causing microorganisms. In addition, there is a risk that hand-contact surfaces of soap dispensers might act as fomites. In the light of all available evidence, the FDA interpretation states that 'Bar soaps continue to be considered acceptable for use in handwashing.' - *NYSMFS Newsletter Fall '84.*

INFECTIOUS DISEASE ISSUES IN RESUSCITATION TRAINING

On 13 April 1984, the Royal Life Saving Society Canada (RLSSC), in cooperation with the Family Practice Unit of Women's College Hospital in Toronto, sponsored a special seminar to address concerns of possible disease transmission during mouth-to-mouth resuscitation or mouth-to-manikin resuscitation training.

Dr. Lee Ford-Jones, Hospital for Sick Children, Toronto, reviewed diseases potentially spread mouth-to-mouth or hand-to-mouth such as infectious mononucleosis, hepatitis A and B, herpes simplex, rhinoviruses, and tuberculosis. A host of other pathogens may also be found in the mouth, nose, or throat, e.g. during infection with adenoviruses, respiratory syncytial virus, influenza, parainfluenza, measles, chicken-pox, psittacosis, Q fever, legionella, staphylococcus, streptococcus, or meningococcus.

Dr. Stanley Read, Toronto General Hospital, reviewed recent developments related to AIDS. This disease appears to be transmitted by intimate sexual contact or by inoculation of blood or blood products. There is no evidence to date of transmission through casual contact with affected individuals or by airborne spread. There have been no cases of AIDS among health care workers that can definitely be ascribed to specific occupational exposures. The U.S. Centers for Disease Control in Atlanta have followed over 50 individuals known to have had definite inoculation or mucous membrane exposure to potentially infectious body fluids from AIDS patients, and none have developed AIDS. Exposures included cuts with sharp instruments, mucosal exposure, and contamination of open skin lesions.

Dr. Colin Wolfe, Toronto General Hospital, and Mr. Ian Wolfe, Emergency Training Programs, Toronto, highlighted the fact that for lay training and practice of resuscitation, the safest way to provide oxygen and get rid of carbon dioxide is mouth-to-mouth contact between rescuer and victim without the aid of mechanical equipment or oxygen supplementation. Mr. Edward Bean, RLSSC, outlined the dilemma which this presented. On the one hand the Society is morally bound to promote and teach this method as the one preferred from the scientific point of view, and on the other hand it should alert those it teaches to what can be considered inherent risks. Each year 130,000 persons are certified in the technique by the RLSSC alone, and well over a million in Canada have been taught by the Society over the past decade. It has been the Society's view that understanding of the method should be supplemented by actual practice. This ensures a spontaneous and competent response in real emergencies. Dr. Jeffrey Coleman, Health Sciences Centre Hospital, Vancouver, indicated that organizations teaching resuscitation could be found liable in a negligence suit relating to the transmission of disease to a student during mouth-to-mouth practice. Even without liability established, a single such case with its attendant publicity would surely result in severely curtailing participation in life saving and CPR programs. In a suit of negligence, the plaintiff would have to prove 3 elements:

(1) that the defendant was negligent;
(2) that injury occurred; and,
(3) that the defendant's negligence caused the injury.

As in all civil actions, these elements have to be proved "on the balance of probability" and not according

to the more stringent standard of "beyond a reasonable doubt" required in criminal proceedings.

Conclusions: Mass public education programs in resuscitation training should continue without change. Increasing care should be taken to inform and warn participants of potential risks and for teaching organizations to eliminate or minimize these hazards wherever possible. There is very limited documentation of disease transmission resulting from mouth-to-manikin-to-mouth contact in spite of the fact that more than 40 million persons have trained with manikins in the U.S. and Canada. This is not accidental as it is likely that those who volunteer for CPR training are generally healthy well-motivated individuals who appreciate and follow hygienic measures which ensure their own well-being and that of their fellow trainees. Responsible precautions in personal hygiene combined with decontamination techniques have undoubtedly been responsible for the good record to date. A mainstay in keeping this record untarnished is attention to the recommendations following this report which were developed by a multidisciplinary committee and approved by the United States National Academy of Sciences. - *Can. Diseases Weekly Report - 12/1/84.*

STREPTOCOCCAL FOODBORNE OUTBREAKS PUERTO RICO, MISSOURI

Two large outbreaks of foodborne group A streptococcal pharyngitis have been reported to CDC during 1984 in Puerto Rico and Missouri.

Puerto Rico: On August 3, 1984, an outbreak occurred among guests attending a party in a private home in San Juan, Puerto Rico. During that weekend, numerous party attendees became ill with sore throat, myalgia, cervical adenopathy, and fever. Many were seen by physicians and had exudative pharyngitis. One was hospitalized.

The Puerto Rico Department of Health was notified of the outbreak on August 8. Because of the high attack rate and the clustering of cases, the outbreak was presumed to be food-borne. Self-administrated questionnaires were received from 45(96%) of the 47 party attendees.

The attack rate for persons who ate carrucho, a conch salad, was 70%, compared with 29% for persons who did not eat carrucho ($p = 0.013$). No other food showed significantly different attack rates. That carrucho was the vehicle for transmission was further supported by the fact that two of four persons who did not attend the party but who ate carrucho that had been brought home to them became ill with pharyngitis. The secondary attack rate for household contacts who did not eat carrucho was 4%. The incubation period was 12-60 hours (median 24 hours).

Throat cultures from 11 party attendees grew group A streptococci, as did a small sample of carrucho remaining from the party. All cultures were of the same serotype (M nontypable, T12, SOR+).

The carrucho was prepared in a small beachside restaurant outside San Juan. The conch used to make the carrucho came in a torn, unlabeled plastic bag and was allegedly imported from Santo Domingo. None of the uncooked conch remained for testing, but the method of salad preparation, which reportably included boiling the conch for 2.5 hours, should have been adequate to kill any streptococci. Seventy pounds of carrucho was made the afternoon of the party. The 25 pounds purchased by the party's host was left in an automobile at ambient temperature for 3 hours before delivery to the party.

Approximately 2,000 persons who ate in the restaurant that weekend were potentially exposed to the 45 pounds of remaining carrucho. Because there was no way to identify individuals who might have eaten there that weekend, four clinical microbiology laboratories serving the San Juan area were surveyed in an attempt to determine if the number of positive throat cultures in August was higher than the number during the same time the previous year; no increase was observed.

All foodhandlers at the restaurant were interviewed and examined for skin lesions, and cultures (pharyngeal, nasal, and hand) were obtained. No cultures were positive, and no histories were obtained of recent pharyngitis or skin lesions. Food prepared at the restaurant, including carrucho, during the week after the party was cultured; all was negative for group A streptococci.

Because party attendees were potentially exposed to streptococci, the Puerto Rico Department of Health recommended that all attendees who developed symptoms of pharyngitis, regardless of culture results, receive antibiotic therapy effective against group A streptococci.

Missouri: Another outbreak occurred among participants from seven states at a meeting held at a Kansas City, Missouri, hotel from May 31, to June 1, 1984. On June 6, the Kansas City Health Department was notified of three cases of group A betahemolytic streptococcal pharyngitis occurring in three technicians from one blood bank who had attended the meeting. Other cases were subsequently reported among persons who attended the meeting. Clustering of cases and a high attack rate suggested a foodborne source.

A questionnaire was administered by telephone or mail to 136 (98%) of the 139 persons identified as having attended the conference. Severity of illness ranged from minor discomfort to symptoms resulting in several days' absence from work. Positive cultures for group A streptococci were reported for 13 (93%) of 14 individuals from whom throat cultures were obtained. However, none of the cultures were still available for typing or confirmation by the time of investigation. The survey implicated a luncheon held May 31. Sixty (57%) cases among the 106 persons who attended it were identified, compared with no cases among 30 conference attendees who did not attend the luncheon ($p < 0.0001$), but only one-third of persons who were ill gave histories of having eaten macaroni salad. The attack rate for persons who ate mousse was 63%, compared with 39% for persons who did not ($p = 0.053$), and, since 82% of ill persons reported having eaten the mousse, it was considered more

likely if only one vehicle were involved. The incubation period of the illness was 24-36 hours (median 36 hours).

All the food for the luncheon was prepared by five hotel employees. The foodhandlers were interviewed and examined, and cultures were obtained. All were negative for group A streptococci, and no visible skin lesions were found on any worker. One worker claimed to have had a sore throat the day of the luncheon but did not seek medical attention.

The pastry chef had prepared two types of mousse the morning of the luncheon. Although it was refrigerated for 30 minutes during one phase of preparation, the final product was kept at room temperature for 1-2 hours before the luncheon.

Editorial Note: Before the advent of pasteurization of milk and availability of adequate refrigeration, foodborne streptococcal outbreaks were very common. Outbreaks resulting in epidemics of scarlet fever, rheumatic fever, and suppurative complications were reported. Improvements in sanitation have resulted in foodborne streptococcal outbreaks becoming relatively uncommon.

These outbreaks show the difficulties involved in recognizing foodborne illness. Foodborne transmission of streptococci, rather than person-to-person transmission, is suggested by a large clustering of cases, a shorter incubation period, and a higher attack rate. Unless disease occurs in a setting where people who are ill are likely to notice the epidemic themselves, it is difficult for public health officials to detect the increased incidence of streptococcal pharyngitis in the community, especially since only a small percentage of persons with sore throats seek medical attention and ultimately receive treatment for the illness. The Puerto Rico outbreak was recognized only because a number of ill people worked in the same office. Initially, the party attendees felt the illness resulted from close person-to-person contact; only when persons who were not at the party ate party food and became ill did the office manager notify the health department. The second outbreak almost escaped detection, since the illness peaked after the conference had ended, and the participants had returned to their homes in seven states.

It is unknown how many cases of endemic streptococcal pharyngitis are caused by foodborne transmission. It is important to recognize that rheumatic fever and glomerulonaphritis may result from outbreaks of these infections. - *MMWR 11/30/84.*

IAMFES MEMBERSHIP CONTEST

Congratulations to the following IAMFES members who have recruited new members.

Don Berg, Minnesota - 4 new members
Jerry Johnson, Minnesota - 1 new member
Roger Hulbert, Wisconsin - 1 new member
Dave Fry, Florida - 1 new member
Tom Masso, Minnesota -1 new member
William Boucher, New York - 1 new member
Charles Yeager, Jr., Colorado - 1 new member

You too can participate in the IAMFES Membership Drive.
Contest is on now and ends June 30, 1985.
Here's how...
Everybody loves a contest...and as a member of the International, you know the benefits of membership and the journals. All you need to do is tell OTHERS about membership with the International.
It's that easy.
A special form for your convenience makes it even easier (page 149). When you run out, just write this office for more. They will be mailed to you the same day the request is received. Or simply photo copy the enclosed form if you wish.
So what are the prizes, you ask? When does it start? When does the contest end?
The Membership Recruitment Contest begins February 1, 1985 and ends June 30, 1985.

GRAND PRIZE FOR RECRUTING 30 MEMBERS

1. Free Registration and Free Social Events at the 72nd IAMFES Annual Meeting, August 4-8, 1985 at the Hyatt Regency, Nashville, TN.
2. Membership Recruiter of the Year Plaque Presented at the Annual Meeting in Nashville.
3. Personal recognition during the Annual Awards Banquet, with seating at the head table.

RECRUITMENT OF 20 MEMBERS

1. Free Registration and Free Social Events
2. Appreciation Certificate Presented at the Annual Meeting

RECRUITMENT OF 10 MEMBERS

1. Free IAMFES Membership for 1986 (includes Dairy and Food Sanitation)

RECRUITMENT OF 5 MEMBERS

1. Bonus Bucks...$10 off your membership for 1986

ALL MEMBERS recruiting new members will be listed in the MEMBERSHIP HALL OF FAME, published in the August issue of *Dairy and Food Sanitation*.
Throughout the contest, updates will be published in *Dairy and Food Sanitation*.
You have NOTHING to lose...but everything to win, plus knowing you are supporting your professional association.
Please write your name on the forms enclosed so that you receive credit for recruitment when they reach the International office.
Questions? Please give me a call.
Kathy R. Hathaway
Executive Manager
515-232-6699
P.S. Remember...June 30, 1985 is the deadline...so start recruiting TODAY!

IAMFES Membership Drive

Recruiter _____

City _____ *State/Providence* _____

Country _____

New Member _____

Address _____

City _____ State/Providence _____

Country _____ Zip _____

Phone with area code _____

Company _____

Job Title _____

Yes, I realize the benefits of membership with the International Association of Milk, Food and Environmental Sanitarians. Please accept my membership for:

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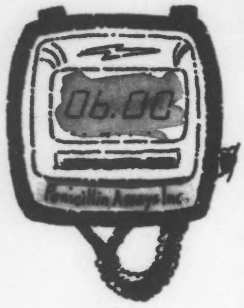

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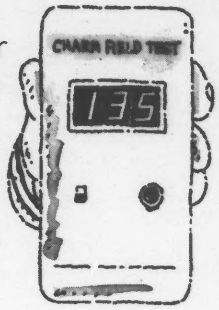

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Abstracts of papers in the April Journal of Food Protection

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Microbiological and Sensory Quality Changes in Cabbage Casserole and Mixed Vegetable Salad with Mayonnaise during Storage, Seppo E. Lindroth, Hannu J. Korkeala, Meri K. Suihko, Mauri J. Aalto, Aimo A. Kuhmonen, and Pirjo-Liisa Penttila, Technical Research Centre of Finland, Food Research Laboratory Biologinkuja 1, SF-02150 Espoo 15, Finland; College of Veterinary Medicine, Department of Food Hygiene, P.O. Box 6 SF-00551 Helsinki 55, Finland; The Food and Milk Inspector Laboratory of the City of Helsinki, Helsinginkatu 24, SF-00530 Helsinki 53, Finland and National Board of Trade and Consumer Interests, P.O. Box 9, SF-00532 Helsinki 53, Finland

J. Food Prot. 48:292-299

The microbiological and sensory quality of cabbage casserole and mixed vegetable salad with mayonnaise was assessed after production, on the sell-by date and 7 d later. Samples were taken directly from five different plants, stored at 4°C and analyzed by three different laboratories. Sell-by periods were 8 to 14 d after the day of production. No *Bacillus cereus, Clostridium perfringens, Staphylococcus aureus* (salad), fecal streptococci or coliforms (casserole) were detected. Casseroles had median aerobic plate counts (APC) of 1.5×10^2, 3.3×10^2 and 4.5×10^3 cfu/g on different analysis times. Yeasts were detected in some casseroles on the sell-by dates. A few more had yeasts and/or molds a week later. Taste, odor, consistency and appearance scores showed a steady decrease during storage. Nine casseroles were deemed unfit for human consumption 7 d after the sell-by dates. Main defects were sliminess and acid, fermented taste and visible mold spots. Salads had a median APC of 5.2×10^3 cfu/g after production, which remained constant during storage. Salads from all companies contained lactobacilli and counts increased slightly during storage. Molds were encountered in samples of only one company and yeasts primarily of another. Median sensory scores decreased slightly during storage. One salad was deemed unfit on the sell-by date and six a week later. Main defects were musty and/or fermented taste and odor and watery consistency. Linear regression equations between taste and $\log_{10}$ microbial counts showed very low or no correlation. Also, the counts of sensorially unfit samples varied from low to high.

Effect of Pasteurization, Centrifugation and Additives on Quality of Concentrated Yogurt (Labneh), S. Dagher and A. Ali, Department of Food Technology and Nutrition, American University of Beirut, Beirut, Lebanon

J. Food Prot. 48:300-302

Pasteurization of yogurt by heat at 60-80°C or by addition of 0.2 to 2% hydrogen peroxide were investigated. Heat-treatment caused a very pronounced reduction in the bacterial count of yogurt samples. Addition of hydrogen peroxide was not effective at the low levels studied. Higher concentrations of hydrogen peroxide that were effective in reducing the bacterial population persisted in the food for more than 4 weeks. Heat-pasteurization in the presence of hydrogen peroxide, was very efficient in destroying bacterial cells and hastened the disappearance of hydrogen peroxide residues from the food. "Labneh", which is usually prepared from yogurt by filtering out the whey through a cloth, had an inferior texture when prepared from pasteurized yogurt. Milder heat treatment in the presence of hydrogen peroxide and addition of potassium sorbate and thickeners, greatly improved the quality and the shelf-life of labneh as confirmed by sensory evaluation experiments. Further improvements were possible by preparing labneh using centrifugation at various speeds for a short time.

Laboratory Simulation of Fluctuating Temperature of Farm Bulk Tank Milk, Halit H. Oz and Ralph J. Farnsworth, Department of Large Animal Clinical Sciences, College of Veterinary Medicine, University of Minnesota, St. Paul, Minnesota 55108

J. Food Prot. 48:303-305

Temperature fluctuation of farm bulk tank milk was simulated in the laboratory. Temperature fluctuations of bulk tank milk on 8 farms were recorded for a week period. The median of the temperature rise and fall at each milking was used as the basis to simulate the fluctuating temperature in the laboratory. A 50-gal capacity aquarium kept in a walk in cooler set at 2°C with proper amounts of 37°C water added at the desired intervals was used to simulate a bulk tank. The recording of temperature fluctuations in farm bulk tanks and the simulated bulk tank in the laboratory were identical.

Growth and Production of Mycotoxins by *Alternaria alternata* in Synthetic, Semisynthetic and Rice Media, Cheng-I Wei and Diane D. Swartz, Food Science and Human Nutrition Department, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida 32611

J. Food Prot. 48:306-311

Alternaria alternata RL671-2 was cultivated in synthetic, semisynthetic or a rice culture medium to study its growth, and production of the mycotoxins alternariol (AOH), alternariol methyl ether (AME), and alteneune (ALT). Toxins were produced during the later stage of growth in both liquid media. Greater toxin production was found in semisynthetic (560 μg/100 ml of medium) than in synthetic medium (135 μg/100 ml). The pH decreased from 4.0 to 2.1 during the cultivation period in the synthetic medium, while it increased from 5.1 to 6.8 in the semisynthetic medium. Reduction of carbon source (glucose) levels in the synthetic medium to change the C/N ratios from 12:1 to 6:1 or 3:1, greatly increased both production of toxins and fungal mycelial weights. At a C/N ratio of 6:1, the fungus produced toxins at a level close to that produced in the semisynthetic medium. The rice culture was more efficient for production of large quantities of toxin.

Evaluation of Media for Enumerating Yeasts and Molds in Fresh and Frozen Fruit Purees, L. R. Beuchat and B. V. Nail, Department of Food Science, University of Georgia Agricultural Experiment Station, Experiment, Georgia 30212

J. Food Prot. 48:312-315

Five mycological media were evaluated for their suitability to enumerate yeasts and molds in 11 different fresh and frozen fruit purees. Overall, acidified (pH 3.5) potato dextrose agar (PDA) and oxytetracycline - glucose - yeast extract (OGY, pH 6.5) agar supported highest overall recovery of total fungal populations from purees; plate count agar supplemented with antibiotics and rose bengal - chlortetracycline agar (RBC) were inferior. Dichloran - rose bengal - chloramphenicol agar was superior for restricting spreading of molds, thus facilitating enumeration of colonies. RBC agar was superior to PDA for recovering molds; PDA was superior to RBC for detecting yeasts. It is concluded that selection of acidified PDA and OGY in lieu of other mycological media is appropriate when high-acid food materials such as fruit purees are analyzed for total fungal populations. These media would be exceptionally desirable when test products contain low populations of molds and high populations of yeasts.

Effects of Culture Media, Exposure Time and Temperature on Near-Ultraviolet-Induced Sporulation of *Alternaria alternata*, Cheng-I Wei, Diane D. Swartz and John A. Cornell, Food Science and Human Nutrition Department and Statistics Department, University of Florida, Gainesville, Florida 32611

J. Food Prot. 48:316-319

Effects of culture media, near-ultraviolet exposure time, and temperature on sporulation of *Alternaria alternata* were investigated. Strains RL 671-2 and ATCC 36068 were cultivated on Potato Dextrose Agar (PDA), V8 Juice Agar (V8 Agar) and Mycological Agar (MA). The best culture medium for sporulation of strain RL 671-2 was PDA, followed by V8 agar, with only negligible numbers of spores appearing on MA. Near-UV exposure significantly increased sporulation in strain RL 671-2 on PDA and V8 agar. Significantly higher ($P<0.01$) spore counts were found in PDA cultures of this strain exposed to near-UV at 35 than at 20°C. On V8 agar significantly more spores were observed at 20 than at 35°C. MA was not a satisfactory medium for sporulation of ATCC 36068. Both PDA and V8 agar equally supported sporulation for this strain (ATCC 36068) at all exposure times.

Establishment of Residue Analysis of Propanil (Dichloropropionanilide), Linuron and Diphenamide in Agricultural Commodities, Yoshio Ito, Hideyo Suzuki, Shunjiro Ogawa and Masahiro Iwaida, National Institute of Hygienic Sciences, Osaka Branch, 1-1-43, Haenzaka, Higashi-ku, Osaka 540, Japan

J. Food Prot. 48:320-324

A method for simultaneous determination of residues of three herbicides containing nitrogen, propanil (3',4'-dichloropropionanilide), linuron and diphenamide, in agricultural commodites was established. The herbicides were extracted by acetone from samples, transferred into dichloromethane, then the dichloromethane extract was dried. The residue was dissolved in n-hexane, and purified from oily contaminants by partition with acetonitrile. The acetonitrile extract was further purified by Florisil column chromatography with dichloromethane. Diphenamide was determined directly by use of gas chromatograph equipped with a flame-thermoionic detection system (FTD-GC). DCPA and linuron were derivatized into their N-monomethyl derivatives by a strong methylation method by use of sodium hydride and methyl iodide in a mixture of dimethyl sulfoxide and benzene, and then subjected to determination by FTD-GC. Recoveries of the three herbicides from brown rice, barley, corn, potato, carrot and onion were not less than 80% at the additional level of 1.0 ppm, while not less than 70% at 0.1 ppm level, respectively.

A Modified Method for Ascertaining Water Activities Within Defined Limits, R. Hilsheimer and A. H. W. Hauschild, Microbiology Research Division, Health Protection Branch, Health and Welfare Canada, Tunney's Pasture, Ottawa, Ontario, Canada K1A 0L2

J. Food Prot. 48:325-326

The salt crystal method of Northolt and Heuvelman (J. Food Prot. 45:537-540, 1982) for testing the water activity of foods was modified to facilitate the recognition of crystal liquefaction. The proposed device is assembled from basic laboratory ware, i.e., an Erlenmeyer flask, a rubber stopper and a test tube.

Effect of Quinic Acid on the Growth of Some Wild Yeasts and Molds, Heikki Kallio, Seija Ahtonen and Seppo S. Sarimo, Department of Chemistry and Biochemistry, Laboratory of Food Chemistry, University of Turku, SF-20500 Turku, Finland

J. Food Prot. 48:326-329

The effect of quinic acid on growth of wild yeasts (*Hansenula anomala, Saccharomyces cerevisiae* and *Schizosaccharomyces pombe*) and molds (*Aspergillus amstelodami, Botrytis cinerea* and *Byssochlamys fulva*) was investigated. Quinic acid alone had no antifungal effect on the microbes tested. Generation time of the yeasts remained unaltered in the presence of up to 1% quinic acid, whereas growth of the molds was accelerated. No synergistic effect of quinic acid together with potassium sorbate or sodium benzoate was observed. Quinic acid was antagonistic to the antifungal effects of both potassium sorbate and sodium benzoate on molds. In co-use with sorbate and benzoate, quinic acid shortened the lag phase of the growth of molds. The inhibitory effect of 0.01 to 0.02% sodium benzoate was almost completely eliminated by adding 1% quinic acid.

Shelf-Life Studies of Vacuum-Packaged Bacon Treated with Nisin, C. Calderon, D. L. Collins-Thompson and W. R. Usborne, Department of Environmental Biology and Food Science, University of Guelph, Guelph, Ontario, Canada N1G 2W1

J. Food Prot. 48:330-333

The effect of various concentrations of nisin (250, 500 or 750 IU/g) combined with 50 ppm sodium nitrite on the shelf-life of vacuum-packaged bacon was evaluated. Control packages of bacon containing 50 and 150 ppm nitrite were included. Total numbers of lactic acid bacteria (LAB) (as measured on MRS medium) was used as a criterion for shelf-life. Treated bacon samples were stored at 30 and 5°C for 4 d or 6 wk, respectively. Bacon stored at 30°C showed a 1-d extension of shelf-life at nisin levels of 500 and 750 IU/g. Lowest counts at 6 wk were in bacon treated with 750 IU nisin and stored at 5°C. The LAB count was 1.5-$\log_{10}$ CFU/g lower than the controls. A 1-wk extension of storage life was predicted for nisin-treated (750 IU) bacon.

Application of Bioluminescence to Rapid Determination of Microbial Levels in Ground Beef, J. E. Kennedy, Jr. and J. L. Oblinger, Food Science and Human Nutrition Department, University of Florida, Gainesville, Florida 32611 and Agricultural Dean's Office, University of Missouri-Columbia, Columbia, Missouri 65211

J. Food Prot. 48:334-340

The relationship between microbial ATP measurements and aerobic plate counts (APC's at 35, 20 and 7°C) was investigated for 75 ground beef samples. Samples (n = 27) were obtained from several local retail markets in one experiment, and ground beef samples obtained from a single, processing facility were sampled throughout 15 d of storage at 1°C for a total of 48 samples in another experiment. Bioluminescent assay time for a given sample was less than 1 h. The correlation coefficient (r) between $\log_{10}$ microbial ATP and $\log_{10}$ APC (20°C) per g was 0.86 and 0.99 for retail and single source samples, respectively. Differences between actual $\log_{10}$ APC (20°C)/g and corresponding values predicted by linear regression equations were $\leq \log_{10}$ 0.5 for 25 of 27 retail samples and 48 of 48 single source samples. Variation was noted in values of ATP per bacterial cell and relative bioluminescent quenching (ATP per relative light unit, RLU) for most retail samples and for single source samples having low APC (20°C) levels ($\leq \log_{10}$ 7.0).

Microcalorimetry as a Rapid Method for Estimation of Bacterial Levels in Ground Meat, Lone Gram and Henry Søgaard, Insitute of Microbiology and Hygiene, Royal Veterinary and Agricultural University, 13 Bülowsvej, DK-1870 Copenhagen V, Denmark

J. Food Prot. 48:341-345

The potential of microcalorimetry as a rapid method for the estimation of bacterial levels in ground meat was studied. The exothermic heat production rates (HPRs) of *Escherichia coli* and meat suspensions were measured in a BioActivity Monitor and correlated to $\log_{10}$ CFU/ml or g. Comparative experiments using 0.1% peptone saline (PS) or nutrient broth (NB) as the suspending medium showed that maximum HPRs (peak times) were obtained faster with NB than with PS, and that HPR peaks were more distinct when using NB. Two series of 11 meat samples suspended 1:10 in NB were examined at instrument operating temperatures of 21 and 30°C, respectively, and HPRs were compared to mesophilic colony counts (30°C/3 d) and to psychrotrophic counts (17°C/17 h then 7°C/72 h). Peak times at 30°C were considerably shorter than those at 21°C. The correlation between both plate count methods and the peak times were better when measuring at 21°C than at 30°C. Significant correlations between HPRs and colony counts were obtained with all experimental conditions. Results indicate that microcalorimetric measurements of 10^{-1} NB suspensions of ground meat provide a promising analytical tool for estimation of the bacterial levels in less than 24 h in the range of 10^5 to 10^8 CFU/g.

Rate Constant and Activation Energy for Formation of a Nitrosoascorbic Acid Intermediate Compound, Kenjiro Izumi, Robert G. Cassens and Marion L. Greaser, Department of Meat and Animal Science, University of Wisconsin, Madison, Wisconsin 53706

J. Food Prot. 48:346-350

The rate of decomposition of nitrite as a result of its reaction with ascorbic acid was determined from spectrophotometric measurements at various pH values and temperatures. The reaction proceeded initially as second order. The product was nitrosoascorbic acid, and it was formed with an increasing rate constant with decreasing pH. The rate was proportional to the concentration of nitrite from pH 4.2 to 5.38. As the reaction proceeded further at lower pH and higher temperature, it deviated from the second order reaction plot, giving kinetic evidence that the formation of 2,3-dinitrosoascorbic acid occurred more easily at low pH and high temperature. The activation energy for formation of nitrosoascorbic acid decreased with increasing pH from 10.90 Kcal/*M* at pH 4.35 to 6.46 Kcal/*M*

at pH 5.49. Apparently there are two different reactions in the activation energy; i.e., the reaction of nitrous acid with the undissociated form of ascorbic acid (high activation energy) and the reaction of nitrous acid with once dissociated ascorbic acid (low activation energy). The significance of the reaction of nitrite with ascorbic acid at the pH values encountered in meats cured with nitrite and ascorbate is emphasized in terms of low activation energy and heating which increase the rate constant.

Measurement of Microbial Protease Activity Using a pH-Stat Titration, H. A. Alkanhal, J. F. Frank and G. L. Christen, Animal and Dairy Science Department, University of Georgia, Athens, Georgia 30602

J. Food Prot. 48:351-354

The activity of purified and crude microbial proteases was measured by titration at pH 9 using an automatic pH-stat instrument. The ability of the pH-stat titration method and the trinitrobenzenesulfonic acid (TNBS) method to detect protease activity was compared. The pH-stat titration produced higher measurements of activity than the TNBS method when purified protease from *Bacillus amyloliquefaciens* was tested. Protease activity determination using the two methods resulted in a linear correlation of $R^2=0.985$ and the same repeatability (C.V.=2.6%). The pH-stat titration method was more sensitive than the TNBS method in measuring activity of the purified protease, and it indicated greater proteolytic activity than the TNBS method when culture filtrates from five *Pseudomonas* spp. which produced proteolytic enzyme with greater activity at pH 9 than pH 7.5 were tested. When culture filtrates from four *Pseudomonas* spp. with similar but low proteolytic activity at pH 9 and 7.5 were tested, the two methods produced similar results. For proteases with optimum activity at or above pH 9, the pH-stat titration method was simplier, faster, and more sensitive than the TNBS method in determining activity.

Bioavailability of Zinc and Copper to Rats Fed Erythorbate and/or Nitrite-Cured Meats, Janet L. Greger, Karen L. Graham, Ken Lee and Barbara L. Chinn, Departments of Nutritional Sciences and Food Science, University of Wisconsin, 1415 Linden Drive, Madison, Wisconsin 53706

J. Food Prot. 48:355-358

The bioavailability of zinc and copper from meats cured with erythorbate and/or nitrite was evaluated. Iron-depleted rats were fed six test diets that contained as protein sources: uncured meat, meat cured with erythorbate, meat cured with nitrite, meat cured with nitrite and erythorbate, lactalbumin, and lactalbumin supplemented with iron to the levels present in the meat-based diets. All diets contained similar levels of zinc and copper. Treatment of the meat with usual commercial levels of nitrite (156 μg/g meat) and/or erythorbate (550 μg/g meat) had no significant effect on zinc and copper utilization by rats. However, rats fed meat-based diets retained more zinc and copper in their livers than rats fed lactalbumin-based diets.

Comparison of Two Models for Process Holding Time Calculations: Convection System, B. Manji and F. R. Van De Voort, Department of Food Science, University of Guelph, Guelph, Ontario N1G 2W1 and School of Food Science, MacDonald College, McGill University, 2111 Lakeshore Rd. Ste. Anne de Bellevue, Quebec H9X 1C0, Canada

J. Food Prot. 48:359-363

The reaction kinetics of microbial destruction in food products are generally determined by the Thermal Death Time method (TDT), while chemical changes have traditionally been calculated by the more widely accepted Arrhenius approach. These two methods do not reconcile mathematically, and simply stated, one is the inverse of the other. It was of interest therefore to consider the relationship of these methods relative to each other on a mathematically simulated and experimental basis. The kinetic parameters of *Saccharomyces uvarum* were determined experimentally and used to calculate simulated processes in accordance to the relationships dictated by the TDT and Arrhenius models. The simulation results indicated a discrepancy between the methods, the Arrhenius approach requiring about 16% more time to complete a process. Based on five processing trials carried out using *S. uvarum* the actual process times were compared to those predicted by the TDT and Arrhenius methods. The Arrhenius method predicted the correct process times on the average, while the TDT predictions were short by about 8% in terms of time. From a microbiological standpoint, these differences are not likely to be singificant, however, they may be important if the TDT method is used to characterize the kinetic parameters of more rigerously defined chemical systems.

Growth and Inhibition of Microorganisms in the Presence of Sorbic Acid: A Review, Michael B. Liewen and Elmer H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

Sorbate (sorbic acid) generally is an effective inhibitor of most molds and yeasts and some bacteria. Environmental factors such as pH, water activity, temperature, atmosphere, microbial load, microbial flora and certain food components can influence the effectiveness of sorbate. Strains of microorganisms resistant to sorbate exist and therefore are common causes of food spoilage. Some molds and bacteria are able to degrade sorbate. This paper reviews the factors that affect the antimicrobial effectiveness of sorbate in foods.

Calendar

1985

April 8-11, 10TH ANNUAL AOAC SPRING TRAINING WORKSHOP, to be held at the Sheraton Dallas Hotel, Dallas, TX. For more information contact: Ginger Gipson, Food and Drug Administration, 3032 Bryan Street, Dallas, TX 75204. 214-767-0309.

April 14-17, 66TH DFISA ANNUAL CONFERENCE, Marriott's Marco Beach Resort, Marco Island, FL. For more information contact: Bruce L. D'Agostino, Director, Public Relations, Dairy and Food Industries Supply Assoc., Inc., 6245 Executive Boulevard, Rockville, MD 20852-3938. 301-984-1444, Telex: 908706.

April 14-18, INTERNATIONAL FOOD FAIR OF SCANDINAVIA - TEMA 85, the 8th international fair for food and beverages, held together with the 5th international hotel, restaurant and catering fair. For more information contact: Leslie Christensen, General Manager, Bella Center A/S, Center Boulevard, DK-2300 Kobenhavn, Denmark.

April 15-16, ADVANCED PEST CONTROL, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

April 15-19, STATISTICAL QUALITY CONTROL SHORT COURSES - STATISTICAL METHODS APPLIED TO PRODUCTIVITY IMPROVEMENT AND QUALITY CONTROL - FOR THE FOOD PROCESSING INDUSTRY, to be held at the University of California, Davis. For more information contact: Robert C. Pearl, Food Science & Technology Dept., University of California, Davis, CA 95616. 916-752-0980.

April 17, MICROBIAL ASPECTS OF FOOD SAFETY, to be held at the Eastern Regional Research Center, USDA, Philadelphia, PA. For more information contact: Marianne Bencivengo, 215-233-6524.

April 17-18, JOINT ANNUAL MEETING OF THE AMERICAN DRY MILK INSTITUTE AND THE WHEY PRODUCTS INSTITUTE, to be held at the Hyatt Regency O'Hare Hotel, River Road at the Kennedy Expressway, Chicago, IL. For more information contact: Dr. Warren S. Clark, Jr., Executive Director of both organizations, 130 N. Franklin St., Chicago, IL 60606.

April 17-19, MEETING OF THE FLORIDA ASSOCIATION OF MILK, FOOD & ENVIRONMENTAL SANITARIANS, to be held at the Quality Inn - Cypress Gardens, FL. For more information contact: Dr. Franklin W. Barber, 1584 Cumberland Ct., Ft. Myers, FL 33907. 813-936-4769.

May 1, SANITATION WORKSHOP, to be held at the Hilton Inn & Towers, Anaheim, CA. For more information contact: John C. Bruhn, Dept. of Food Science & Technology, University of California, Davis, CA 95616.

May 6-7, MOLD MONITORING AND CONTROLS SPECIAL COURSE, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

May 8-10, SOUTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION meeting. To be held in Spearfish, SD. For more information contact: Cathy Meyer, President S.D.E.H.A., PO Box 903, Mitchell, SD 57301. 605-996-6452.

May 13-15, PENNSYLVANIA DAIRY SANITARIANS' AND LABORATORY DIRECTORS' CONFERENCE, to be held at the J. O. Keller Conference Center, The Pennsylvania State University, State College, PA. For more information contact: Agricultural Conference Coordinator, 409 J. O. Keller Building, University Park, PA 16802. 814-865-9547. Or contact: Sidney E. Barnard, Program Chairman, 814-863-3915.

May 13-16, ASEPTIC PROCESSING AND PACKAGING WORKSHOP, to be held at Purdue University, West Lafayette, IN. For more information contact: James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907. 317-494-8279.

May 13-17, NATIONAL CONFERENCE ON INTERSTATE MILK SHIPMENTS, to be held at the Hyatt Regency, Lexington, KY. For more information contact: H. H. Vaux, Indiana State Board of Health, Indianapolis, IN 46206. 317-633-0313.

May 14-16, CONFERENCE ON INFANT FORMULA, to be held at the Sheraton Beach Inn & Conference Center, Virginia Beach, VA. For more information contact: Dr. James T. Tanner, Food & Drug Administration, HFF-266, 200 C Street S.W., Washington, DC 20204. 202-472-5364.

May 20-23, FOODANZA '85, joint convention of the Australian and New Zealand Institutes of Food Science and Technology. To be held at the University of Canterbury, Christchurch, New Zealand. For more information contact: D. R. Hayes, Convention Secretary, 394-410 Blenheim Road, PO Box 6010, Christchurch, New Zealand.

May 21-23 or June 4-6, 1985, FOOD ANALYSIS WORKSHOP, Salt/Sodium: Rapid Methods Evaluation. To be held at Iowa State University, Ames, Ia. For more information contact: Tom Aspelund, Iowa State University, 515-294-3156.

May 21-23, INTERNATIONAL DAIRY FEDERATION SEMINAR, Progress in the Control of Bovine Mastitis, to be held at Bundesanstalt fur Milchforschung, D-2300 Kiel, FRG. For more information contact: Prof. Dr. W. Heescher, Bundesanstalt fur Milchforschung, Institut fur Hygiene, Hermann-Weigmann-Strabe 1, P.O. Box 1649, D-2300 Kiel / FRG. Telephone: (0431) 609-392 or 609-1. Telex: 292966.

May 21-23, DESCRIPTIVE ANALYSIS WORKSHOP, to be held in London, England. For more information contact: Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833.

May 24, DFISA INTERNATIONAL TRADE SEMINAR, to be held at the Key Bridge Marriott, Washington, D.C. For more information contact: Bruce L. D'Agostino, Director, Public Relations, Dairy and Food Industries Supply Assoc., Inc., 6245 Executive Boulevard, Rockville, MD 20852-3938. 301-984-1444, Telex: 908706.

June 3-5, NATIONAL COUNCIL FOR INTERNATIONAL HEALTH 1985 ANNUAL INTERNATIONAL HEALTH CONFERENCE, to be held in Washington, D.C. For more information contact: Dr. Curtiss Swezy, Program Manager, National Council for International Health, 2100 Pennsylvania Avenue, N.W., Suite 740, Washington, D.C. 20037.

June 7-8, IFT BASIC SYMPOSIUM: FOODBORNE MICROORGANISMS AND THEIR TOXINS - DEVELOPING METHODOLOGY, to be held in conjunction with the IFT National Meeting in Atlanta, GA. For more information contact: Dr. Norman Stern, USDA-ARS, Beltsville Agricultural Research Center, Beltsville, MD 20705. 301-344-2438. Or contact: Dr. Merle Pierson, Dept. of Food Science & Technology, VPI & SU, Blacksburg, VA 24061. 703-961-6423.

June 17-20, BASIC FOOD PLANT MICROBIOLOGY, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

June 23-26, CANADIAN INSTITUTE OF FOOD SCIENCE AND TECHNOLOGY 28TH ANNUAL CONFERENCE, to be held at the Royal York Hotel, Toronto, Ontario, Canada. For more information contact: Mr. Bill Munns, Conference Chairman, Canada Packers Inc., 95 St. Clair Avenue W., Toronto, Ontario M4V 1P2, Canada. 416-766-4311.

July 13-20, RAPID METHODS AND AUTOMATION IN MICROBIOLOGY WORKSHOP, to be held at Kansas State University, Manhattan, KS. For more information contact: Jan Hurley, Conference Coordinator, 800-255-2757 (outside Kansas) or 913-532-5575 (in Kansas or outside the U.S.).

July 14-17, SECOND INTERNATIONAL CONFERENCE ON FOULING AND CLEANING IN FOOD PROCESSING (ICFCFP), to be held in Madison, WI. For more information contact: Daryl Lund, University of Wisconsin-Madison, Department of Food Science, 1605 Linden Drive, Madison, WI 53706. 608-262-3046.

July 15-17, TECHNIQUES IN MEASUREMENT WORKSHOP, to be held in Palo Alto, CA. For more information contact: Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833.

July 15-19, PURDUE CANNERS TECHNICIANS MOLD COUNT SCHOOL. For more information contact: Dr. James V. Chambers,

Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907. 317-494-8279.

August 3-9, 1985 ANNUAL MEETING OF THE SOCIETY FOR INDUSTRIAL MICROBIOLOGY, to be held at the Westin Hotel, in Copley Place, Boston, MA. For more information contact: Mrs. Ann Kulback - SIM Business Secretary, SIM Headquarters, 1401 Wilson Boulevard, Arlington, VA 22209.

AUG. 4-8, IAMFES ANNUAL MEETING, to be held at the Hyatt Regency, Nashville, TN. For more information contact: Kathy R. Hathaway, IAMFES, Inc., P.O. Box 701, Ames, IA 50010. 515-232-6699.

August 5-9, "BIOTECHNOLOGY: MICROBIAL PRINCIPLES AND PROCESSES FOR FUELS, CHEMICALS AND BIOLOGICALS," to be held at the Massachusetts Institute of Technology, Cambridge, MA. For more information contact: Director of Summer Session, MIT, Room E19-356, Cambridge, MA 02139.

August 25-30, 9TH SYMPOSIUM OF WAVFH. The World Association of Veterinary Food Hygienists (WAVFH) will hold their 9th Symposium in Budapest, Hungary. For more information contact: 9th WAVFH Symposium, Organizing Commitee, Mester u. 81, H-1453 Budapest Pf 13, Hungary.

September 9-12, ASEPTIC PROCESSING AND PACKAGING OF FOODS, sponsored by The International Union of Food Science and Technology Food Working Party of the European Federation of Chemical Engineering, to be held in Tylosand, Sweden. For more information contact: Ann-Britt Madsen, Kurssekretariatet, Lund Institute of Technology, P.O. Box 118, S-221 00 Lund, Sweden.

September 17-19, NEW YORK STATE ASSOCIATION OF MILK AND FOOD SANITARIANS, to be held at the Sheraton Inn, Syracuse, NY. For more information contact: D. K. Bandler, 11 Stocking Hall, Cornell University, Ithaca, NY 14853. 607-256-3027.

September 30-October 2, ADVANCED SANITATION PROGRAM, to be held in Chicago, IL. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

October 1-2, SOUTH DAKOTA STATE DAIRY ASSOCIATION CONVENTION to be held at the Ramada Inn, Sioux Falls, So. Dakota. For more information contact: Shirley W. Seas, Ex Secretary, Dairy Science Dept., So. Dakota State University, Brookings, SD 57007.

October 1-3, STORAGE LIVES OF CHILLED AND FROZEN FISH AND FISH PRODUCTS, to be held at The Conference Centre, University of Aberdeen, Aberdeen, Scotland. For more information contact: IIR Conference Organiser, Torry Research Station, PO Box 31, 135 Abbey Road, Aberdeen AB9 8DG, UK.

October 2-4, WORKSHOP IN FOOD FLAVOR: DEVELOPMENT, MANUFACTURE AND USE, to be held at the University of Minnesota, St. Paul, MN. For more information contact: Joanne Parsons, Office of Special Programs, 405 Coffey Hall, 1420 Eckles Avenue, University of Minnesota, St. Paul, MN 55108. 612-373-0725.

October 5-9, DFISA FOOD & DAIRY EXPO '85, to be held at the Georgia World Congress Center, Atlanta, GA. For more information contact: Bruce L. D'Agostino, Director, Public Relations, Dairy and Food Industries Supply Assoc., Inc., 6245 Executive Boulevard, Rockville, MD 20852-3938. 301-984-1444, Telex: 908706.

October 7-9, BIOTECHNOLOGY IN THE FOOD PROCESSING INDUSTRY, sponsored by the Department of Food Science and Nutrition, University of Minnesota. To be held at the University Radisson Hotel, Minneapolis, Minnesota. For more information contact: Lynette Marten, 405 Coffey Hall, 1420 Eckles Avenue, St. Paul, MN 55108. 612-373-0725.

October 21-23, STABILITY AND QUALITY CONTROL WORKSHOP, to be held in Palo Alto, CA. For more information contact: Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833.

October 21-25, 69TH ANNUAL SESSIONS OF THE INTERNATIONAL DAIRY FEDERATION, to be held in Auckland, New Zealand. For more information contact: H. Wainess, Secretary, U.S. National Committee of the IDF (USNAC), 464 Central Avenue, Northfield, IL 60093. 312-446-2402.

October 28-30, PCO RECERTIFICATION, to be held in Manhattan, KS. For more information contact: Shirley Grunder, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750.

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April 14-18, FRUIT AND FRUIT TECHNOLOGY RESEARCH INSTITUTE INTERNATIONAL CONFERENCE to be held at the CSIR Conference Centre, South Africa. For more information contact: Symposium Secretariat S.341, CSIR, P.O. Box 395, Pretoria 0001, South Africa. Telephone: 012 869211 x 2063. Telex: 3-630 SA.

May 26-31, 2ND WORLD CONGRESS FOODBORNE INFECTIONS AND INTOXICATIONS will take place in Berlin (West) at the International Congress Centre (ICC). For more information contact: FAO/WHO Collaborating Centre for Research and Training in Food Hygiene and Zoonoses, Institute of Veterinary Medicine (Robert von Ostertag-Institute), Thielallee 88-92, D-1000 Berlin 33.

June 29-July 2, 29TH CONFERENCE OF THE CANADIAN INSTITUTE OF FOOD SCIENCE AND TECHNOLOGY, to be held in Calgary, Alberta, Canada. For more information contact: Terry Smyrl, Ph.D., Alberta Horticultural Research Center, Brooks, Alberta, Canada, T0J 0J0. 403-362-3391.

AUG. 3-7, IAMFES ANNUAL MEETING, to be held at the Radisson South, Minneapolis, MN. For more information contact: Kathy R. Hathaway, IAMFES, Inc., P.O. Box 701, Ames, IA 50010. 515-232-6699.

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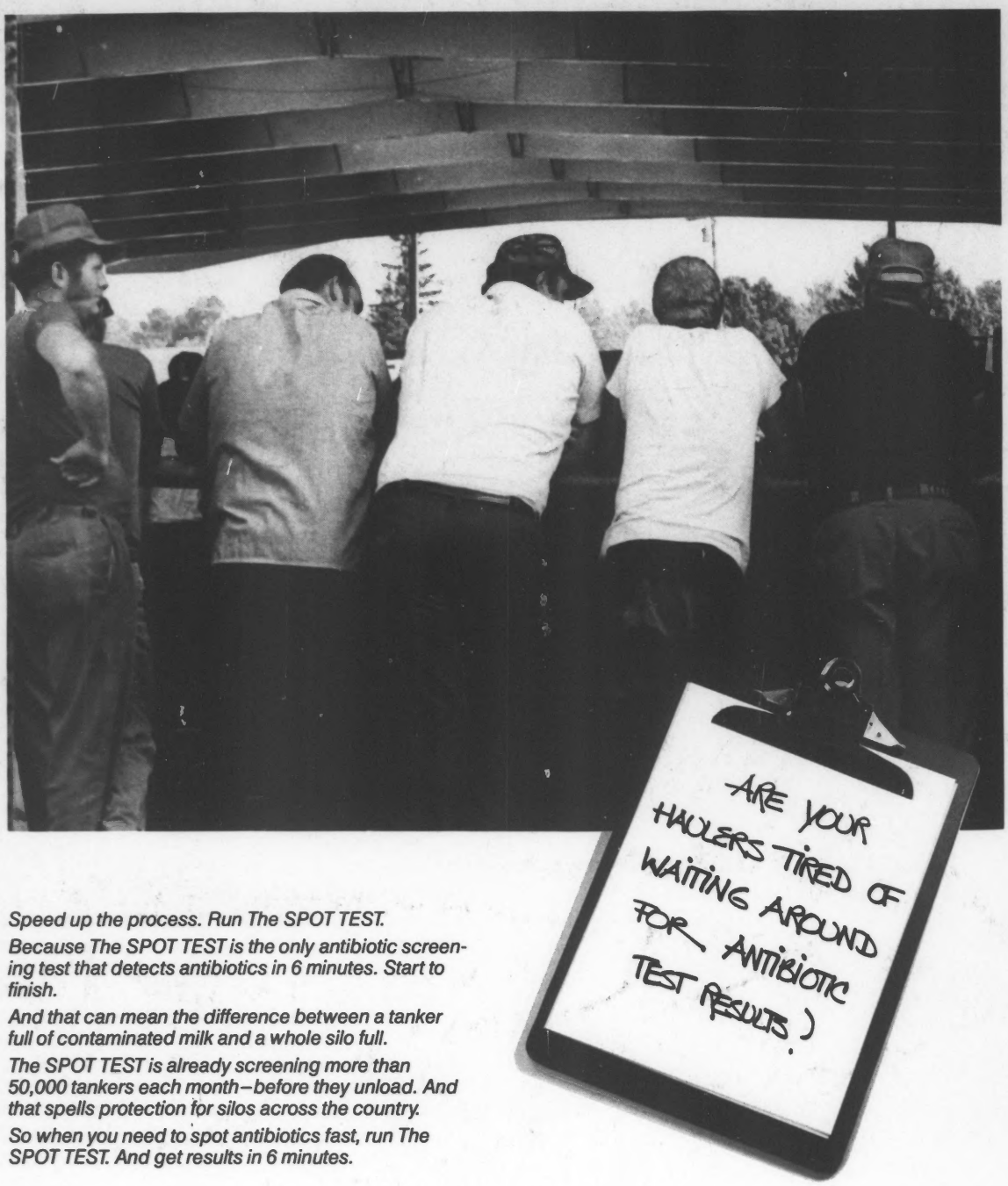

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