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DAIRY, FOOD AND ENVIRONMENTAL

SANITATION

MARCH 1991



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On My Mind . . .



By
Steven K. Halstead
IAMFES
Executive Manager

... are affiliate meetings

It seems like all of our affiliates plan their annual meetings in one of four months - February, March, September or October. I am scheduled to attend five meetings in February/March and our Affiliate Liaison, Dee Buske, is scheduled for a like number. Busy, Busy, Busy!

In determining which of us will attend a particular affiliate meeting, we first look at which meetings we will be attending. We are able (travel budgets and schedules permitting) to attend between 15 and 20 affiliate meetings yearly. That's between 1/3 and 1/2 of our state groups.

The first priority is those having problems where we might be helpful. The next priority goes to those who we have not visited in the last year or two. The next priority is for those who are scheduled to host an upcoming International meeting (Kentucky, Ontario, and Georgia). Our very last priority is those we want to go to because of their location, topics or people involved.

Once the priorities are established, Dee and I look at our schedules to see which one of us is available. Where possible we try to line up multiple meetings in proximity to one another. At this same time, we also consider if there has been a specific request for one or the other of us.

All this has been a gentle hint - if you would like Dee or I, or for that matter, one of our elected officers - to attend your affiliate meeting - ask. Other things that will help is if you can give us at least 15 minutes on the program and a place near your registration table where we can put out copies of *Journal of Food Protection and Dairy, Food and Environmental Sanitation* and membership brochures. (If you can estimate the number of attendees, that is helpful also).

Along these lines, have you considered changing your meeting dates to put them closer to the weekend? This isn't just a selfish request on our part (although a Saturday night stay makes flying much cheaper), it might help your attendance. Many groups have found that a Friday/Saturday or a Sunday/Monday meeting works very well for them.

A couple of things go into this:

- 1) hotels can often give you better room rates because weekends are usually slow times for them;
- 2) employers are more likely to permit employees to attend where the employee is "giving" a day of his/her time; and 3) employers look favorably on the productivity aspect i.e. the week is more productive if it is not broken by the employee being gone for a couple of days in the middle of the week.

The mark of a successful meeting is how well it meets the needs of the attendees. Holding the meeting in a warm, sunny, luxurious location is nice, but the real draw is the program. Are the topics

those that are of interest to the attendees? Are the speakers able to get their message across? Will the learning experience help the attendees do a better job and/or live a happier, more fulfilled life?

As you do your planning, keep up the good work. I am amazed at the quality and diversity of the programming I see. It's too bad each and everyone of you can't attend all the meetings we do. I guarantee that you would be a better person for it. I know I am.

Attending 15-20 affiliate meeting each year, Dee and I have amassed a rather lengthy list of topics and speakers, which we'd be happy to share with your affiliate. Just give us a call. It would be our pleasure to be able to help your affiliate put on a better meeting.

**If you want an IAMFES officer or
Staff person to speak at your meeting,
just ask. The Sooner, the Better!**

Thoughts From the President . . .

By
Bob Sanders
IAMFES President



It seems only last week that I sat down to write the previous column. Things have been rather hectic around the office these past few weeks. What with getting ready for the upcoming National Conference on Interstate Milk Shipments, the animal drug in dairy products issues and the going's on with IAMFES business.

Plans are progressing very smoothly for the annual meeting. Next month's issue of *Dairy, Food and Environmental Sanitation* will contain a preliminary copy of the program. Pending enough people signing up, the workshop on "Investigation of Foodborne Disease Outbreaks" will be held on Friday, July 28th and Saturday, July 29th. The program committee has already received requests from 12 individuals for space to display posters at the Wednesday "Poster Session." Another new innovation at this year's annual meeting will be a "Video Theater" presentation. (This will be a preview of video and slide presentations to use as educational and training aids.) Many of these will come from our own IAMFES lending library. You will be able to drop in on Wednesday from 8:00 a.m. till 5:00 p.m. and have an opportunity to view the training films and other visual aids that are available from the lending library. Additional material will be available on a wide range of topics. Past President Bob Gravani has agreed to organize this phase of the program. I am sure Bob will do an excellent job and make this "Video Theater" another successful venture.

By the time that you receive this issue, the IAMFES Executive Board will have held our spring meeting. This will be at the Galt House Hotel and will give the board an opportunity to review the facilities of the hotel, meet with Dale Marcum, the Chairman of the Local Arrangements Committee, and finalize the plans for the July meeting. Also we will handle all of the other details that are necessary to keep our organization running smoothly from month to month.

The number of papers that are being presented for publication in the *Journal of Food Protection* has been slowly dropping over the past few years. If we are going to maintain our status as the outstanding publication on food protection, we must continue to recruit excellent research articles for publication. I would encourage all of the University and College professors to continue to be on the lookout for good papers for publication in the journal. All papers should be submitted to Dr. Lloyd Bullerman, Editor of the Journal. Instructions for authors were published in the January issue of the *Journal of Food Protection*.

As long as I am on the subject of articles, we can always use additional articles for *Dairy, Food and Environmental Sanitation*. Send these articles to Margie Marble at the Ames office.

Don't forget to cast your ballot for the candidate of your choice for IAMFES Secretary. Also fill in the ballot for your opinion about the name change.

See you next month with further details about this year's annual meeting.

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Industry Perspective on the BST Issue

How the Food Industry is Learning About the Development of a Widely Discussed Dairy Production Aid

Dennis L. Erpelding, Industry Affairs Associate

Elanco Products Company, A Division of Eli Lilly and Company, Lilly Corporate Center, Indianapolis, IN 46285

Researchers discovered during the 1930's that bovine somatotropin (BST), produced in a cow's pituitary gland, regulates milk production. For decades, that knowledge was of no practical value, since many cows had to be slaughtered to provide enough BST to supplement a single other animal. Recent tests have shown that cows whose natural BST was supplemented would yield significantly more milk during the period when supplemental BST is received.

The advent of recombinant DNA technology gives us the opportunity to employ that knowledge about BST and greatly improve the efficiency of dairy farming. The gene responsible for natural BST production in dairy cows has been isolated and can be transferred to ordinary bacteria cells. The bacteria are used to produce large quantities of BST through standard fermentation techniques. We use exactly the same process to produce human insulin for diabetics and human somatotropin to treat dwarfism. This technology has been in practical use since the early 1980's.

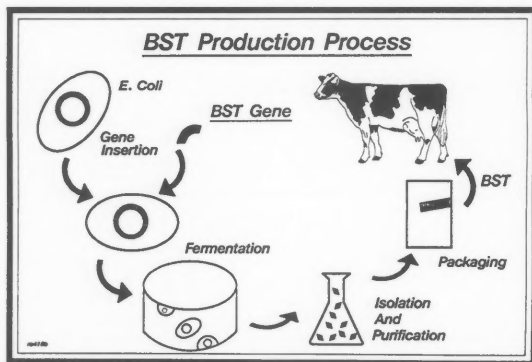


Figure 1. BST Production Process Illustration.

BST Is Safe and Does Not Change The Milk

The BST we produce is biologically identical to that produced in the cow. As a result, there is no change in the quality, safety, or nutritional value of the milk produced by a cow receiving supplementary BST. And we have known for many years that BST is inactive in humans, whether when ingested as food or injected. Attempts in the 1950's

to treat human dwarfism with massive injections of BST had no effect whatsoever on the subjects. In the early 1980's, Eli Lilly and Company and other animal health care companies began developing commercial versions of supplemental BST. The federal Food and Drug Administration (FDA) began the years-long task of reviewing test data to determine whether supplemental BST is safe for cows. Based on the long-standing knowledge of BST's safety for humans, the FDA, early on (1984), allowed milk and meat from test herds to be marketed.

Special Interest Groups Oppose BST

According to recent news media accounts, the FDA has indicated it will likely be sometime during 1991 before any BST products will be approved for commercial use in dairy cows. But opposition to this important new dairy management tool has arisen from groups which — despite their frequent lack of basic scientific knowledge — are determined that society should not benefit from this application of biotechnology.

These forces have resorted to a campaign of distortions which plays on the very limited scientific understanding found — unfortunately — among most Americans. They make unsupportable charges that BST's effects on human health are either unknown or detrimental, ignoring the fact the FDA has determined that milk and meat from BST treated cows are safe for human consumption. They portray BST as some sort of mysterious "additive" to milk, when in fact BST is never put into the milk; it is put into the cow and has no direct connection with the milk. The opposition groups don't like to recognize that BST simply involves supplementation of a natural process in the cow, with no effect on the milk itself.

The animal health care industry recognizes the threat posed by the anti-biotechnologists, not just to BST, but to all scientific advancement. If one new product can be barred from the market without regard for its scientific merits, we are just a few steps from bringing biotechnological progress to a halt. What a tragedy that would be for the millions who look to science to find cures for life-threatening diseases and for all of us who benefit from progress.

Our animal health industry is engaged in a cooperative effort with the scientific community to show Americans why

researchers must be permitted to conduct orderly, well-regulated studies, and why business must be able to bring into the market safe, FDA approved products.

We are working with the food industry — from the farmer to the processor to the retailer at the corner store. We know that you understand the critical role technology already plays in your ability to assure consumers of safe and abundant food supplies. Had opponents of new technology had their way in past decades, we might never have benefited from pasteurization, freeze-drying, vitamin and mineral fortification or dozens of other technological advances. Today, those advances are used routinely in food production and processing.

We All Benefit From Improved Technology

Improvements in milk production technology, specifically, have made it possible for consumers to spend progressively less of their food budget on dairy products — without diminishing the profitability of the family dairy farm.

Fig. 2 reflects the impact of technologies such as artificial insemination, improved feeding practices, and computerized record-keeping on milk prices. Technology adoption has enabled us as consumers to pay about \$2 per gallon for milk, rather than \$4 per gallon, which we would pay if dairy farmers were reliant solely on 1950's technology. In 1988, these technologies saved consumers about \$12 billion on their purchases of dairy products.

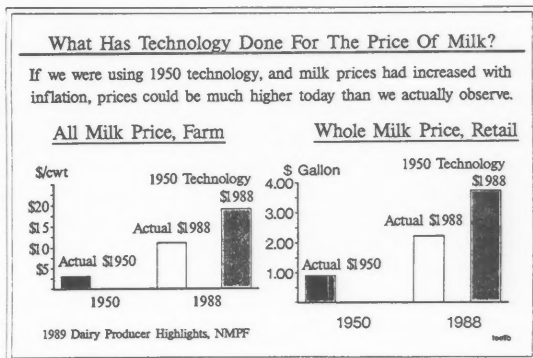


Figure 2. What has Technology Done for the Price of Milk

We Can Work For Understanding

We all recognize that your individual role of providing the items on grocery shelves means consumers will turn to you with their questions about BST and other biotechnology products used in food production. It is critical that you understand the science of BST — one of the first major biotechnology products under development for use in the food chain. We want to provide you with credible sources in the scientific community who can help you help consumers understand the vital role that science plays and must continue to play in the food industry.

Thanks to scientific advancement, Americans enjoy the safest, highest quality food supply in the world. Improvements in milk production technology over the years have enabled consumers to spend progressively less of their food budget on dairy products, without diminishing the profitabil-

ity of the family dairy farm. BST is just another new management tool which the farmer can apply to produce the same high-quality milk more efficiently.

It is critical that those of us involved in developing new technologies support three important goals:

1. We must protect the nation's scientifically based regulatory process from manipulation by special interest groups.
2. Our free markets must continue as the *sole* arbiters of the success of new products deemed safe and effective by the regulators.
3. The U.S. must remain committed to innovation which has provided Americans with an array of safe, nutritious and affordable food products.

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Biotechnology is Influencing The Dairy Industry

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Call it what you like - biotechnology, genetic engineering, recombinant DNA technology, or genetic manipulation - this rapidly expanding science is influencing many facets of our lives. The food industry, including the dairy industry, is no exception. On the dairy farm and in the dairy foods processing plant, the influence of biotechnology is in evidence and will become more so in coming years. On March 23, 1990, the Food and Drug Administration (FDA) approved for use, the first food ingredient manufactured using genetic engineering technologies (1). This food ingredient, identical to the ingredient produced naturally in the stomach of young calves, is a milk coagulating compound used to help make most types of cheese.

Biotech Products For The Dairy Industry

On the dairy farm, the growth promoting protein called bovine somatotropin or BST, a genetically engineered product still awaiting FDA approval, will be used by some dairy farmers, when it is approved, to stimulate more milk production from their dairy herd. BST is somewhat controversial because of some people's concern that BST will speed up the rate of the loss of the family farm due to not adopting this technology by small and/or family farms. Also some people are concerned that the use of this biotechnology product to stimulate more milk production in a market that traditionally has had surpluses, is not necessary.

An important ingredient used to make cheese is bacterial starter. Some of these bacteria are part of modern biotechnology. The specially selected bacteria are added to the cheese milk to ferment acid from the milk sugar called lactose. The acid produced by these bacteria are important in the manufacturing and curing of most cheeses. The objective of the biotechnology studies now underway is to make them more dependable in their acid producing ability and to make them resistant to bacteria virus, often called phage, that can slow or stop a bacterial culture during the critical early cheese making procedures (2).

Biotechnology Influences The Food Industry

The dairy industry is one of the leaders in the biotechnology revolution that we are experiencing. We now are seeing just the tip of the iceberg on how biotechnology will influence other important aspects of our lives like the medicines we use, the agriculture products available, and the food we eat. Food ingredients and food products, both new and old, no doubt will be more nutritious and better flavored,

as well as safer, as they are influenced by modern biotechnology. Already the cereals, dairy, brewing, meat, fruit, and confectionery portions of the food industry have been influenced by modern biotechnology.

But there is much more to come. A major impact will be made on food safety and quality as foods will be made resistant to insects and microorganisms responsible for spoilage and foodborne illness. Rapid tests, produced by biotechnology, for food pathogen detection are and will become more prevalent for use by food producers, processors and in the food service industry as well as consumers. Hopefully this will enable us to avoid most of the 10 million cases of foodborne illness that now occur each year in the United States.

The Cheese Industry and The Milk Coagulator

The use of a coagulator is an important part of making cheese. Application of biotechnology techniques have developed a unique source of a milk coagulator. Milk protein, composed mostly of a special protein called casein, is coagulated by the addition of a proteolytic enzyme called rennet that changes the chemical structure of the proteins. Rennet is a generic term for any milk coagulant. For many years, the coagulator of choice of the cheese industry has been calf rennet. This is because of calf rennet's ability for good cheese yield from milk and because of the good flavor development in cured cheeses.

Calf rennet comes from the stomach of a butchered milk drinking calf. The milk protein coagulating enzyme that is extracted from the calf's stomach is called chymosin. It is the primary enzyme in calf rennet, comprising 92 to 95 % of the enzyme content of the 4th stomach of each calf. The proteolytic action of chymosin is very specific on the casein portion of milk protein. Casein is changed chemically by this enzyme to a less soluble form of casein called para-casein within 30 minutes after a dilute solution of the coagulator is added to the 85-90 F milk to be made into cheese (2). When the milk gels during this time, the milkfat and other milk constituents are trapped in this gel forming the cheese curds. After the gel is cut with wire knives into about 1/4 inch cubes, stirred and heated, much of the water, milk sugar (lactose), and the whey proteins (albumin and globulin) are expelled from the curd cubes. This whey is then drained from the cheese curds and stored until the whey can be further processed.

Calf Rennet and Cheese Production

The supply of natural rennet began to decline several years ago, world wide, as the market supply of milk fed calves for slaughter decreased. This situation led to a very tight supply of young calf stomachs. During this same time, cheese consumption per person in the United States (3) has shown a steady increase as consumer's food tastes became more sophisticated and incomes for many people were on the rise. Cured cheese consumption data show that we consume about 25 pounds a year compared to 14 pounds in 1979.

Currently one half of Iowa's 4 billion pound annual milk crop is used to make cured cheese like Cheddar, Swiss, Blue and Italian types. In 1970, 21% of the Iowa milk crop was made into cheese and only 7% in 1960. In the United States, 30% of the total milk crop of 145 billion pounds is used to make cured types of cheese in 1989 with only 10% in 1960 (4). This demand for good quality cheese and the world wide shortage of calf stomachs strained the supply of this top quality milk coagulator causing the world supply of calf rennet, worth \$100 million annually, to continue to decline. In the United States, 60% of the cheese manufactured incorporates imported calf rennet.

Biotechnology Involves The Dairy Industry

In March 1990, FDA approved biotechnology produced chymosin as Generally Recognized As Safe (GRAS) as a food additive. In the near future, the shortage of a top quality coagulator should be alleviated because of this biotechnology breakthrough. This genetically engineered chymosin is to be called chymosin preparation, according to the FDA (1). Chymosin preparation, according to the FDA, is a clear solution containing the active enzyme chymosin, derived via fermentation from a non-pathogenic and non-toxicogenic strain of *Escherichia coli* K-12. This genetically altered bacteria contains the inserted and desired prochymosin gene.

The 1990 FDA GRAS approval came on a 1988 petition filed by Pfizer Central Research. The research on this project was conducted by Pfizer under the National Institute of Health guidelines for recombinant DNA research (5).

The FDA regulation approving chymosin as GRAS provides further that the prochymosin (the inactive form of chymosin) isolated from *E. coli* K-12 bacteria cells as an insoluble aggregate that is acid-treated to destroy residual bacteria cellular material and, after becoming soluble, is acid-treated to form chymosin, the active form of the enzyme. FDA concluded "that the chymosin enzyme in chymosin preparation is the same as the chymosin enzyme in calf rennet" and "the chymosin enzyme in chymosin preparation is as safe as the chymosin enzyme in rennet". Also it has the same molecular weight and the same functional activities as the chymosin derived from calves. FDA concluded that the chymosin preparation "will not contain DNA encoding resistance to antibiotics at levels that would provide any safety concern" (1).

Microbial produced chymosin and calf stomach chymosin are structurally and functionally identical. The protein in the fermentation produced chymosin has the same molecular mass, isoelectric points, UV spectrum, and antisera binding capacity. Amino acid sequences and peptide fragment "maps"

are identical. The bacteria cloned with the chymosin gene is food safe. The cloned chymosin according to the FDA "was found to clot milk at the same rate as the chymosin rennet under various temperature, salt concentrations, and pH conditions" (1).

Due to the shortage of calf stomachs and the economic value of cheese rennet, calf chymosin was one of the first mammalian enzymes of which cloning in microorganisms was carried out. These studies began in the early 1980's (6-12). Research using the following microorganisms was conducted; *Kluyveromyces* (13), *Yarrowia* (14), *Saccharomyces* (15), *Aspergillus* (16) and *E. coli* (17).

The gene that produces the chymosin enzyme in a calf stomach was isolated and the gene transplanted into the above microorganisms. *E. coli* K-12 proved the most successful producer of chymosin that is identical to that produced in the calf stomach. Chymosin is mass produced by the metabolic fermentation by this modified bacteria.

Other companies have petitioned the FDA for approval of their unique methods of producing chymosin from genetically modified microorganisms. To date, none of these methods and products have been approved for use as a food additive for making cheese (1).

So hang on to your hat and enjoy the ride. The biotechnology era is well under way and the prospects for better quality safe food are great.

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Comparison of Petrifilm™ Test Kit-L and Standard Cultural Methods for Determining General Sanitation Condition of Fast Food Freezers by Sampling Milk Shakes

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The Pennsylvania Department of Agriculture and regulatory agencies in other states have been concerned about the high numbers of licensed food service operations which produced milk shake samples from freezers which did not meet quality standards. For the past three years, shakes have been purchased from fast outlets in consumer containers with a lid, stored in iced, insulated cases and tested within 24 hours of purchase. Results from the first two years showed that from 32% to 40% of samples were free of coliforms, and mix handling and freezer sanitation would seem to have been excellent. However, there was concern about the 40% to 51% of samples which exceeded the maximum permitted coliform count of 10 per ml. allowed in Pennsylvania in 1988 and 1989, respectively. In 1988 only 30%, and in 1989, 25% of samples had exceeded the maximum Standard Plate Count of 50,000 per ml. for 194 and 475 samples, respectively, which had been purchased throughout the state.

The interest was how could the situation be improved. One way will be a videotape on handling mix and freezer sanitation to be available by spring 1991, directed at employees on what to do and why. To assist more than 4,000 freezer license holders, exclusive of the new soft serve yogurt ones, a simple test was needed which could be performed without laboratory facilities. We became aware of the Petrifilm Test Kit-L which seemed to possibly fill this need.

The Petrifilm Test Kit-L contains Petrifilm E. coli Count plates and Petrifilm Aerobic Count Plates, 9 ml. buffer pouches to dilute the samples, and disposable pipets. Directions to make appropriate serial dilutions and to plate them on the Petrifilm plates are included with the kit. Thus monitoring of sanitation in fast food operations could be done on site and without access to a laboratory. Earlier studies compared incubation at room temperature with those

held in a shirt or blouse pocket. In both cases, the Petrifilm Test Kit was able to identify the shake or soft serve freezers with obvious sanitation problems.

A final comparison of 96 samples with simultaneous performing of standard cultural method plating and Petrifilm procedures gave results when incubated at 32 C, which pinpointed most of the grossly contaminated mix in most freezer barrels. A 1:10 dilution was plated on the Petrifilm E. coli plate and a 1:1 dilution was made and 10 ml. of this dilution was divided into three petri plates. Thus, coliform counts of less than 10 per ml. could not be detected by the Petrifilm plate. This seemed to account for most of the variation between the standard cultural plating method and the Petrifilm Kit methods.

Coliform counts of 10 colonies or less by the standard cultural plating method were 55% versus 68% by the Petrifilm Kit method. Coliform counts above 10 per ml. were 45% and 32%, respectively. Numerical categories failed to show those samples with colony numbers just below or just above 10. Presumptive colonies on the Violet Red Bile Agar plates were not confirmed, but were assumed to be contaminants. Coliform colonies on Petrifilm plates were distinguished by the association of a gas bubble produced by the fermentation of lactose. Both colonies associated with gas and those without were counted on the Petrifilm plates. The agar plate does not distinguish gas producers from non-gas producers and no confirmatory tests were performed. This could account for differences between the results of a field test procedure and the standard cultural method always performed in a laboratory. The purpose was to find a procedure which could be performed on site in the fast food operation which separated good sanitation from grossly contaminated mix in freezers.

Standard Plate Counts performed by the Petri dish and Petrifilm Kit procedures appeared very similar. There were some differences in the < 100 per ml. and the 10,000 to 50,000 per ml. categories. These differences were for Petridish and Petrifilm for each of the two ranges, 3.1% vs. 10.4% and 24% vs 15.6%, respectively.

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Colony numbers and percentages would not seem to be significant when the purpose was to determine which freezers were of relatively good sanitation and which had received little or no sanitary care for one or more days. Petrifilm Test Kit L performed with the single service, sterile equipment seems to be very adequate for indentifying freezers which are not of good sanitary condition by testing a sample of mix on the premises. Similar uses would seem to offer opportunities for determining the quality of good

versus grossly contaminated food or equipment surfaces in any food service operation. Because freezers normally contain product during any reasonable work day, a visual inspection is not possible. The use of Petrifilm Test Kit L for coliforms and total aerobic count seems to offer the best available means of assessing the quality of shakes, soft serve, soft serve yogurts of other food products.

Test Kits were supplied by 3M™ Microbiology Products, St. Paul, MN. Petrifilm is a trademark of 3M™.

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Bovine Somatotropin: An Overview

Nolan R. Hartwig, DVM, Extension Veterinarian

Introduction

Bovine somatotropin (bST), or bovine growth hormone, is a natural substance produced by the pituitary gland, a small structure at the base of the brain. Growth hormone is produced in all species of animals and is important for growth, development, and other body functions. In the 1930's, it was discovered that injection of bST into lactating cows resulted in a significant increase in milk production.

Until recently, the only source of bST was from the pituitary gland of slaughtered cattle. Only small, expensive quantities were available. The advent of biotechnology led to the isolation of the gene that "codes" for, or controls the production of bST. Scientists, using a technique known as recombinant DNA technology, removed the gene from the nucleus of bovine pituitary gland cells and inserted it into the bacterium *Escherichia coli*. These genetically altered bacteria are then grown in artificial media and produce large amounts of bST which is then purified and injected into cattle. Similar recombinant DNA technology is used to produce several approved drugs, including insulin for treatment of diabetes and tissue plasminogen activator (TPA) for treatment of coronary thrombosis (heart attack) in man.

In agriculture, biotechnology has often been viewed as either a panacea for curing most problems, including the elimination of world hunger, or damned as a threat to the environment and the economic viability of the family farm¹. The potential licensure of bST for commercial use in dairy cattle has been controversial and has stirred heated debate by the dairy industry, activist groups, politicians, and consumers. Four commercial companies are in the process of submitting data to the Food and Drug Administration (FDA) for approval to use bST in dairy cows to increase milk production.

Effects on Production

Since bST is a complex protein, it is immediately broken down into small, inactive amino acids and peptides when ingested. bST must be given by injection on a regular basis, similar to insulin in people who suffer from diabetes. Commercial bST products will be administered by this route. The frequency of injection will depend on the formulation of sustained release products.

Milk yields are significantly increased when cows are treated with bST, although not as much as some reports in the popular press have indicated. All of the precise mechanisms for increasing milk production are not known, but blood flow is increased to the mammary gland, resulting in an increased availability of nutrients available for milk

production. There is also an increased extraction of non-esterified fatty acids by the mammary gland, which increases efficiency of milk production. Feed efficiency (pounds of milk produced per pound of feed consumed) is improved because more milk is produced and the proportion of feed used for body maintenance is decreased. There is an increase in absolute feed intake by bST treated cows, however. Milk yield increases from 2.2 to 5.2 kg (4.8 to 11.2 pounds) per day and feed efficiency improves from 2.7 to 9.3%². Table 1 summarizes trials in several states and foreign countries (32 week treatment):

Table 1. Increases in Milk Production and Feed Efficiency of bST Treated Cows²

Location	Increase in Milk Yield (%)	Increase in Feed Efficiency (%)
Arizona	8.3	2.7
Cornell University	11.5	5.3
Missouri/Monsanto	21.8	8.2
Utah/Utah State U.	14.6	5.3
France	17.8	9.3
Germany	16.6	4.9
Netherlands	18.5	7.6
United Kingdom	19.2	5.4

Galligar and Chalupa summarized several trials and found a production increase of 3.8 kg (8.36 pounds)³. They estimated that, depending on management capabilities, responses in treated cows are expected to range from 8.5 to 17.6%. Grain used to meet the needs for this increased production would increase from 10 to 30% and forage consumption would increase from 0.6 to 10.5%. Milk yield gradually increases for the first few days after treatment begins, and maximum increase is seen in about 6 days.

Normally, cows reach peak production a few weeks after lactation begins. Production then slowly declines throughout the remainder of lactation. The ability of cows to maintain relatively high levels of production throughout lactation is referred to as persistency. The major response of cows treated with bST is a significant improvement in persistency. There is a marked reduction in the normal decline in milk yield as lactation progresses. The response of treated cows in early lactation is fairly small³.

"Misinformation by groups that are antitechnology, against use of food animals, and those with a hidden agenda, tends to give the impression that controversy exists concerning the biology of somatotropin. Eight hundred reports on 20,000 treated cows have yielded remarkably consistent results worldwide"³.

It is difficult to predict the response of individual cows to bST. Quality of management, including health programs, milking practices, nutrition, cow condition, and environmental conditions will be the major factors in the response to bST. Cows show a slightly higher response when treatment is started at day 101 of lactation rather than days 57-100. Multiparous cows show a greater response than first lactation heifers².

Effects on Cow Health

The physiological effects of bST treatment are the same as those seen in any high producing cow. The management changes instituted by producers in anticipation of using bST will probably cause a greater increase in milk production, efficiency, and profitability than actual use of the drug⁴. In the initial stages of use, producers will be encouraged to begin use of bST on cows at least 100 days into lactation, in good physical condition, and free from health problems such as mastitis or infertility. Concern has been expressed regarding the effect of bST on reproduction. The optimum calving interval of 12-13 months may lengthen due to bST altering the shape of the lactation curve.

DHIA records show that higher producing herds have lower conception rates than low producing herds⁵. This negative effect on calving rate is seen in cows treated with bST and is consistent with the increase in production. Effect on reproduction is affected by condition, nutritional status, and health, as well as by dosage of bST. Few studies have investigated the physiological effects of bST on ovarian and pituitary function. Cows on a high dosage of bST show an increase in length of estrous and reduced activity when in heat. This effect is not seen on low to average dosages of the drug. High dosages of bST (50 mg/day) are reported to increase embryonic death, and initiation of treatment during early pregnancy should probably be avoided⁵.

Eight studies show no association with increased mammary infections⁵. Overall, 13% of control cows and 15% of bST treated cows had mastitis. Gestation length, calf birth weight, calf viability, and calf growth have not been influenced by using the drug. Some early reports indicated an increased incidence of twins, but later trials contradicted this.

Many health problems of dairy cows are associated with calving and rebreeding, so that an increased calving interval in treated cows could benefit the health status of treated cows.

Milk Composition and Safety

Consumer advocates and others have expressed concern regarding the safety of milk from bST treated cows. The characteristics of milk from bST treated cows is within the normal range of variation of milk from untreated cows.

All milk contains natural bST that is produced by the cow. Milk from treated cows also contains small amounts of bST. Since the hormone is a protein, it is immediately broken down into inactive amino acids and peptides in the digestive tract when consumed. Steroid hormones such as estrogens, progesterone, and anabolic steroids taken illegally by athletes are smaller, ring-like structures that are absorbed from the digestive tract and are biologically active in man.

This is not the case with bST, whether produced naturally by the cow or by recombinant DNA technology³.

Bovine somatotropin is inactive in man, even when injected. During the 1950's, natural bovine somatotropin was injected into children with growth defects and found to be biologically inactive. The bovine somatotropin protein molecule differs from human somatotropin by about 30% of the amino acid sequences. There are four forms of natural bST and each has either 190 or 191 amino acids. Recombinant bST injected into cows has 191 amino acids. One company's product differs by only one amino acid on the end of this chain. The biological inactivity of bST in man and the fact that it is completely degraded in the digestive process means that the small amount of recombinant bST in milk from treated cows is inactive in man.

Milk composition from bST treated cows has been thoroughly investigated⁶. During the first 28 days of treatment, milk fat increases and milk protein decreases slightly. After longer treatment, cows adjust intake and the normal balance is re-established. An increase in non-protein nitrogen and whey protein and a decrease in casein has been observed after long-term bST administration. This difference is not always statistically significant, and the effect on cheese yield would probably be minor, if any. One study showed a slight increase in unsaturated vs. saturated fat. The difference was small but tended toward a more healthful product. No differences in free fatty acids have been observed. No differences in flavor tests have been found. There is possibly a slight increase in cholesterol but it is within the range for normal milk. Insulin-like growth factor I increases by up to two-fold in milk from treated cows but is still well within the range for both bovine and human milk.

Economics

The ultimate economic effect of bST approval and use on the family dairy farm has generated heated debate. The Animal Health Institute, a consortium of drug and vaccine manufacturers, maintains that use of the product will be of equal value to any size farm¹. They contend that use of the product will favor the good dairy manager, regardless of farm size.

Estimates of the effect of bST on dairy production have probably been exaggerated. The USDA estimates that the use of bST could lead to a 2 to 5% increase in national milk production within five years, or about the increase seen every year without the use of bST.

In most dairy herds, the product will not be used in cows prior to about 100 days of lactation. It will not be used in cows with chronic low level disease, fertility problems, and usage may be somewhat less in heifers than adult cows. If 50% of farmers adopt the technology and it is used in 60% of lactation days per user herd, milk production will increase by about 3 1/2%, assuming an average per cow production increase of 15%. Most well managed herds increase per cow production more than this with improved management and genetics on an annual basis. A thorough herd analysis by a competent nutritionist and veterinarian and timely implementation of resulting recommendations will result in a larger increase than use of bST in most herds⁴.

Failure to adopt proven technology is a problem

throughout the dairy industry. Almost 50% of cow breedings in Iowa are to natural service, rather than artificial insemination from proven sires with superior genetic performance. Only 45% of Iowa dairy producers use DHIA management information and records to improve production⁷.

The government milk price support system makes prediction of the effect of bST on milk prices difficult to predict. It is true, however, that efficient managers in areas of the country with higher milk prices benefit more from application of technology and increased production. The present price support system would tend to work to the disadvantage of producers in the upper Midwest, although the degree of this effect is unknown.

It can be argued that the large commercial dairy operation can institute use of bST more easily, rapidly, and efficiently than smaller operations. Sophisticated record keeping and division of labor may make timely injection of cows more feasible. Demands on the labor and management skills of diversified farming operations typical of Midwest dairy producers may make newer technology more difficult to implement.

Others argue that smaller producers with direct owner control of the herd can actually manage individual cows better and will see a greater production increase from use of bST. It is not automatically true that larger herds are better managed and will therefore benefit more from use of bST.

There is no question, however, that if the consumer loses confidence in the quality of milk, whether the reasons are logical or not, consumption and prices will fall. This is a major concern of many dairy producers. The best that can be said about bST is that it is neutral concerning milk quality.

FDA Approval

The Food and Drug Administration has not licensed bST for use in dairy herds. They have, however, approved the consumption of milk and meat from treated animals. Such approval is often granted during the process of license approval of animal drugs. Milk from treated cows has been deemed safe because bST is biologically inactive in man and is a protein hormone which is digested and enzymatically destroyed when consumed. Each sponsor (company seeking approval for bST) has to demonstrate zero activity in milk when ingested. No withholding period following treatment of cows with bST is required. Some fat changes occur during the first few weeks of treatment but this returns to normal. This change is within the normal variation of milkfat. Nutritional and processing qualities are not significantly altered.

"The FDA has found no pertinent information indicating that food derived from bST treated cows is unsafe⁸."

Effectiveness must be demonstrated in expected use conditions before a product can be approved. This must be done in a minimum of 3 geographic locations. Fifty cows per herd were required for bST approval.

Three dosages of the drug were used for titration studies. Use of the drug was initiated at various times during the lactation period. The efficacy and safety for the first and later lactations is monitored. Milk yield was calculated on a 3.5% fat corrected basis. Composition variables including

fat, crude protein, lactose, calcium, and phosphorus are measured about once per week. Daily feed intake was measured in several of the test herds. Body condition and health were monitored throughout the studies. The effect of bST treatment on reproduction, including estrous cycles, conception rates, number of breedings per conception, length of time from parturition to conception, abortions, incidence of twinning, calving difficulties, stillbirths; weight, growth, and health of calves during the first four weeks of life were all monitored. Monthly somatic cell counts, as a measure of mastitis, was required. Injection sites were monitored for any signs of adverse reactions.

To monitor safety, 1, 3, and 5 times expected use level was required for two consecutive lactations in one herd from each investigator. Heifers born to treated cows were raised through breeding age and monitored for abnormalities. Investigators were also required to prove that use of bST was not harmful to the environment.

The quality control of bST used in the trials was monitored and all protocols for investigation were approved before the trials were run. The majority of the trials used in the approval process were done by independent scientists at university laboratories and farms or using commercial herds. FDA rulings on the approval process are expected within a year, pending completion and review of all trials.

Federal law prohibits the social and economic need for a drug to enter into FDA's approval decision. It is the policy of the federal government that producers can decide whether a product is economical or useful, as long as the product is safe, pure, potent, and effective. Approval does not mean that a product must be used, but only that it can be if desired.

Controversies Concerning use of bST

The most intense controversy surrounding possible approval of bST for use in dairy cows has occurred in Wisconsin, Minnesota, and Vermont. In Minnesota and Wisconsin, a one year moratorium on the use of bST was passed by the respective state legislatures. This moratorium expires in the summer of 1991.

Some producers fear that advancing technology will outpace them and they will suffer economically as a result. Others feel that a product such as bST will work to the disadvantage of producers in the Great Lake States and the Northeast. Natural resistance to advancing technology and a fear of the new biotechnology causes some to resist the approval and use of bST. Activist groups with a variety of agendas and motives have addressed the issue. Some have stated that milk from treated cows may not be safe after all and more testing is needed, others see this as a scare tactic to delay or block the approval process and undermine consumer confidence in milk if the product is approved. Some animal rights groups see the use of animals for food, under any circumstances, as inhumane or a violation of those animal's "rights". Others have stated that cows have a right not to be injected with bST.

Other opposing arguments state that the FDA does no independent testing of its own but only monitors the investigators studies. The persistent oversupply of milk and dairy products has also been listed as a reason not to approve use of bST. Some dairy farmers opposed the use of bST but feel

they would have no choice but to use the product in their own herd in order to remain competitive if it came into general use⁹.

Stanton and Novalovic have listed arguments for and against approval of bST in the categories of food safety and the effect on the number and size of farms¹⁰:

Food Safety

Arguments for approval of bST:

1. Safety is not an issue. BST is naturally present in milk, and any recombinant bST present would be broken down in the digestive process.
2. The FDA approval process can be trusted.
3. Consumers will be reassured when they get the complete story of safety of milk from treated cows.
4. Improved efficiency of production will reduce prices.
5. Milk consumption will increase when prices decline.
6. Decreased prices will be an advantage for low income families.
7. Some consumers will prefer "organic" (non-bST treated) milk. Marketers could sell such an "organic" product.

Arguments against approval:

1. Can we really be sure that milk from bST treated cows is safe? Do we really know all we need to know?
2. The FDA is understaffed and over-worked. Their credibility is not high.
3. We won't see lower milk prices. Farm prices from 1981-1998 fell 11%, but retail food prices increased 11% over the same period.
4. Dairy product consumption at best will be unaffected, and more likely will be hurt by approval of bST.
5. Scientists don't really know what sells dairy products.
6. Organizations will work hard to convince consumers that bST is bad.
7. Moratoria imposed by some states will make consumers more wary.
8. Consumers won't believe the chemical companies and FDA when they refute negative campaigns.
9. The dairy industry can't afford to stake everything on what some people say is scientific truth.

Effects on number and size of farms

Arguments for approval:

1. bST is size neutral.
2. Careful management may give an advantage to small farms.
3. Those who implement bST effectively soon after approval will have an advantage.
4. Saying that small farms can't handle this technology is wrong.
5. Farm size has been increasing and number of dairy farms has been decreasing for years. This will occur with or without approval of bST.
6. bST will give smaller farms a chance to improve performance.
7. Manure and waste management will slow the switch

to large farms.

8. bST will assist farmers who are low cost producers, regardless of farm or herd size.

Arguments against approval:

1. Economies of scale work against the small producer.
2. Feed and forage is more difficult to produce on smaller farms.
3. Small farms will be pushed out faster. Farm buildings and other assets will be worth less as more producers are forced out of dairy production.
4. There will be a period of over-supply of milk.
5. In the Northeast and Midwest, fewer farms will result in decreased service and supplier support for remaining farms.
6. bST is one more thing to buy, one more risk to take.
7. Uncertainty increases risk. This works to the disadvantage of small farms.
8. The financial spread between small and large farms will get wider.
9. There is an adverse effect on the environment and quality of life when large farms are favored.

Summary

Approval and use of bST is highly controversial and will have a significant effect on research and development investment in biotechnology in agriculture by commercial firms. Universities will face the difficulty of presenting scientific information in a manner that both is and gives the appearance of being unbiased. An era of a direct challenge to technology itself is relatively new to most professional agriculturalists. Patience, tolerance, and understanding will be required by educators, extension workers, and other professionals in agriculture who work with groups that both support and oppose implementation of technology such as bST.

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Porcine Somatotropin: A Review

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What is it?

Porcine Somatotropin (PST) is a hormone produced by the pig's pituitary gland and is responsible for normal growth and muscle development. Hormone is a general term for a wide variety of substances that are normally found in the body, produced in glands, function as cell level messengers, and operate in different sites.

There are large differences in hormone structures. Insulin, a hormone most people are familiar with, functions to control blood sugar (glucose), and is involved in other body processes. Porcine somatotropin is a protein composed of 191 amino acids.

What does it do?

Injection of PST during the finishing phase of pig production essentially shifts the growth pattern from fat deposition to lean tissue deposition. Etherton (et al., 1986) demonstrated that growth responses in pigs were similar for PST prepared from pituitaries (pPST) or by recombinant techniques (rPST). Pigs treated with rPST have greater feed efficiency, significantly less fat, and more lean tissue than pigs not treated with rPST. Rate of gain was maximized with 4 mg, but feed intake, feed/gain ratio and fat depth decreased and loin eye area increased linearly as treatment increased from 0 to 8 mg rPST (Ivy et al., 1986).

Zimmerman's review (1989) summarized 20 trials in which pigs weighed more than 88 lbs. at the beginning of the trials and were fed diets containing 16 percent or more protein. Responses to rPST expressed as percentage improvements compared with controls were: daily gain +15.2%, feed/gain +21.1%, backfat thickness -24.8%, loin eye area +18.5%, muscle +9.9% and dressing percent -2.4%. Current research on lysine and protein requirements of pigs treated with rPST indicates that requirements vary depending on the pigs' potential for lean tissue growth (genotype and sex) and on rPST dosage. With corn-soybean meal diets, 4 mg rPST/day given to mixed barrows and gilts between 130 and 220 lbs., the non-specific nitrogen requirement is met by a 15 to 16 percent crude protein diet and the lysine requirement is at least 1 percent. Therefore, if all lysine is supplied by native proteins, a corn-soybean meal diet with 18 percent crude protein is required.

How does it work?

The simplified action of rPST in the pig works basically in two separate ways. One mechanism is that rPST directly affects fat tissue by promoting the breakdown of triglycer-

ides in the fat cell. At the same time, rPST in the blood stream causes the liver and muscles to make Somatomedin C. Somatomedin C (also referred to as insulin-like growth factor I; IGF-I) stimulates many metabolic responses. Two of the significant affects include an increase in blood glucose and a decrease in blood urea nitrogen. The increase in blood glucose occurs because less glucose is used in fat cells to make fat products, and the decrease in blood urea suggests a greater efficiency in protein (muscle) production and a decrease in the amount of protein being broken down.

How is it made?

In the 1930's, injections of crude extracts of pituitary glands were shown to increase growth rates of growing animals. There has been interest in administration of PST to pigs for some time. Turman and Andrews (1955) demonstrated that daily injections of three purified PST preparations improved the feed efficiency of pigs and increased the ratio of lean to fat in the carcass.

Through the use of genetic engineering techniques recombinant PST (rPST) is now available in large quantities. The gene that codes for production of PST has been spliced into the genetic makeup of bacteria. These bacteria, in turn, produce rPST. The bacteria are grown in a fermentation vat and produce the rPST in quantity. The rPST from the bacteria is extracted and purified for use in pigs.

Assessment of risk?

Risks are a part of anything a human being is involved with. Sometimes risks may be considered unacceptable to a person because of past experience. Often these risks are unacceptable because of a feeling of lack of control and the uncertainty of trusting a compound relatively unknown or not understood.

How can we be certain that rPST will be safe?

Fortunately, the concerns for safety of the somatotropins are minimal, since these peptides are digested in the gastrointestinal tract and are species specific (Apostolou, 1988). No one can absolutely guarantee that rPST will never cause any problems; however, rPST is not orally active because gastric and intestinal proteases such as pepsin, trypsin and chymotrypsin digest the protein molecule into its constituent amino acids. Somatotropins are species specific even when injected, except between primates where lowered responses can be observed. Recombinant PST is inactive in humans,

even when injected. Also, manufacturing processes and cooking may inactivate somatotropin. Relationship between somatotropin and IGF-I is being examined because of potential increased concentrations of IGF-I in the meat from pigs treated with rPST.

Regulatory procedures

Before rPST can be used in the United States, regulatory approval for on farm use must be obtained. The Food and Drug Administration (FDA) is responsible for the pre-marketing efficacy and safety evaluation and approval of new animal drugs and feed additives; for regulating their manufacture, sale and use; and for setting tolerances for residues permitted in food. Before a new animal drug may receive formal FDA approval, it must be tested for effectiveness and safety by the sponsor of the drug product. If the product is intended of use in a food-producing animal, data must be obtained which demonstrate that the edible animal products do not contain unsafe residues.

The industrialized nations of the world have agreed that products resulting from recombinant DNA technology should be regulated under the same policies and procedures currently applicable to other animal drugs. The process of biotechnology is regulated independently. The existing national regulatory processes are adequate to address the human food safety concerns of the somatotropins and related compounds (Anon, 1986).

Consumer acceptability and concern

The consumer holds the ultimate power in marketing. To a great extent, the public will dictate if producers will use rPST if pork is perceived to be wholesome and desirable. American consumers clearly and emphatically demand meat that fits in with their lifestyle demands. It must be lean, nutritious, and taste good (Kline, 1989).

Americans consume too much fat (NRC, 1988). Overconsumption of fat has been linked to a number of nutrition related health problems (NRC, 1988). Current recommendations from the American Heart Association, the American Cancer Society, the National Institutes of Health, the Surgeon General's report on nutrition, and the National Research Council advise individuals to limit their intake of total fat in the diet.

One of the most common methods of fat reduction in meat products is the trimming of external fat. Perhaps a more efficient method is the production of leaner animals (NRC, 1988).

Growth enhancers appear to have little, if any, effect on the fatty acid profiles of subcutaneous or intra-muscular fat. Thus no new concerns regarding health or processing should arise regarding fat composition of pigs treated with PST. Effective development of innovative technologies is difficult in societies where the credibility of the regulatory system is low or suspect (P. van der Wal 1989). The public, when unable to evaluate risk, evaluates the regulator. When not satisfied, ways will be found for rejecting the regulatory decisions. The regulatory authority is the only institution with enough highly qualified expertise to effectively interpret and implement rules for implementation of innovative technology. Objectivity and consistency in policy seem

essential for building public confidence and acceptance of regulatory decisions.

Certain regulatory concerns inevitably emerge from any new technological endeavor. With the development of the somatotropins and related compounds for food animal use, concerns relating to efficacy, animal safety and welfare, and environmental safety have been expressed.

Pork quality

Sensory panels and the Warner-Bratzler shear (an instrumental measure of texture) have been used to evaluate the effects of PST on pork quality. Porcine somatotropin has had no effect on the tenderness, juiciness and flavor of the loin eye muscle (Kanis et al., 1988; Novakofski, 1987; Prusa et al., 1989a). Although not all studies agree, it appears that new growth enhancer administration significantly reduces the intramuscular fat content of pork. Some reductions in sensory characteristics have been associated with growth enhancer use.

Skaggs (1989) found evidence that objective measures of muscle color and quality were improved with PST treatment of pigs with known heredity of pale, soft and exudative (PSE) pork.

Animal and environmental safety

Target animal safety and the environmental safety of the somatotropins and related compounds are being addressed in scientific studies. Currently, the influence of PST on the health of swine is not well documented. Chung et al. (1985) evaluated various chemistries and tissues samples for parameters indicative of health. They reported no harmful effects on the health of young, growing swine.

Gilts injected with porcine-somatotropin during the growing-finishing phase reached puberty at a similar age as untreated gilts and were equally fertile to the control group at breeding. Reproductive disorders have been observed when porcine growth hormone was given daily at, or immediately prior to, estrus and ovulation. Limited data suggest that the lactation curve can be altered and milk production increased in sows by administration of porcine somatotropin during the second to fourth week of lactation. Insufficient studies have been conducted to determine if changes in body composition in sows given rPST during lactation have any effects on postweaning reproductive performance.

The environmental effects of products produced by recombinant DNA technology are of considerable interest. It is possible that adverse effects could result from altering the genetic makeup of micro-organisms and allowing their inadvertent release into the environment. The concerns of responsible scientists and environmentalists are not to be dismissed since there are examples of unfavorable consequences resulting from organisms being introduced into new environments (e.g. multiflora rose, English sparrow, etc.).

Production cost impacts

The first step in determining the potential economic impacts of PST on a commercial producer is to compare the partial hog enterprise budget with and without the use of growth enhancers. Although this procedure doesn't account

for possible market adjustments (in terms of price changes as a consequence of supply adjustment) after the initial adoption, it provides insight into the economic effects on the first adopters.

Partial budgeting essentially transforms the technical changes into economic terms. Therefore, it is necessary to establish assumptions about the farm characteristics prior to adoption, and then incorporate the appropriate technical changes with the product use.

The initial hog production unit size is assumed to be 200 market hogs with a standard turnaround rate of three, and a non-feed cost per unit capacity of \$100 per hog (Table 1). The feed ration is a standard corn, soybean, vitamin-mineral supplement ration with 14 percent crude protein. The cost of each feed ingredient is based on each ingredient's respective average price from 1982 to mid-1989, multiplied by the quantity of the required ingredient. Labor is valued at \$6 per hour and .67 hours are required to finish a feeder pig.

Incorporating PST into the hog enterprise has three primary effects on production. In general, PST increases the rate of gain of the hog, reduces time on feed, and increases

Table 1. Assumptions for partial budgeting: PST vs. Control.

Item	Control	PST	Change
Days on feed:			
40-120 lbs.	56	56	0
120-240 lbs.	69	61	- 8 days
Total	125	117	- 8 days
Feed/gain:			
40-120 lbs.	2.68	2.68	0
120-240 lbs.	3.75	2.81	+25%
Daily Gain:			
120-240 lbs.	1.73	1.95	+13%
Crude Protein Requirements(%):			
120-240 lbs.	14%	17%	+03%
Feed Requirements (lbs):			
40-240 lbs.			
Corn	549	427	-122 lbs.
Soybean Meal	99	110	+11 lbs.
Premix	16.4	14.4	-2 lbs.
Feed Costs (\$):			
40-120 lbs.			
Corn	7.41	7.41	0
Soybean Meal	2.87	2.87	0
Premix	1.21	1.21	0
Total	11.49	11.49	0
Feed Costs (\$):			
Corn	15.55	10.08	-\$5.47
Soybean Meal	6.03	7.92	+\$1.89
Premix	2.53	1.90	-\$0.63
Total	24.11	19.90	-\$4.21
Dressing Percent	72	70	-2%
Live Market Price Factor	1.000	1.033	+3.3%
Facilities, Equipment & Machinery (\$100/3 groups/yr.):			
\$/hd.	33.33	31.75	-\$1.58
Feed Storage, Manure Handling & Tractor			
\$/hd.	19.00	19.00	0
Total Investment	52.33	50.75	-\$1.58
Interest, Taxes, Insurance & Depreciation at 13%			
\$/hd.	6.80	6.60	-\$0.20

the turn-around rate, increases feed efficiency, reduces total feed requirements, and increases the crude protein requirement to 17 percent, causing the ration composition to change. PST has its greatest impacts over the 120 pound to market stage of growth, which limits the economic impacts to the finishing phase.

However, a few intricacies from using PST must also be accounted for. First, the use of PST results in an increase in lean and a decrease in fat in the hog carcass. Therefore, it will, in general, be advantageous for the producer using PST to use carcass merit pricing.

According to Robert Kaufman's (1987) survey of packers' carcass merit pricing systems, a 35 percent reduction in backfat results in an increase in value of approximately 2.3 percent of the market price. In addition, if the carcass has a higher muscle content, the market price would increase by 1 percent.

Second, the purchase cost of PST is determined by comparing returns of adopters and nonadopters, and is priced at one-third the estimated net benefits. This is simply a rule-of-thumb pricing method often used for new products in the animal health product industry.

Table 1 provides a summary of the expected technical and cost changes used in developing the partial budget. The results of the partial budget analysis are shown in Table 2.

Table 2. Hog enterprise partial budget: PST vs. Control.

Item	Control	PST
INCOME		
Market Hog		
240#x\$.4804	115.30	
240#x\$.4804x1.033x.98		119.10
VARIABLE COSTS		
Feeder Pig (40 lbs.)	40.28	40.28
Interest at 11% (125 days)	1.52	(117 days) 1.42
Feed Costs (40-120 lbs.)		
Corn	7.41	7.41
Soybean Meal	2.87	2.87
Premix	1.21	1.21
Feed Costs (120-240 lbs.)		
Corn	15.55	10.08
Soybean Meal	6.03	7.92
Premix	2.53	1.90
Total Feed Costs	35.60	31.39
Vet. Med., Fuel Repairs, Utilities & Marketing		
\$/hd.	6.00	6.00
Interest at 11% on Feed & Other Costs		
\$/hd.	.71	.60
Growth Promotant	0.00	2.27
Labor	4.00	4.00
TOTAL VARIABLE COSTS	88.11	85.96
INCOME OVER VARIABLE COSTS	27.19	33.14
FIXED COSTS	6.80	6.60
TOTAL OF ALL COSTS	94.91	92.56
INCOME OVER ALL COSTS	20.39	26.54
KEY ASSUMPTIONS:		
•PST is priced on a 3:1 return to cost basis		
•No increased labor for PST usage as administration time is assumed to be offset by fewer days on feed.		
•Carcass merit pricing used to gain advantage from a leaner product.		

Economic effects on the pork industry

M. Hayenga and coworkers (1989) provided a comprehensive analysis of the impact of rPST on the pork industry. Their study attempts to account for all of the dynamic economic impacts of the introduction of rPST. However, it must be remembered that the results obtained from their study are limited by the assumptions used in the analysis, and by the limited availability of data on rPST.

The overwhelming impact of rPST is the reduction in cost combined with an increased lean yield per hog. The resulting greater profitability as producers adopt rPST causes production to increase rapidly. More pork production forces prices down at both the farm and retail levels. Due to the lower production costs, producers adopting rPST immediately read higher profits, but the industry as a whole realizes lower returns as the expanded production pushes down farm prices.

From a profitability perspective, there appears to be an incentive to pork producers to adopt the new technology due to the short term profit increases and the longer term competitive advantage of adopters compared to non-adopters in the pork industry. In addition, pork producers regain some of the ground lost to technological advances in poultry production over the last thirty years and become more viable competitors for the consumer's food dollar. Thus, higher production and lower price levels benefit processors and consumers, while late-adopters are on the "technological treadmill."

Aggregate pork producer profits change very little in the long run, as you would expect in a competitive industry with free entry. Feed grain producers are hurt while soybean producers are not affected.

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News

Iowa State University offers New Videos

A VHS video titled "The Bulk Milk Hauler - Protocol and Procedures" now is available from Iowa State University Extension. This training tape is a joint product of ISU Extension and the Iowa Department of Agriculture with assistance from Dairy Products Inspector John Hill. Production was done by Iowa State University Extension Communication Services.

This video is accompanied by a one page 3-fold brochure. This brochure explains the procedures the milk hauler should follow at the dairy farm and at the milk plant where the milk is unloaded. A check list of equipment and supplies the hauler needs in the truck prior to beginning the milk route is listed.

The nine minute video and brochure provides a training tool for recently hired milk haulers. It also serves as refresher training for the experienced hauler. The bulk milk hauler is a key person in the quality milk chain from farm to factory. This person represents not only him or herself but the dairy farmers on the milk route and the dairy processing plant that buys the milk.

Topics covered include: the procedures the milk hauler follows in evaluating the milk's quality on the farm and deciding whether or not to accept each farm's milk, determining the exact weight of milk in each farm bulk tank, and obtaining aseptically a representative milk sample at each dairy farm including the proper care of the milk samples. Training and retaining personnel involved in this important part of the dairy industry are critical factors influencing milk and dairy foods quality.

Provide an excellent training aid for your bulk milk haulers and purchase this VHS videotape and receive a copy of the brochure as well for \$35.60.

Personal hygiene and sanitation along with time and temperature control are the keys to food safety in any and all food service establishments. A new VHS video titled "Food Safety: For Goodness Sake, Keep Food Safe," available from Iowa State University, addresses these important factors in preventing foodborne illness.

This 15-minute video illustrates and describes the importance of good personal hygiene and sanitary practices for people working in food service, both commercial and institutional. Since roughly 75% of all foodborne illnesses are caused by mistakes made by people working in food service, it is critical that all food service personnel be made aware of their important role in food safety and in preventing foodborne illness.

This personnel training aid can be obtained for \$35.

Order these tapes from Media Resources Center, 121 Pearson Hall, Iowa State University, Ames, IA 50011. Make checks payable to Iowa State University.

Ohio Department of Health's Computerized Milk Program Assures Public Safety

Most of us take the milk we drink everyday and use in cereal and coffee for granted. Members of the Milk Program at the Ohio Department of Health, on the other hand, take the milk destined for consumers very seriously. In fact, the program's main objective is to ensure that only wholesome, Grade A milk reaches schools, markets, companies and anyone else in the state who consumes milk.

The Milk Program is meeting its objective with a sophisticated quality control program that relies on computer database management technology. This program is regarded by other states as a model to be followed for quality and sanitation.

The Milk Program operates under the Ohio Department of Health's Milk Sanitation Program, developed and supported by the Bureau of Data Services. The program performs a number of functions ranging from recording lab test results of Grade A milk and analyzing data, to issuing warning or suspension letters to dairies for violations.

At the heart of the Milk Sanitation Program is System 1032 from CompuServe Data Technologies, a VAX/VMS-based computer software system designed to manage large, complex applications. The database management system provides a way for the state's computers to store, manipulate and analyze vast amounts of data and then create reports and letters for taking action based on the findings.

Automating Quality Control

Prior to implementing a database management system, the Milk Sanitation Program managed all the data it collected manually. It became increasingly clear as the program evolved that the volumes of data required some kind of automation system to ensure efficient and effective reporting of milk standards.

The Department of Health began automating the Milk Sanitation Program in 1985. Since then, the department has upgraded its database management requirements, adding more power to its system. As of December 1990, it has upgraded from CompuServe Data Technologies System 1022 to its more powerful System 1032.

Laboratory and Inspection Systems

The Milk Sanitation Program is comprised of two operations that run in System 1032 -- the Laboratory System and the Milk Inspection System. The Laboratory System determines what action, if any, should be taken against dairies based upon laboratory analysis. Contracted laboratories around the state perform routine milk testing for such factors as bacteria count, presence of antibiotics, and somatic cell count, which determines whether abnormalities exist. Tests are performed monthly, or as directed by state agencies.

Under the Laboratory System, lab test information comes in from the approximately 13 remote laboratories on a daily basis. All data is sent from the laboratory databases to the central database at the state's data center in Columbus. Speed is a critical element as timely problem tracking protects the public.

All data is checked to determine if it falls within a normal range. If two tests register out of the designated limitations within a designated period of time, usually a month, the state can shut a farm down. Depending on the level of the problem, letters can be created by System 1032 advising dairies of the state's course of action. Letters are customized depending on the standards that have been violated.

The Milk Inspection Program optimizes the database in a similar way, tracking and analyzing information drawn from the system and customizing letters to licensed dairies defining their violation, the state's course of action and their timeframe for correction.

Information for the letters comes from a continuously growing library of information based on the state's milk requirements. The library contains more than 1,000 various paragraphs detailing policies, codes and violations that can be accessed by any data entry operator and used to custom-tailor each letter. Letters can then be sent to offending dairies as a warning or suspension. If a separate issue needs to be addressed, the operator has the versatility to modify the library in any way to meet the particular need.

Database Management Is The Key

System 1032 manages 50,000 laboratory tests annually. Four different types of master files are maintained that contain from 5,000 to more than 150,000 records. Actual laboratory tests kept on-line for the last couple of years number around 200,000.

Speed and effective analysis are the key characteristics of database systems. Faster reporting of remote laboratory data means faster health safety enforcement. Better sampling means more accurate results and greater public protection.

With the Milk Sanitation Program, consumers of milk in the state can continue to enjoy the quality they've come to expect. The reason is pure and simple - the Ohio Department of Health and System 1032 go a long way towards providing public safety.

In addition to the Milk Sanitation Program, the Ohio Department of Health uses System 1032 to manage 40-50 other programs including vaccine immunization, radioactive materials, billing, nursing home administration and the Bureau of Maternal and Child Health Systems.

FDA Updates Bibliography of Training Materials

At the request of numerous organizations and individuals, the U.S. Food and Drug Administration's State Training and Information Branch is updating its *Bibliography of Training Materials*. This bibliography, initially developed

in 1989, serves as a "source of sources" of training materials in the following categories: general food safety, dairy safety, seafood safety, HACCP, and other associated categories, i.e. "legal."

Anyone aware of applicable training materials is asked to provide the following information:

- Source
- Name, address and telephone number
- Abstract of content (25 words or less)
- Media (i.e. video, slides)
- Audience (school age, regulators, industry)
- Subject (food, dairy, seafood, HACCP, other)
- Cost (free, rental, \$ ___)

This information for each source should be sent by May 1 to Gary German, Director, State Information and Training Branch, 5600 Fishers Lane, Rockville, Maryland 20857, Room 12-07, telephone (301)443-6200, FAX (301)443-2143.

Once compiled the updated bibliography will be shared with all contributing organizations and individuals.



Food Chemist Jeff Hyatt prepares a pesticide residue sample for injection into an automated gas chromatograph at the Oregon Department of Agriculture's new Export Service Center in Portland. By conducting the analytical tests required by foreign countries, the center simplifies the export process for food processors.

New Center Reduces Hassles for Exporters

Food processors who export products to Pacific Rim countries can save time and money by taking advantage of services offered by the Oregon Department of Agriculture's new Export Service Center in Portland.

The purpose of the center is to make it easier for U.S. firms to export processed food, says center administrator Michael Wehr.

The new center offers a multitude of technical services on a cost-recovery basis.

"Whether it's wine, fruit juice, meat or pizza, we can tell firms what analytical tests are required by foreign countries," says Wehr. "We can warn them about potential trade barriers and tariffs, and work with them to find solutions."

The center, which is part of the Department of Agriculture's Laboratory Services Division, consists of a 4,000 square-foot laboratory and office complex. It is located in the Albers Mill Building on the Willamette River in Portland.

Before the recent move to Portland, export-related programs operated out of the department's main office in Salem. The Portland location offered better access for exporters and allowed for much-needed expansion.

Food certification

Export services are split into two major programs: certification of food exports and quality assurance.

Food certification services are specifically designed to help U.S. exporters meet foreign food requirements.

Special agreements with the governments of Japan and Taiwan allow the center to certify U.S. foods exported to those countries. Certification involves pre-testing products to make sure they meet the standards set by Japan and Taiwan for additives and preservatives, trace elements and pesticide residues.

Pre-testing expedites the movement of products into the foreign marketplace, helping avoid financial losses due to delays.

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EVERYTHING YOU'VE ALWAYS WANTED TO KNOW ABOUT SANITATION BUT WERE AFRAID TO ASK...

ASI's new **Food Protection and Employee Safety for the 90's** lets you, the food industry professional, select the topics that will benefit you the most, from a variety of presentations given by industry experts.

Recertification credit for pesticide application can also be earned for most states.

The seminar will be held May 13-15 at the Hampton Inn - Union Station in St. Louis, Missouri.

For more information, call Louann Morrow at 800-325-3371. In Missouri, 314-725-2555.



"In a sense, the center serves as a customs lab for the foreign government," says Wehr. "Conducting these analytical tests on this side of the Pacific eliminates the need for time-consuming dockside testing at the foreign port."

Since 1987 center staff have consulted with more than 150 U.S. exporters and certified more than 1,000 food products for export to Japan.

Smooth sailing to Taiwan

The ability to certify U.S. products exported to Taiwan is recent development.

Previously, food exporters had to pay the cost of a bonded warehouse in Taiwan for up to a week while their products were tested for compliance with local standards. Now, thanks to an agreement with the ROC Bureau of Commodity Inspection and Quarantine, Export Service Center staff will do the testing.

The new agreement ensures that U.S. exports will not only be acceptable to customs officials but will have quicker access to the Taiwanese marketplace.

"No other state or country has such an arrangement," says Bruce Andrews, director of the Oregon Department of Agriculture. "Oregon will now be able to offer direct access to consumers in the Republic of China."

Other services

In addition to certification services, the center can also provide U.S. firms with information on quotas, tariffs and labelling laws; advise companies on import procedures; and conduct special projects that make it easier to export specific products.

JAS: quality control

Another export-related service is the JAS, or Japanese Agricultural Standards, program. This program is basically a tool to help exporters gain a larger piece of the Japanese market, explains Wehr.

In Japan, the 'JAS' label appears on food that has met tough quality standards.

"Japanese consumers view the symbol as a guarantee of quality," Wehr says. "It's like our Good Housekeeping seal of approval."

Under an agreement with the Japanese government, the Oregon Department of Agriculture has the authority to help U.S. firms obtain the JAS label for use on canned fruit and vegetables, jams, jellies, meats, and juice products.

Until the Department of Agriculture began its program, U.S. firms had to deal directly with the Japanese government to obtain the JAS label.

Since 1987, the department has helped two Oregon canneries gain approval to use the JAS label on canned vegetables.

Wehr hopes that the center's ability to expedite exporting will lead to increased Northwest food exports.

For more information, contact Michael Wehr at the Export Service Center, Albers Mill Building, Suite 320, 1200 N.W. Front Avenue, Portland, OR 97209; (503)229-6557; FAX (503)229-5933.

IAMFES Awards Nominations

The 78th IAMFES Annual Meeting will take place in Louisville, Kentucky on July 21-24, 1991 at the Galt House. The Local Arrangements Committee, Program Advisory Committee, the central office staff and many other members are hard at work to insure an innovative and exciting session. What can you do to help? Well, you can take a few minutes and think about a deserving friend, colleague or acquaintance (who is an IAMFES member) and nominate that individual for one of the many awards that our association offers.

I'm sure that you know some hardworking, dedicated food protection professionals who have distinguished themselves in their profession and who deserves to be recognized by their peers. Let me briefly describe the awards. They are the:

- **Sanitarian Award.** This award is sponsored by Klenszade Div. of Ecolab, Inc., Diversey Corporation, and Monarch Chemicals, Div. of H.B. Fuller Company, and recognizes outstanding service to the profession of the sanitarian. It consists of a plaque and a \$1,000 honorarium.
- **Educator Award.** This award is sponsored by IBA, Inc. and is presented to an educator in recognition of outstanding academic contributions to the field of food protection. It consists of a plaque and a \$1,000 honorarium.
- **Citation Award.** This award is given to a member for many years of dedication and devotion to the ideals and objectives of the association. It consists of a plaque.
- **Harold Barnum Industry Award.** This award is sponsored by Nasco, Inc., and is presented in recognition of outstanding service to the public, IAMFES and the profession of the sanitarian. It consists of a plaque and a \$500 honorarium.
- **Honorary Life Membership.** It is awarded to those members who demonstrate devotion to the high ideals and principles of IAMFES. It consists of a plaque and a lifetime membership in IAMFES.

Please take some time today, think of a deserving candidate (nomination forms were mailed February 22nd to the membership) and mail it to:

Mr. Steven K. Halstead
IAMFES Awards Committee
502 E. Lincoln Way
Ames, IA 50010

by April 5, 1991. The individual award committees will then deliberate and choose the recipient of each award. Nominators and recipients will be notified of the outcome in June. Award presentations will take place during the IAMFES Annual Awards Banquet on Wednesday evening, July 24, 1991.

Thank you very much for your time and efforts in nominating a deserving IAMFES member.

If you have any questions or require additional forms, please contact IAMFES, 502 E. Lincoln Way, Ames, IA 50010-6666; (515)232-6699, (800)369-6337, U.S., (800)284-6336, Canada, FAX (515)232-4736.

Food and Environmental Hazards to Health

Typhoid Fever - Skagit County, Washington

In June and July 1990, an outbreak of typhoid fever occurred in Skagit County, Washington, following a family gathering of 293 people from five states. This report provides a preliminary summary of the investigation of this outbreak by the Skagit County and Washington State departments of health.

Based on interviews of 257 attendees, 17 (6.6%) of these persons developed an illness that met the case definition for probable or confirmed typhoid fever. Blood cultures were obtained from seven case-patients and from three other symptomatic persons; four of these yielded *Salmonella typhi*. Stool specimens from nine case-patients and six asymptomatic persons yielded *S. typhi*. The 17-case patients ranged in age from 1 to 50 years; eight were male. Fourteen were from Washington, and three, from California. The mean incubation period was 16.1 days (range: 7-27 days); mean duration of illness was 19.7 days (range: 7-35 days). Two case-patients were hospitalized and treated with systemic antibiotics.

The investigation indicated that consumption of three food items served during the gathering was associated with risk for illness. A foodhandler who prepared one of the implicated food items had an *S. typhi*-positive stool culture and an elevated antibody titer (1:80) to the Vi antigen, suggesting chronic carriage of *S. typhi*. No other suspected carriers were identified.

To prevent secondary transmission of *S. typhi* associated with this outbreak, the county and state health departments implemented several measures from July 30 to August 17, including 1) widely disseminating information about typhoid fever and its prevention; 2) recruiting local family members to assist with case finding and disease-control efforts by asking them to contact family members and friends who had attended the gathering; 3) culturing stool samples from household contacts of infected persons, foodhandlers who had worked at the gathering, and other attendees who had jobs as foodhandlers; 4) excluding selected persons (foodhandlers who worked at the gathering, attended the gathering, or cultured positive for *S. typhi*) from foodhandling until three consecutive negative stool cultures were obtained; and 5) instructing all other infected persons in proper handwashing and advising these persons to refrain from handling food until three consecutive negative stool cultures are obtained. No new cases of typhoid fever related to this outbreak have occurred since August 4.

Editorial Note: Although the incidence of typhoid fever has declined in developed nations, sporadic cases and outbreaks continue to occur. About 400 cases are reported annually in the United States, and the case-fatality rate ranges from

1.3% to 8.4%. In addition to the outbreak in his report, in 1990, state health departments have reported five other outbreaks of typhoid fever to CDC, including two outbreaks associated with restaurants, one with home-prepared food, one with imported shellfish, and one with unknown source. In comparison, from 1980 to 1989, only six outbreaks were reported to CDC.

Because complications of typhoid fever can be life-threatening, outbreaks require immediate and thorough epidemiologic investigation. However, these investigations are often constrained by three factors: 1) identification of outbreaks is often delayed because of the long incubation period (typically 10-14 days); 2) case-finding may be hampered because the symptoms of typhoid fever are similar to those of other illnesses, such as urinary tract or respiratory tract infections; and 3) cultures of stool alone often fail to detect the organism. The probability of recovering the organism can be increased by culturing whole stool samples (rather than rectal swabs), blood, and bone marrow. Cultures of urine usually are not necessary.

Because outbreaks of typhoid fever are often traced to foodhandlers who are asymptomatic carriers, stool samples from all foodhandlers associated with an outbreak should be cultured, even when the foodhandlers are asymptomatic. However, isolation of *S. typhi* from the stool of a foodhandler does not necessarily identify that person as the source of the outbreak or as a carrier because the foodhandler may have consumed the contaminated food or drink. To be considered a carrier, a person must excrete the organism for at least 3 months. During that time, the potential carrier should be excluded from foodhandling.

As demonstrated in this report, testing a possible carrier's serum for antibody to the purified Vi antigen may be helpful because carriers often have a high serum antibody titer. Therefore, serum specimens should be obtained from all potential or suspected carriers at the time of the investigation and, if possible, repeated several weeks later. The Vi antibody also serves as a useful marker during treatment of chronic carriers because they usually revert to seronegative after successful antimicrobial therapy.

A 6-week course of ampicillin with probenecid has been successful for treating chronic carriers with normal gallbladders and without evidence of cholelithiasis. A prolonged course of amoxicillin has been reported to be effective even in patients with gallstones or nonfunctioning gallbladders. Other effective treatments include trimethoprim-sulfamethoxazole and oral quinolones. Cholecystectomy is also useful in eradicating the carrier state and may be necessary for patients whose illnesses relapse after therapy or who cannot tolerate antimicrobial therapy.

MMWR 10/26/90

Community Outbreaks of Shigellosis - United States

From 1986 to 1988, the reported isolation rate of *Shigella* in the United States increased from 5.4 to 10.1 isolates per 100,000 persons. In 1988, state health departments reported 22,796 isolates of *Shigella* to CDC, the highest number since national surveillance began in 1965. In addition to the recent increase in *Shigella* isolation rates, many communitywide shigellosis outbreaks that have been difficult to control have been reported. This report describes four community outbreaks of shigellosis during 1986-1989 in which innovative public health control measures were used.

Kankakee County, Illinois. From October 1986 through February 1987, an outbreak of shigellosis caused by *S. sonnei* occurred in Kankakee County, Illinois (population: 97,800). Of 191 persons with culture-confirmed shigellosis, 70% were black and 61% were aged 1-10 years. Thirty-one percent of patients were hospitalized. Cases were clustered in low-income areas. An epidemiologic investigation did not identify common sources of exposure in the community; many patients reported having had contact with persons with culture-confirmed shigellosis or symptoms compatible with shigellosis.

To control this outbreak, from December 12 to January 10 the following measures were implemented: 1) information about shigellosis and its prevention was provided to parents of all children in the school district where most of the cases occurred, to child-care centers and preschools, and through schools, churches, and the news media; 2) teachers monitored handwashing by students before lunch; 3) parents assisted in monitoring handwashing in schools in the most severely affected areas; and 4) home-prepared foods were not permitted at any school or child-care events. Although the number of reported cases subsequently decreased, the outbreak did not end until March.

Peoria County, Illinois. From February through September 1987, a shigellosis outbreak caused by *S. sonnei* occurred in Peoria County, Illinois (population: 181,500). Of the 513 culture-confirmed cases, 75% were in blacks and 69% were in children aged 1-10 years. Most patients resided in low-income areas. Seven percent of patients were hospitalized. Investigation did not identify a common source of exposure; most patients had a history of contact with a person who had culture-confirmed shigellosis or symptoms compatible with shigellosis.

During April, the following interventions were implemented: 1) child-care center and nursery school employees were informed about shigellosis prevention; 2) school officials in the affected area ensured that warm water, soap, and disposable towels for handwashing were always available for students; 3) in schools, parents and teachers instructed students on proper handwashing and monitored children for symptoms of shigellosis; 4) printed educational material about shigellosis was provided to all persons attending Women, Infants, and Children (WIC) clinics, immunization clinics, community clinics, and hospital emergency rooms; 5) volunteers from the local Urban League and housing

authority made door-to-door visits in affected neighborhoods to identify cases and provide printed educational material; 6) religious leaders discussed the *Shigella* outbreak with their congregations, and church publications included information on shigellosis prevention; and 7) parents taught neighborhood children how to wash their hands and monitored them for symptoms of shigellosis. Although the number of reported cases decreased concurrently with the intervention, the outbreak continued at a lower level until September.

Orange County, New York. From November 29, 1986, to February 28, 1987, 110 culture-confirmed cases of *S. sonnei* gastroenteritis were reported in residents of a religious community (population: 5520) in Orange County, New York. Cases occurred primarily among school children 2 1/2-9 years of age; cases were evenly distributed by sex. An epidemiologic investigation did not identify a point source of exposure; spread of disease was consistent with person-to-person transmission.

Control measures were focused in schools and implemented from January 12 through February 28. The measures included 1) widespread dissemination of information about shigellosis and its prevention (e.g., proper handwashing and diaper changing) in schools and the community child-care center, 2) a program in which older children monitored handwashing by young children in the schools, and 3) periodic health department sanitation inspections of the schools. The number of reported cases of shigellosis declined concurrently with the intervention efforts.

Caddo County, Oklahoma. From August through October 1989, 34 persons with gastroenteritis caused by *S. sonnei* were identified in Caddo County, Oklahoma (population: approximately 32,100, including 18% Native Americans). Ninety-one percent of cases were in Native Americans. Seventy-one percent were in children and teenagers. An epidemiologic investigation did not identify a common source of infection but did suggest person-to-person transmission: 37 persons with symptoms compatible with shigellosis became ill after being exposed to a person (usually in their household) with a culture-confirmed *Shigella* infection. Clusters of cases occurred in persons residing in two Native American housing developments where children regularly played and ate snacks together.

Initial interventions implemented from August 29 to September 13 included 1) efforts to contact families of patients to identify potential exposures and secondary cases and to provide information on hygiene and handwashing, 2) education at child-care centers and other institutions on the importance of hygiene and sanitation in preventing transmission, and 3) encouragement of physicians, hospitals, and clinical laboratories in the area to assist in identifying and reporting new cases. The number of new cases reported initially declined; however, when new cases began to increase again, additional measures were implemented from September 26 to October 4, including dissemination of information on shigellosis and its prevention through 1) assistance of tribal leaders in providing information in tribal newsletters and at informal gatherings, 2) presentations at tribal senior citizen lunches, 3) house-to-house visits by public health officials and other persons in areas where

clusters of cases were identified, 4) distribution of take-home handouts to students in child-care centers and schools, 5) press releases to local newspapers and radio stations, 6) puppet shows on handwashing performed at all child-care centers, where informational posters were distributed to attendees, and 7) notification to restaurants and churches of the importance of excluding symptomatic persons from food handling duties. The last confirmed case occurred on October 21.

Editorial Note: Since 1986, the incidence of shigellosis in the United States has increased in all regions of the country. The highest isolation rates were reported among residents of counties with large proportions of low-income minority residents, among young children, and among women of childbearing age.

Communitywide outbreaks of shigellosis can be difficult to control because of the ease of person-to-person transmission among young children, high secondary attack rates, the frequently extended duration of these outbreaks, and multiple points of exposure. The impact of community interventions can be difficult to measure; however, the outbreaks described in this report suggest that effective control efforts should include the following: 1) communitywide recognition of the problem and participation in the intervention, 2) diversified and culture-specific educational efforts to promote handwashing and hygiene, and 3) supervised handwashing for children. Because

community leaders can play a key role in developing interventions and ensuring that these interventions are accepted in the community, they should be actively involved in all control efforts.

Handwashing with soap and running water may be the single most important preventive measure to interrupt transmission of shigellosis. Soap and running water should be readily accessible to all persons during community outbreaks of shigellosis. Because young children are most likely to be infected with *Shigella* and are also most likely to infect others, a strict policy of supervised handwashing for young children after they have defecated and before they eat is crucial. Institutions where hygiene may be suboptimal (e.g., schools, child-care centers, and homeless shelters) can amplify transmission of shigellosis into the community and should be targeted for intensive control efforts. Excluding persons with diarrhea from handling food and limiting use of home-prepared foods at large gatherings will reduce the risk of large outbreaks caused by foodborne transmission.

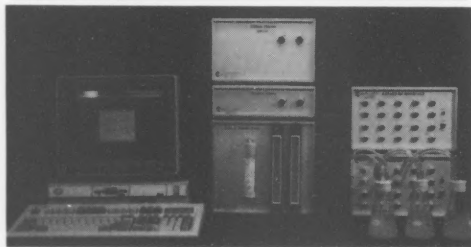
Antimicrobials have a limited role in the control of epidemic shigellosis and are not a substitute for hygienic measures in reducing the secondary spread of shigellosis. Antimicrobials should be reserved for treatment of patients only when clinically indicated, and the decision to use antimicrobials to treat patients with mild, self-limiting illness should be weighed against the risk of producing resistant strains of *Shigella*. Prophylactic use of antimicrobials cannot be recommended to prevent illness in persons who are exposed but not ill. In addition, using antimicrobials to treat patients with mild shigellosis to reduce the spread of secondary infections is not known to be any more effective in preventing *Shigella* infections than handwashing with soap and water; moreover, this practice can lead to the development of resistant strains that complicate therapy. Because resistance patterns may change, antimicrobial selection should be based on ongoing monitoring of local antimicrobial resistance of *Shigella* strains.

Shigellosis outbreaks can occur at any time of the year but are most common in the summertime. *Shigella* infections should be suspected in communitywide epidemics of diarrheal illness that disproportionately affect young children. Stool specimens should be obtained and state and local health departments informed promptly of culture-confirmed cases so that outbreaks of shigellosis can be recognized and appropriate control measures instituted.

MMWR 8/3/90

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O₂/CO₂ Respirometer for Measuring Bacteria and Fungus Growth



The micro-Oxymax O₂/CO₂ Respirometer is equipped with O₂ and CO₂ sensors which monitor "head space" gas exchange produced by bacterial or fungal contamination in solids or liquids. Operates with 1 to 20 measuring chambers (supplied or user's own chambers) with volumes ranging from 50mL to 50L. Max. sensitivity is 0.2 μ L/hr. Fully automatic 24 hr. operation with periodic printouts under IBM-PC computer control. Applications are in monitoring aflatoxin contamination in grains, bacterial contamination in food, biodegradation of pollutants in water and soil, fermentation, etc.

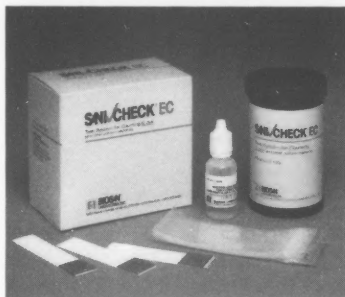


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Industry Products



Test Kit to Monitor Coliforms on Food Contact and Other Surfaces

Biosan Laboratories introduces a new test system for culturing *E. coli* and other coliforms from surfaces. Sani-Check EC contains test strips which are extremely sensitive and selective for coliform growth. The strip is pre-wet with a neutralizer solution provided with the kit. (Neutralizing avoids false negatives from sanitizer carry-over.) The test area is wiped and the strip is incubated at about 30 C for 18-24 hours.

After incubation the reacted strip is evaluated by comparing it to a color chart. Coliform growth appear as distinct, bright yellow patches on a stark magenta background. The degree of yellow coloring is proportional to the amount of coliform bacteria present.

The product is provided in kits of 25 test strips. Sani-Check EC is ideal for foodservice establishments, food and beverage processors, and dairies concerned with surface sanitation. Checking for coliforms allows the user to get specific information on the sanitary quality of their facility. Biosan also offers test kits for total bacterial counts (Sani-Check AB) and total yeast and mold counts (Sani-Check YM).

Biosan Laboratories, Inc. - Ferndale, MI

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Delco's Compact I.D.C. 2200 Industrial Pressure Washer Tackles Tough Cleaning Jobs Easily

Delco's I.D.C. 2200 Cold Water Pressure Washer is an industrial duty, portable pressure washer designed and built for continuous duty applications. This rugged unit has the durability to tackle tough cleaning jobs and the portability to get there.

The heart of Delco's I.D.C. 2200 unit, surrounded by an unbreakable hand carry polyethyl

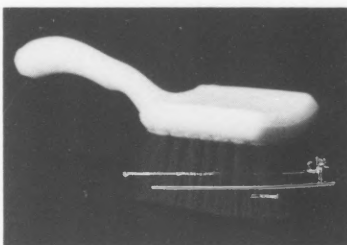
ene case, is an industrial strength pump and motor with a beefed up bearing arrangement designed for long life and rugged dependability.

Delco's I.D.C. 2200 is equipped with a 1 1/2 hp, high power factor, induction type, industrial motor featuring dual needle bearings to withstand extreme axial loads. The result is a motor with the highest torque characteristics of any induction type motor, greater efficiency, lower amp draw and a pressure washer that can be counted on to go the distance.

Additional features of Delco's I.D.C. 2200 portable cold water unit include pressure up to 1,000 psi, direct drive, 35' power cord with ground circuit interrupt for operator safety, and accessories to handle any tough cleaning job.

Clarke Industries, Inc. - St. Louis, MO

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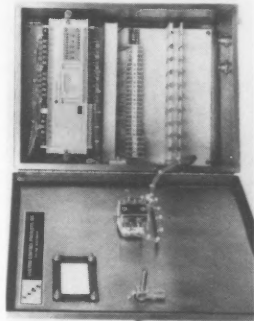


New Sanitary Scrub Brushes

Perfex Corporation has introduced a new series of Sanitary Scrub Brushes designed to prevent fiber-loss. Utilizing fused construction, the fibers are permanently sealed into the polymer brush block thus preventing fiber-loss and eliminating filth attracting crevices or edges. Seals out dirt and deadly bacteria. The long wearing synthetic fibers are stiff and will not collapse under vigorous scrubbing and are unaffected by solvents, grease, oil, acid and chemicals. The brushes can be sterilized thus insuring high sanitary standards are met. 100% synthetic construction using FDA and USDA approved materials. Ergonomically designed to provide efficient cleaning action eliminating fatigue and scraping of knuckles. The Sanitary Scrub Brushes are available in the Short Handle & Long Handle Brush as well as in the all purpose Counter Brush version.

Perfex Corporation - Poland, NY

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Custom Control Products Inc. - Leading the Industry

Custom Control Products Inc. announces its new Flow Diversion Valve Control (FDVC). This solid state Flow Diversion Valve Control is in compliance with PMO and FDA regulations for use in a Grade "A" milk plant.

Unlike electromechanical flow diversion valve controls, the innovative FDVC from Custom Control Products contains no moving parts. Downtime previously associated with valve problems is now minimized or eliminated. A window in the sealed box reveals on-line indicator lights for quick diagnostic identification of system status.

Engineered and tested for over three years, the Flow Diversion Valve Control is specifically designed to be totally compatible with all flow diversion valves conforming with 3A/FDA regulations and guidelines.

Custom Control Products Inc. provides the highest quality control systems and auxiliary products backed by personal and professional service to the dairy, food and industrial markets.

Custom Control Products, Inc. - Racine, WI

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AOAC Acts on Tecra® Salmonella Test Kit

At its annual meeting in New Orleans last September, The Association of Official Analytical Chemists granted the TECRA® Visual Immunoassay for *Salmonella* Official Final Action status.

TECRA Visual Immunoassays can be used to test enrichment broth samples for *Salmonella* in less than two hours.

Vitek Systems is the exclusive U.S. distributor for TECRA Visual Immunoassays and also distributes the products in Canada and Puerto Rico.

Vitek Systems - Hazelwood, MO

**Please circle No. 261
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L&N Offers Handy Selection Guide for Recorders and Data Acquisition Systems

A new, eight-page bulletin, entitled "Recorder & Data Acquisition Selection Guide" is offered by Leeds & Northrup. It covers the entire spectrum of instruments for industrial or laboratory applications - from single-pen recorders, through hybrid recorders, to sophisticated data acquisition systems.

In a simple question-and-answer format, the Guide addresses potential users' common concerns when specifying recorder or data acquisition equipment. The Q & A section also includes a useful graph relating cost-per-point with the number of data points and, in general, which type of data logging system should be considered.

Included with the Guide is a handy "decision tree" Application Checklist - which can be easily filled out, following a step-by-step outline. The check list is a self-mailer that can be sent to Leeds & Northrup to request more information or a free, no-obligation consultation with an L&N recorder/data acquisition expert.

Leeds & Northrup - North Wales, PA

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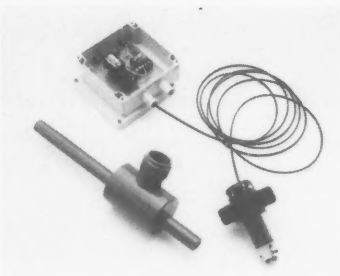


The 1991 Sigma General Catalog

The new 1991 Sigma General Catalog is now available. No laboratory is complete without this 2,144-page resource of more than 27,000 chemicals, biochemicals and related products. This year's catalog contains more than 2,000 new products, and for the first time, most chemical product listings include the Molecular Weight, Molecular Formula and CAS Number to assist you in your research.

Sigma Chemical Company - St. Louis, MO

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Presto-Tek Lightspeed Flowmeter

Lightspeed Flowmeter uses fiber-optics to provide hi-resolution flow measurement for process control applications. Digital system utilizes a 6 bladed impeller to interrupt a light circuit creating high frequency pulses. Pulse rate is converted to 4-20 mA for process applications. Rate Totalizers are available when local display of Rate and Total Flow is required.

Presto-Tek Corporation - Los Angeles, CA

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API RAPID* SYS Screening System

API Rapid* SYS Screening system is a rapid, cost-effective screen for the enteric pathogens including *Salmonella*, *Shigella*, and *Yersinia enterocolitica* isolated from various specimens, including stools. The test screens for suspect organisms after 2 hours of incubation and indicates those specimens in which there is a high likelihood that *Salmonella*, *Shigella* or *Y. enterocolitica* is present.

The strip consists of 5 pairs of cupules. One cupule tests for the presence or absence of the enzymes B-galactosidase, B-xylosidase, esterase, lipase, and phenylalanin deaminase. Results of these enzymatic tests are used to determine the need for additional testing. The second cupule of each pair maintains the strain for use when additional testing is necessary.

Because the test can rule out suspect organisms after 2 hours, negative specimens are reported one day sooner and the cost of working up specimens is reduced. This can represent substantial annual savings in both time and money.

Analytab Products - Plainview, NY

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Free Catalogue of Human Chromosome Specific Genomic Libraries; Human and Mouse DNA Probes and Cloned Genes; Probes and Clones for Oncogenes and Transforming Proteins; Oligonucleotides; Bacterial Hosts for Transformation or Plating Libraries; Other cDNA and Genomic Libraries

The American Type Culture Collection (ATCC) announces the availability of the 4th edition of the ATCC/NIH REPOSITORY CATALOGUE OF HUMAN AND MOUSE DNA PROBES -AND LIBRARIES, 216 pages, copy-right September 1990.

The catalogue lists materials deposited at the ATCC as part of the DNA repository supported by the NIH, National Institute of Child Health and Human Development (NICHD) and the National Center for Research Resources, contract #N01-HD-5-2944. The catalogue also lists related materials from the ATCC's own molecular biology collection and Patent Culture Depository.

The catalogue contains all materials available from the repository through August 8, 1990. Among the new materials in the catalogue is a collection of low cost oligonucleotide primers for the human genome.

American Type Culture Collection -
Rockville, MD

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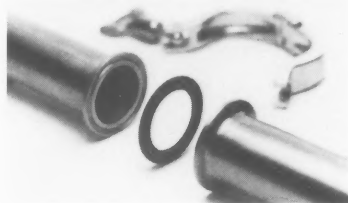


Hygienic Lobby Broom

100% polymer constructed Lobby Broom is designed for the sanitary conscious market. Flagged polypropylene fibers are fused into the block to prevent fiber fallout. Fused construction also seals out dirt or bacteria. The long memory fiber will spring back to its original shape and is unaffected by water, grease dirt and most harsh chemicals. The Lobby Broom is angled cut to reach corners easily and wear evenly. The Lobby Broom will not absorb odors. Easy to clean and keep clean.

Perfex Corporation - Poland, NY

Please circle No. 267
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New Clamp-Tite Gaskets Announced by Haynes® Manufacturing Company

A new line of gaskets that maintains sanitary conditions in CLAMP style fittings in food processing operations has been introduced by Haynes® Manufacturing Company, Cleveland, Ohio U.S.A., a leading manufacturer of sanitary products for the food, meat, poultry, dairy processing, brewery and soft drink industries.

The new gaskets are available in Buna or Teflon and fit all standard clamp fittings. They feature a self-aligning design that makes assembly extremely fast and efficient. Taste-free, they are made of FDA and USDA accepted compounds and are 100% non-toxic. Resilient and durable, they provide excellent seals and tight joints.

The Teflon gaskets are made in sizes 1 1/2" thru 3", and withstand a wide temperature range from -40° to +500°F. They are impervious to nearly all fats and solvents.

After individual inspection of each piece, gaskets are packaged in bags of 25 for all sizes. Same day shipments can be made on all orders received by noon.

Haynes Manufacturing Co. - Cleveland, OH

**Please circle No. 268
on your Reader Service Card**

Complete Laboratory Air Packages Designed to Produce Ultra Dry, Purified CO₂-Free Compressed Air for FT-IR Spectrometers are now Available for Laboratories

Dangerous and inconvenient cylinders of gas used to purge FT-IR instruments can now be replaced with a new Complete Laboratory Air Package, available from Balston Filter Systems!

The Balston Laboratory Air Packages produce high purity compressed air at -100°F pressure dew point with no suspended impurities larger than 0.01µm, and removal of CO₂ and non-methane hydrocarbons to less than 2 ppm with flow rates up to 85 lpm. The Balston Laboratory Air

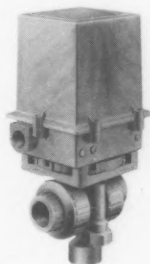
Packages completely eliminate the inconvenience and the high costs of nitrogen Dewars and cylinders, and significantly reduce the costs of operating FT-IR instruments. Typical payback period is less than one year!!

Standard features for the Balston Types 74-5021 and 74-5071 Air Packages include a new, (state-of-the-art) oil-less air compressor, aftercooler, liquid and solids removal filters, heatless desiccant dryer, and a 0.01µm membrane final filter.

The packages are insulated for quiet operation, and are easy to install and operate.

Balston, Inc. - Lexington, MA

**Please circle No. 269
on your Reader Service Card**



New Electrically Actuated 3- Way Ball Valve Developed for Long Cycle Life in Corrosive Environments

BLDL, Inc., an affiliate of Plast-O-Matic Valves, Inc., announces the addition of an electrically actuated 3-way ball valve to its True Blue Line. The actuated unit is designed to provide superior performance in a broad range of applications including today's sophisticated automated systems, which are often computer controlled and where reliability is critical.

The electric actuator is constructed of rugged non-corrosive Petra® thermoplastic for strength and durability and is ideal for applications involving highly aggressive atmospheres.

Important features of these Series TEBV actuated valves include a NEMA IV water and dust-tight enclosure, and thermally protected motor which will withstand stall torque. Also included are unique position indicator and motor running lights; color coded red, yellow and green.

Innovative features of the manual ball valve element that contribute to performance superiority, include Teflon® seats backed up with precompressed O-rings to compensate for wear, as well as machined concentricity of the ball which is polished to mirror finish to assure smooth and leak proof operation.

The durability and optimum performance of these True Blue million-cycle actuated ball valves, has been extensively tested and assured through perfect matching of manual ball valve and electric actuator at the factory. Available in sizes from 1/4" to 2".

**BLDL, Inc., Affiliate of Plast-O-Matic
Valves, Inc. - Totowa, NJ**

**Please circle No. 270
on your Reader Service Card**

GENE-TRAK Systems Markets Hygicult® Agar Slides to Monitor Plant Hygiene

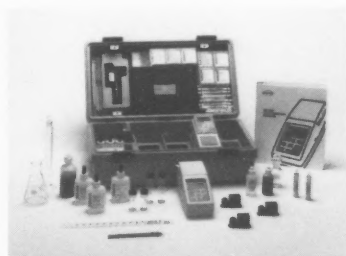
GENE-TRAK Systems recently began marketing Hygicult® Agar Slides throughout the United States through an exclusive distribution agreement with Orion Diagnostica, Espoo, Finland.

Hygicult® Agar Slides are specifically designed for the reliable, economical, and time-saving monitoring of microbiological hygiene. They are widely used in the food industry where monitoring of hygiene during the manufacturing process is of critical importance. Raw materials, production facilities, as well as finished products can be easily checked with Hygicult® Agar Slides.

Hygicult® Agar Slides are available in three versions, including Total Plate Count, Yeasts and Fungi, and Enterobacteriaceae, and are packaged in convenient test kits containing 10 Agar Slides and easy-to-follow instructions.

GENE-TRAK Systems - Framingham, MA

**Please circle No. 271
on your Reader Service Card**



New Portable Laboratory Tests 27 Water Quality Parameters

Hach Company has introduced a new portable laboratory designed to bring accuracy and economy to field and laboratory analysis. Equipped with the instrumentation, apparatus and reagents to test 27 common water quality parameters, the self-contained CEL/700 (Colorimetric Environmental Laboratory) is ideal for water quality testing, field studies or regulatory monitoring.

Housed in a durable carrying case, the fully-equipped CEL/700 includes the innovative Dr/700 Colorimeter, the Hach One Portable pH Meter, Hach's Conductivity/TDS meter and the Digital Titrator. The portable laboratory also includes illustrated step-by-step instructions, and all necessary apparatus and reagents required for testing.

For specialized applications, analysts can customize the CEL/700 by ordering instruments, apparatus and reagents separately.

Hach Company - Loveland, CO

**Please circle No. 272
on your Reader Service Card**

Federal Register

Department of Agriculture

Hazard Analysis and Critical Control Point (HACCP) Pilot Plant Testing - Solicitation of Volunteers

Summary: In cooperation with the meat and poultry industry, the Food Safety and Inspection Services (FSIS) is soliciting volunteers for in-plant pilot testing of generic model Hazard Analysis and Critical Control Point (HACCP) plans developed jointly by the Agency and the industry at workshops. Volunteer plants selected to participate in the pilot study will be requested to sign a letter of commitment pledging their full cooperation during the course of the test.

Dates: Letters of inquiry from interested participants [were to] be submitted by February 15, 1991.

For further information contact: Catherine M. DeRoever, United States Department of Agriculture, FSIS, Executive Secretariat, room 3175, South Building, 14th & Independence Avenue, SW., Washington, DC 20250 (202)447-9150.

Supplementary information: FSIS recognizes the merits of the HACCP system as a system for sanitation and process control. FSIS wishes to assist the meat and poultry industry in its efforts to incorporate (HACCP) into the safe production of meat and poultry products. Workshops are being conducted to develop model HACCP plans for specific products and processes. At these workshops, FSIS is facilitating the industry in preparing model HACCP plans. HACCP plans are being developed for refrigerated foods, cooked sausage, poultry slaughter - young chickens, fresh ground beef and swine slaughter - market hogs.

It is the intention of FSIS to evaluate and monitor the pilot testing of those model HACCP plans. Volunteers need not have previous experiences in HACCP-based operations. In fact, it is desirable to include firms with varying degrees of prior HACCP experience.

For technical information on the Agency's HACCP initiative, letters of inquiry should be addressed to Dr. Wallace I. Leary, Director, HACCP Special Team, room 0139 South Building, 14th & Independence Avenue, SW., Washington, DC 20250.

Federal Register/Vol. 56, No. 20/Wednesday, January 30, 1991/Rules and Regulations

Chickens Affected by *Salmonella enteritidis*

Summary: We are affirming with changes an interim rule concerning chicken disease caused by *Salmonella enteritidis* serotype *enteritidis* (SE) by revising certain definitions, test procedures, and restrictions on interstate movement of chickens, eggs, and other articles. We are making these changes to better control the spread of SE in commercial egg-type chicken flocks, to control its spread from chicken breeding flocks to egg-type production flocks, and to better detect invasive strains of SE which are the cause of outbreaks of disease caused by SE in humans. These changes will affect persons engaged in interstate commerce involving the sale of eggs and egg-type chickens.

Effective date: Final rule effective January 30, 1991.

For further information contact: Dr. I. L. Peterson, Staff Veterinarian, Sheep, Goat, Equine, and Poultry Diseases Staff, VS, APHIS, USDA, room 771, Federal Building, 6505 Belcrest Road, Hyattsville, MD 20782, (301)436-5777.

Federal Register/Vol. 56, No. 20/Wednesday, January 30, 1991/Rules and Regulations

Synopsis of Papers for the 78th Annual Meeting

Abstracts of papers to be presented at the 78th Annual Meeting of the International Association of Milk, Food and Environmental Sanitarians, Inc. to be held in Louisville, Kentucky, July 21-24, 1991.

Isolation of *Clostridium Perfringens* by Aerobic and Anaerobic Procedures From Ground Beef, Mohammad S. Ali* and Daniel Y.C. Fung, 264 Weber Hall, Kansas State University, Manhattan, KS 66506.

Two procedures for isolation of *Clostridium perfringens* from ground beef were compared: aerobic procedure used routinely for isolation of *C. perfringens* from foods and another anaerobic procedure, in which all bacteriological procedures are performed inside the Anaerobic Glove Box. Twelve ground beef samples inoculated with three strains of *C. perfringens*, 16 ground beef samples incubated at 23°C for 24 hr, and 41 fresh ground beef samples were compared by these procedures. Fung's Double-tube method was used for enumeration of *C. perfringens* from these samples. Inoculated and incubated samples did not show any significant difference in *C. perfringens* counts enumerated by either procedure. Among 41 fresh ground beef samples, 21 (51%) samples were positive for *C. perfringens* by the anaerobic procedure and 20 (49%) by aerobic procedure. It was concluded that the conventional aerobic procedure was adequate for enumeration of *C. perfringens* from ground beef samples.

Extending The Keeping Quality of Fluid Milk, S.E. Barnard, The Pennsylvania State University, University Park, PA 16802

Dairy processors are extending sell by or open dates on fluid milk to 14 or more days. The best available processing and sanitation procedures must be regularly followed or packaged milk will be spoiled if held at 45°F. One alternative would be to request that the maximum product temperature be reduced to 40°F for fluid dairy products from filler to consumer purchase. Unless this occurs all possible steps must be taken in processing and packaging rooms to prevent the slightest recontamination after pasteurizing. In nearly all cases hot water sanitizing is a must with the temperature at the point of discharge from filler valves being a minimum of 170°F. Some plants have achieved acceptable flavor and excellent bacterial counts of packaged milk on more than 95% of samples held for 14 days at 45°F. Other plants have samples of acceptable flavor, but bacterial counts are high. Our studies have shown that 30% or more of dairy plants have spoiled product from a given days processing after 14 days at 45°F. A list of recommended procedures and practices will be most of the presentation.

H₂O₂ Induced Free Radical Damage on *E. coli*, H.S. Basaga,* F.T. Bozoglu and A. Kassab, Dept. of Sci. Education, Dept. of Food Eng. Middle East Technical University, 06531-Ankara/Turkey

Previous workers have characterized *E. coli* lethality by H₂O₂ at two modes of killing, the first occurring at concentrations below 2mM and the second at concentrations higher than 10 mM. In our study we have generated OH radicals via Fenton reaction and investigated the site of damage caused by the radical itself. At low

concentrations of H₂O₂ the OH radical scavengers, thiourea and DMSO did not significantly effect the survival of *E. coli*, however, at high concentrations of H₂O₂, the survival of *E. coli* was markedly reduced by the above mentioned scavengers. Effect of thiourea on the lethality of H₂O₂ was more pronounced than that of DMSO.

Metal chelators, such as EDTA and 2,2-bipyridyl reduced the lethality of H₂O₂ when used with a high concentration of H₂O₂, whereas the same chemicals did not significantly effect the survival of the microorganism when used in combination with low concentration of H₂O₂, indicating different toxic species and/or sites of damage occurring at two different modes.

Anion Exchange Diode Array HPLC Analysis of Heated Ground Beef, Carl E. Davis* and William E. Townsend, USDA, ARS, RRC, P.O. Box 5677, Athens, GA 30613

USDA-FSIS regulations establish thermal treatments for meat and poultry products. Changes in water-soluble heated beef muscle proteins were profiled by anion exchange diode array HPLC at several end-point temperatures (EPT). Lean ground beef (gluteus medius, 16 g) packed in a glass tube (25 x 150 mm) was heated to 48.8, 54.4, 60.0, 62.8, 65.6, 68.3, 71.1, 73.9, 76.7 or 79.4 C. in a water bath set 1.5 C above the target temperature. At the target EPT, tubes were removed and immediately chilled (0-2 C). Extracts (5 g meat to 15 g water) were prepared by high-speed blending, centrifuging and vacuum filtering. Extracts were buffered (1:1) with 0.05 M diethanolamine (DEA), pH 8.8 and 200 uL separated by anion exchange HPLC using a 13 minute linear gradient to 0.5 M NaCl. Diode array analysis (200 to 700 nm) was used to detect separation components. A peak near 11.0 min. (N=6) had a curvilinear response to EPT with an almost linear decrease from 62.8, 65.6 to 68.3 C (R²=98.44%). Peak spectrum analysis showed principal absorbance maximas of 218 and 278 nm below 68.3 C shifting to 214 and 252 nm above 71.1 C. This procedure provides a rapid (25 min.), sensitive analytical method to characterize EPT in lean ground beef.

Prevalence of *Salmonella*, *Campylobacter*, *Yersinia enterocolitica* and *Listeria monocytogenes* in Farm Bulk Milk Tanks, F.A. Draughon, University of Tennessee, Dept. Food Tech. & Science, Knoxville, TN 37901-1071

This study was undertaken to document the prevalence of *Salmonella*, *Campylobacter*, *Yersinia enterocolitica*, and *Listeria monocytogenes* in farm bulk tanks from a sample of 300 Tennessee dairies. Other factors evaluated in association with samples was herd size, grade of milk, somatic counts, consumption of raw milk on farm and a general questionnaire. From 300 bulk milk samples, 27 were positive for *Salmonella*, 12 were positive for *Listeria monocytogenes*, 36 were positive for *Campylobacter jejuni*, and 43 were positive for *Yersinia enterocolitica*. Over 20 of the milk samples were positive for more than one pathogen. Approximately 37% of those surveyed reported the consumption of raw milk at the dairy farm.

Preview of the 78th IAMFES Annual Meeting

The following is an abbreviated overview of the educational program for the 78th IAMFES Annual Meeting, July 21-24, 1991, The Galt House, Louisville, Kentucky. A more complete program will appear in the April Issue of Dairy, Food and Environmental Sanitation.

Monday, July 22

Field Representatives and Sanitarians All-Day Symposium

- Dairy Programs in Kentucky
- Brucellosis in Kentucky
- Dairy Forecast
- Hauler's Training
- Dairy Politics
- Field Representatives Handbook
- Antibiotics Control
- Milk Residues

Scientific Papers on Chemical Methods

- Fluorometric Analysis of Acid Phosphatase in Meats for Monitoring Cooking Temperatures
- Anion Exchange Diode Array HPLC Analysis of Heated Ground Beef
- A Low-cost Technique for Water Activity without Specialized Instrumentation
- Determination of Ozone Produced Oxidants and Byproducts in Artificial Seawater
- Detection of Antimicrobial Drugs Through Their Functional Group as Compared to Physio-Chemical or Immunological Methods

Scientific Papers on Water Quality and Safety

- *Cryptosporidium parvum*, A Newly Recognized Waterborne Pathogen
- Characterization of Plasmids from *Plesiomonas shigelloides* Isolated from Louisiana Blue Crabs
- Survival and Culturability of *Vibrio vulnificus* and Resuscitation of the Viable but Non-culturable Form in Artificial Seawater Microcosms
- Environmental Survey on Bacterial Distribution in Catfish Ponds
- Water Quality of Wells on Poultry Farms in Tennessee

Symposium on Role of Food Service in Quality and Safety of Foods

- Epidemiological Overview
- Current Regulations
- Food Service Industry
- Retail Food Industry
- A Practical View of the Sous Vide Issue from a Food Service Perspective
- Food Service Sanitation Certification Training - The Whys and Hows
- A Self Care Action Program (SCAP) Applied to Food Service Establishment

- Increase Quality of Food Service Inspections
- Improving Food Safety Education in Public and Private Schools
- A National Survey of Consumer Home Food Preparation Practices
- Who Participates in Voluntary Recycling Programs and Why?

Scientific Papers on Micro Pathogens and Spoilage

- The Effects of Storage Time and Temperature on the Growth of *Salmonella enteritidis* in Naturally Contaminated Eggs
- Growth and Production of Enterotoxins A and D by *Staphylococcus aureus* in Salad Bar Ingredients and Clam Chowder
- Thermal Resistance of *Listeria monocytogenes* in Raw Liquid Egg Yolk
- The Use of Bacteriocin-producing *Pediococcus* to Control Post-processing *Listeria monocytogenes* Contamination of Frankfurters
- Antibacterial Effect of Selected Naturally Occurring Chelating Agents on *Listeria monocytogenes*
- Inhibition of *Listeria monocytogenes* by Fatty Acids
- Factors in the Contamination of Beef Tissue Surfaces by *Salmonella typhimurium* Which May Influence the Antibacterial Action of Acetic Acid
- Effects of Ingredients on the Survival of *Campylobacter jejuni* in Processed Turkey Ham
- Influence of Modified Atmosphere Storage on the Competitive Growth of *Listeria* and *Pseudomonas* on Chicken
- Methods for Selective Enrichment of *Campylobacter* Species from Poultry for Use in Conjunction with DNA Hybridization Method
- Effects of Pasteurization and Storage Temperature on Vacuum-Packaged Sausage Spoilage

Tuesday, July 23

Symposium on Shelf Life of Milk and Dairy Foods

- Testing Methods
- Plant Environment/Shelf Life
- Quality Assurance/Shelf Life
- Other topics

Microbiological Methods Scientific Papers

- Isolation of *Clostridium perfringens* by Aerobic and Anaerobic Procedures from Ground Beef

- Recovery of Microorganisms from Ground Beef by Homogenizing with Hand Roller or Stomacher
- A Differential-Selective Medium and Simple Atmosphere for Recovery of *Campylobacter jejuni*
- Optimized Enrichment Methods and Selective Media for Recovery of *Campylobacter jejuni* from Broiler Chicken Carcasses
- Spoilage Rate Comparisons for Ground Turkey and Ground Beef
- Comparison of Methods for Molecular Epidemiology of *Listeria monocytogenes*
- Evaluation of Reagents for Use in Rapid Methods of Analytical Food Microbiology
- Development of an Enzyme-Linked Antibody Procedure for Detection of *Salmonella* using Hydrophobic Grid Membrane Filters
- Monitoring the Hygienic Status of Surfaces
- A Comparison of Calibration Data for Conductance Microbiology Using Spiked Margarine and Dairy Products and Naturally Contaminated Products

Symposium on the Use of Computers in Food Protection

(Topics to be announced later)

Plenary Session - Tuesday afternoon

- Food Safety Issues in Europe
- Seafood Safety
- Pasteurized Milk Ordinance Update
- National Conference on Food Protection

Wednesday, July 24

Dairy Foods Scientific Papers

- The Dispersal of Microorganisms by Cleaning Systems
- Chlorine Dioxide Foam Sanitation in Fluid Milk and Other Dairy Processing
- Determination of Atrazine in Milk by Enzyme Immunoassay
- A Rapid Bioluminescence Assay of Alkaline Phosphatase in Milk and Dairy Products Using the Charm II System
- Extending the Keeping Quality of Fluid Milk
- Effects of Oxygen Absorber and other Packaging Conditions on the Shelf Life of Dry Whole Milk
- Determination of the Incidence of Coliforms by Preliminary Incubation - One Way to Predict Milk Quality
- A Rapid Concentration Procedure for Microorganisms in Raw Milk
- Prevalence of *Salmonella*, *Campylobacter*, *Yersinia enterocolitica* and *Listeria monocytogenes* in Farm Bulk Milk Tanks

Water In Food Processing Symposium

(Topics to be announced later)

(New Event) Scientific Poster Session - Wednesday morning

- Effect of Packaging on Shrimps (*Penaeus* spp.) Quality during Ice Storage
- A Hazard Analysis Critical Control Point (HACCP) Program for the Production of Imitation Crab
- Background Levels and Radiation Dose Yield of o-Tyrosine in Chicken Meat
- H₂O₂ Induced Free Radical Damage on *E. coli*
- Growth Modeling of Proteolytic Strains of *Clostridium botulinum*
- *In vitro* inhibition of *Salmonella typhimurium* and *Escherichia coli* 0157:H7 by an Anaerobic Gram-positive Coccus Isolated from the Cecal Contents of Adult Chickens
- Survival of Food-Associated Pathogens Following Sonication
- Fate of *Salmonella* and *Listeria monocytogenes* in Commercial, Reduced-Calorie Mayonnaise
- Antimicrobial Activity of Sucrose Laurate, EDTA and BHA Alone and in Combination
- Microbiocidal Effectiveness of Glucose Oxidase on Chicken Breast Skin and Muscle
- Performance of a DNA Hybridization Method with Abbreviated Enrichment in the Detection of *Escherichia coli* in Naturally Contaminated Foods
- Use of Agar Dipslides for Hygiene Monitoring in a Bakery
- Comparison of Two Enzyme Immunoassays for the Recovery of *Salmonella* from Foods
- An Evaluation of the Conductimetric Method for Total Microbial Activity, Coliforms, and Yeast/Mold of Spices and Seasonings
- Edualette Test, A Proposed Revision to Serological Polyvalent Flagellar (H) Test
- Incidence of *Brucella* in Milk in Cajeme County and Fat Content

(New Event) Video Theatre - All Day

Educational videos will be shown on a regular schedule throughout the day for your review.

Symposium on Microbiological Issues for the 90's

- Concepts/Considerations
- Evaluation and Validation
- Facts/Fallacies
- New Horizons

Symposium on Laboratory Safety

(Topics will be announced later)

78th IAMFES Annual Meeting Registration Form

Galt House - Louisville, Kentucky - July 21-24, 1991

(Use photocopies for extra registrations)

FOR OFFICE USE
 Date Recd. _____ First Initial _____ Last Name _____
 ID# _____ Registration # _____

Sign up to become a NEW member*

Yes, I want to become a NEW member of IAMFES for \$40 (Students \$20) which includes 12 monthly issues of *Dairy, Food and Environmental Sanitation* and take advantage of the member discount.

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

Last Name _____

Title _____

Employer _____

Mailing Address (Please specify: _____)

Home _____

Work) _____

City _____

State _____

Zip _____

Please check where applicable:

- IAMFES Member
- Non-Member
- Local Arrangements
- 30 Yr. Member
- 50 Yr. Member
- Past President
- Executive Board
- Speaker
- Honorary Life Member
- Exhibitor

Fax # _____

Area Code & Telephone _____

Registration

**Credit Card payments may be sent via Fax today!
515-232-4736**

Amount _____ Total Amount _____

- *IAMFES Member (Banquet included) \$ 95 (\$125 on-site)
- Non-Member (Banquet included) \$135 (\$165 on-site)
- IAMFES Student Member \$ 20 (\$ 50 on-site)
- IAMFES Member One Day (Circle: Mon/Tues/Wed) \$ 45 (\$ 55 on-site)
- IAMFES Non-Member One Day (Circle: Mon/Tues/Wed) \$ 65 (\$ 75 on-site)
- Spouse/Companion (Name: _____) \$ 15 (\$ 20 on-site)
- Children (12 & Over, Name _____) \$ 15 (\$ 20 on-site)
- *New member with *Dairy, Food and Environmental Sanitation* \$ 40
- *Student Membership (verification required) \$ 20
- Journal of Food Protection* or
- Dairy, Food and Environmental Sanitation*

Other Fees: (Per Person)

- Cheese & Wine Reception (Sun., 7/21) _____
- Belle of Louisville Dinner Cruise (Mon., 7/22) _____

IAMFES Awards Banquet (Wed., 7/24) _____

- They're Off - Lunch at Derby Cafe (Mon., 7/22) \$ 25 (\$ 30 on-site)
- Bardstown & Jim Beam Distillery, Lunch at Talbot Tavern (Tues., 7/23) \$ 25 (\$ 30 on-site)
- Shelbyville, Lunch at Old Stone Inn (Wed., 7/24) \$ 25 (\$ 30 on-site)

of tickets _____ - 0 -

Total Amount Enclosed \$ _____
 U.S. FUNDS

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

Card # _____

Exp. Date _____

Name on Card _____

Signature _____

Registration Information

Send payment with registration to IAMFES, 502 E. Lincoln Way, Ames, IA 50010-6666. Make checks payable to IAMFES. Pre-registration must be post-marked by July 10, 1991. The pre-registration deadline will be strictly observed. For additional information contact Julie Heim at 1-800-369-6337, 1-800-284-6336 (Canada).

Refund/Cancellation Policy

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

Exhibitor Information

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

Guest Room Commitment
GOOD UNTIL JUNE 19, 1991
Make Your Reservation Now

- Please check accommodation requested:
- Single (1 person)
 - Double (2 persons 2 beds)
 - King (2 persons 1 bed)
 - Triple Quad

Special Requests _____
All room rates are subject to prevailing taxes.
Reservations must be received by hotel prior to arrival.

HOTEL RESERVATIONS IAMFFES

78th Annual Meeting
July 21-24, 1991
The Galt House
Louisville, Kentucky

NAME _____

SHARING WITH (Name) _____

COMPANY NAME _____

ADDRESS _____

STATE/PROVINCE _____ COUNTRY _____ CITY _____ ZIP _____

TELEPHONE _____

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

SPECIAL REQUESTS _____

After June 19, 1991 reservations will be accepted on a space availability basis only. Reservations will be held until 6:00 p.m. on the date of arrival, unless guaranteed by one night advance deposit, payable by money order, certified check or a Major Credit Card.

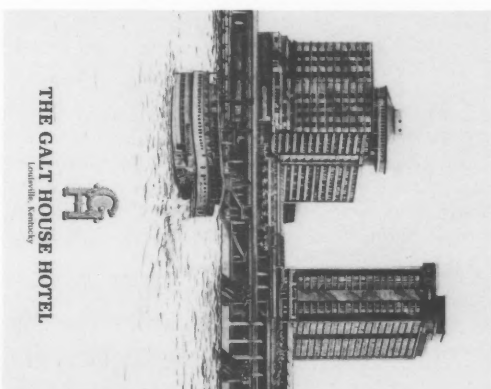
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EXPIRATION DATE _____

CARD HOLDERS SIGNATURE _____

SPECIAL ROOM RATES for this convention \$75 plus tax single/double occupancy,
\$85 plus tax triple/quad occupancy

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(800)962-0150 (within KY)
(800)626-1814 (outside KY)
or FAX (502)585-4266



MAIL DIRECTLY TO:

THE GALT HOUSE
140 N. 4TH AVENUE
LOUISVILLE,
KENTUCKY 40202-9210 USA

IAMFES

78th Annual Meeting Spouse/Companion Tours

THEY'RE OFF - LUNCH AT DERBY CAFE

Monday, July 22, 1991

9:00 a.m. - 1:00 p.m.

Cost: \$25 (Includes Lunch)

You'll visit historic West Main Street, home of the nation's second-largest district of preserved cast iron facades; then on to the grandeur of St. James Court and one of the country's finest neighborhoods of Victorian mansions. Next, you'll pass by the University of Louisville, oldest municipal university west of the Alleghenies, and its splendid J. B. Speed Art Museum, Kentucky's largest fine arts collection. The famed twin spires of Churchill Downs will greet your arrival at the fabulous Kentucky Derby Museum where you will experience fascinating hands-on Kentucky Derby exhibits and the spectacular three hundred sixty degree multi-image show depicting the panorama of Derby Day! You'll finish your circuit at the world famous Louisville Stoneware for a tour and opportunity to make that prized bargain purchase in the Seconds Shop. (Tour limited to 47 people).

BARDSTOWN & JIM BEAM DISTILLERY - LUNCH AT TALBOTT TAVERN

Tuesday, July 23, 1991

9:00 a.m. - 3:00 p.m.

Cost: \$25 (Includes Lunch)

Just up the road from Bardstown, your group will wind its way to Clermont, Kentucky, home of the oldest continuing business in the state, Beam Distillery. Nestled among gently rolling hillsides, Jim Beam's American Outpost offers a film on bourbon making and splendid handmade crafts. Your trip into quaint Bardstown includes a must for travelers worldwide - a tour of Federal Hill, the stately Georgian Colonial mansion built circa 1818 and immortalized by composer Stephen Foster as "My Old Kentucky Home." You'll return to days of the antebellum South as your costumed guide points out the rare furnishings, formal gardens, and introduces you to other attractions in the Nelson County seat, such as Spalding Hall, dating from 1826 and now the home of the Oscar Getz Museum of Whisky History. This unsurpassed collection of the bourbon maker's art from pre-Colonial days to post-Prohibition years even contains an authentic - albeit illicit - whisky still! Lunch is at the historic Talbott Tavern. Time allowing, Bardstown's charming stores extend wonderful shopping opportunities. (Tour limited to 47 people).

SHELBYVILLE, LUNCH AT OLD STONE INN

Wednesday, July 24, 1991

9:00 a.m. - 3:00 p.m.

Cost: \$25 (Includes Lunch)

A visit to the Farm of the nationally known Saddlebred horse trainer, Don Harris, will allow you a fascinating glimpse into the world of gaited horses! At Don Harris Stables, you'll see a demonstration of the skills and finesse being taught these magnificent animals. Then, it's onto your comfortable coach for a short trip to picturesque Shelbyville, and the many fine shops at Science Hill, built in 1870 as a girls' finishing school. Today, the National Register structure houses the Wakefield-Scearce Galleries, noted for its internationally-recognized collections of antique English furniture, fine silver -- including a silver vault -- and period accessories. A stroll through Science Hill and down Shelbyville's quaint streets is like a trip back in time, perhaps putting you in the mood for a leisurely lunch at the Old Stone Inn. (Tour limited to 47 people).

*Special Events - Belle of Louisville Dinner Cruise, Monday evening, July 22
and the IAMFES Awards Banquet, Wednesday evening, July 24*

Affiliate News

Connecticut Association of Dairy & Food Sanitarians, Inc. Meet in Berlin

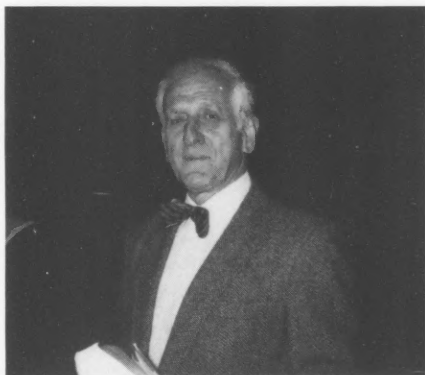
Talk about timeliness!! The "featured speaker" at the Annual Meeting of the Connecticut Association of Dairy & Food Sanitarians, on January 30, 1991, was Richard Coduri, who spoke on "The Food Industry in the Arabian Peninsula."

With the Persian Gulf War just two weeks old, the audience of 47 was primed with questions about food service in Saudi Arabia as well as a multitude of questions about the area in general. Having lived and worked in Saudi Arabia for seven years as a Food Safety Consultant, Mr. Coduri was in a good position to answer those questions.

Other speakers at the meeting held at the Historic Hawthorne Inn in Berlin, included Brian Eitzer, Connecticut State Testing Lab on "Testing Bottled Water," Jack Baker, Crystal Rock Bottling Company, "Industry Approach to Bottled Water"; Ted Faraci, Chief of Standards and Tests, "Methods of Establishing State Standards for Foods"; and Austin Rhodes, New England Ice Cream Association, "New Developments in Frozen Desserts."

IAMFES Executive Manager, Steve Halstead, reported on activities at IAMFES and gave a report on the upcoming IAMFES Annual Meeting.

The program for the meeting was put together by Dr. Lester Hankin who also did the honors of chairing the session. Any questions regarding this meeting may be directed at Dr. Hankin, Connecticut Agric. Exp. Station, Box 1106, New Haven, CT 06504; (203)789-7219.



Dr. Lester Hankin

Upcoming IAMFES Affiliate Meetings

1991

APRIL

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

•11-12, **Nebraska Association of Milk and Food Sanitarians Annual Conference** will be held at the Omaha Douglas County Extension Office, 8015 West Center in Omaha, just off 84th and I-80. For further information contact Lois Clauson at (402)444-7196.

•30, **Associated Illinois Milk, Food and Environmental Sanitarians Annual Spring Conference** will be held at the Woodfield Hilton, Arlington Heights, IL. For more information contact Robert A. Crombie, Secretary AIMFES, 521 Cowles, Joliet, IL 60435 (815)726-1683 (Voice & FAX).

MAY

•13-14, **New York State Association of Milk and Food Sanitarians Super Conference** will be held at the Sheraton Inn, Liverpool, NY. For more information contact Paul Dersam at (716)937-3432.

•13-15, **Pennsylvania Association of Dairy Sanitarians and Dairy Laboratory Analysts Annual Conference** will be held at the Keller Conference Center, Penn State University, University Park, PA. For more information, contact Sid Barnard, 8 Borland Lab, University Park, PA 16802, (814)863-3915.

JUNE

•5, **Tennessee Association of Milk, Water and Food Protection Annual Meeting** will be held at the Ramada Airport, Nashville, TN. For more information contact Dennis Lampley at (615)360-0157.

•11-12, **Texas Association of Milk, Food and Environmental Sanitarians Annual Meeting** will be held at the Howard Johnson, South, Austin, Texas. For further information contact Janie Park at (512)458-7281.

SEPTEMBER

•24-26, **New York State Association of Milk and Food Sanitarians Annual Conference** will be held at the Sheraton Inn, Liverpool, NY. For more information contact Paul Dersam at (716)937-3432.

The CADFS Board of Governors met immediately following the program. Officers for the upcoming year are:

PresidentPete Nuzzo
SecretaryDonald Shields
TreasurerBud Pancoast
DelegateSatyakam Sen

Dairy, Food and Environmental Sanitation Instructions for Authors

Nature of the Magazine

Dairy, Food and Environmental Sanitation is a monthly publication of the International Association of Milk, Food and Environmental Sanitarians, Inc. (IAMFES). It is targeted for persons working in industry, regulatory agencies, or teaching in milk, food and environmental protection.

The major emphases include: 1) practical articles in milk, food and environmental protection, 2) new product information, 3) news of activities and individuals in the field, 4) news of IAMFES affiliate groups and their members, 5) 3-A and E-3-A Sanitary Standards, amendments, and lists of symbol holders, 6) excerpts of articles and information from other publications of interest to the readership.

Anyone with questions about the suitability of material for publication should contact the editor.

Submitting Articles

All manuscripts and letters should be submitted to the Editor, Margie Marble, 502 E. Lincoln Way, Ames, Iowa 50010-6666.

Articles are reviewed by two members of the editorial board. After review, the article is generally returned to the author for revision in accordance with reviewer's suggestions. Authors can hasten publication of their articles by revising and returning them promptly. With authors' cooperation articles are usually published within three to six months after they are received and may appear sooner.

Membership in IAMFES is not a prerequisite for acceptance of an article.

Articles, when accepted, become the copyright property of *Dairy, Food and Environmental Sanitation* and its sponsoring association. Reprinting of any material from *Dairy, Food and Environmental Sanitation* or republishing of any papers or portions of them is prohibited unless permission to do so is granted by the editor.

Reprints

Reprints of an article may be ordered by the author. An order form for reprints will be sent to you. Reprints may be ordered with or without covers, in multiples of 100. Reprint costs vary according to the number of printed pages in the article. Reprints cannot be provided free of charge.

Types of Articles

Dairy, Food and Environmental Sanitation readers include persons working as sanitarians, fieldmen or quality control persons for industry, regulatory agencies, or in education. *Dairy, Food and Environmental Sanitation* serves this readership by publishing a variety of papers of interest and usefulness to these persons. The following types of articles and information are acceptable for publication in *Dairy, Food and Environmental Sanitation*.

General Interest

Dairy, Food and Environmental Sanitation regularly publishes non-technical articles as a service to those readers who are not involved in the technical aspects of milk, food and environmental protection. These articles deal with such topics as the organization and application of a milk or food control program or quality control program, ways of solving a

particular problem in the field, organization and application of an educational program, management skills, use of visual aids, and similar subjects. Often talks and presentations given at meetings of affiliate groups and other gatherings can be modified sufficiently to make them appropriate for publication. Authors planning to prepare general interest nontechnical articles are invited to correspond with the editor if they have questions about the suitability of their material.

Book Reviews

Authors and publishers of books in the fields covered by *Dairy, Food and Environmental Sanitation* are invited to submit their books to the editor. Books will then be reviewed and the review will be published in an issue of *Dairy, Food and Environmental Sanitation*.

Preparation of Articles

All manuscripts should be typed, double-spaced, on 8-1/2 by 11 inch paper. Side margins should be one inch wide.

The title of the article should appear at the top of the first page. It should be as brief as possible and contain no abbreviations.

Names of authors and their professions should follow under the title. If an author has changed location since the article was completed, his new address should be given in a footnote.

Illustrations, Photographs, Figures

Wherever possible, submission of photographs, graphics, or drawings to illustrate the article will help the article. The nature of *Dairy, Food and Environmental Sanitation* allows liberal use of such illustrations, and interesting photographs or drawings often increase the number of persons who are attracted to and read the article.

Photographs which are submitted should have sharp images, with good contrast.

Examples of Proper Bibliographic Citations

Paper in a journal

Alderman, G. G. and E. H. Marth. 1974. Experimental production of aflatoxin in citrus juice and peel. *J. Milk Food Technol.* 37:308-313.

Paper in a book

Marth, E. H. 1974. Fermentations. pp. 771-882. In B. H. Webb, A. H. Johnson, and J. A. Alford (eds.), *Fundamentals of dairy chemistry* (2nd ed.), AVI Publishing Co., Westport, CT.

Book

Fennema, O. R., W. D. Powrie, and E. H. Marth. 1973. *Low-temperature preservation of foods and living matter.* Marcel Dekker, Inc., New York. 598 p.

Patent

Hussong, R. V., E. H. Marth, and D. G. Vakaleris. 1964. Manufacture of cottage cheese. U. S. Pat. 3,117,870. Jan. 14.

Book Review

Autoxidation of Unsaturated Lipids, H.W.-S. Chan, editor, Academic Press, London, 1987, \$63.50, 296 p.

This monograph is an up-to-date review of current knowledge of lipid oxidation. The beginning chapters by Chan, Coxon, and Gardner discuss the free-radical mechanism of oxidation and the properties and reactions of the hydroperoxides that are formed. The breakdown of hydroperoxides to flavor compounds and other low molecular weight products is discussed by W. Grosch. Helpful chapters also are included on the factors affecting autoxidation of lipids (Pokorny) and the application of current knowledge about oxidation to food systems (Wriksson). The book closes with a discussion of the oxidation of fats in living tissue by O'Brien. Workers in food science and in the biological effects of lipid oxidation will find this a valuable summary of much of the current knowledge and literature in the field.

Earl G. Hammond
Department of Food Science and
Human Nutrition
Iowa State University
Ames, IA 50010

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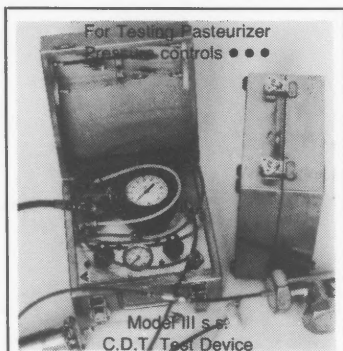
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Coming Events

1991

April

•1-5, Asbestos Abatement: Project Management & Supervision. For more information contact the University of Florida, TREEO Center, 3900SW 63rd Boulevard, Gainesville, FL 32608-3848 or call (904)392-9570.

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

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

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

•8-9, Annual Meeting: National Cheese Institute and American Butter Institute will be held at the Chicago Marriott Downtown, Chicago, IL. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006, (202)296-4250.

•8-12, Statistical Process/Quality Control Short Course, University of California. For more information contact Robert C. Pearl, Director of Continuing Education for the Food Industry, University Extension, University of California, Davis, CA 95616.

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

•11-12, Nebraska Association of Milk and Food Sanitarians Annual Conference will be held at the Omaha Douglas County Extension Office, 8015 West Center in Omaha, just off 84th and I-80. For further information contact Lois Clauson at (402)444-7196.

•15-16, Clean Air Act From A To Z, sponsored by Executive Enterprises, Inc., will be held at The Palmer House, Chicago, IL. For more information contact Executive Enterprises, Inc. at (800)831-8333.

•15-16, Air Toxics Regulation Conference, sponsored by Executive Enterprises, Inc., will be held at the Washington Hilton & Towers, Washington, DC. For more information contact Executive Enterprises, Inc. at (800)831-8333.

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

•16-18, Texas Association of Milk, Food and Environmental Sanitarians will hold a training seminar entitled "Basic Pasteurization Course" at the Seven Oaks, 1400 Austin Hwy,

San Antonio, TX. For more information contact Janie Parks at (512)458-7281.

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

•21-26, The National Conference on Interstate Milk Shipments will be held at the Galt House, Louisville, KY. For additional information contact Leon Townsend, Executive Secretary/Treasurer, 110 Tecumseh Trail, Frankfort, KY 40601; (502)695-1088.

•22-23, Pesticides: Strategic Planning For The Future, sponsored by Executive Enterprises, Inc., will be held at the Grand Hyatt Washington, Washington, DC. For more information contact Executive Enterprises, Inc. at (800)831-8333.

•22-23, Canadian Environmental Regulation Course, sponsored by Executive Enterprises, Inc., will be held at the Holiday Inn Crown Plaza, Toronto, Ontario. For more information contact Executive Enterprises, Inc. at (800)831-8333.

•23, Food Taint Workshop, hosted by the Leatherhead Food Research Association

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

•30, Associated Illinois Milk, Food and Environmental Sanitarians Annual Spring Conference will be held at the Woodfield Hilton, Arlington Heights, IL. For more information contact Robert A. Crombie, Secretary AIMFES, 521 Cowles, Joliet, IL 60435 (815)726-1683 (Voice & FAX).

May

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

•6-7, Air Toxics Regulation Conference, sponsored by Executive Enterprises, Inc., will be held at Seattle Airport Hilton, Seattle, WA. For more information contact Executive Enterprises at (800)831-8333.

•7-8, Canadian Environmental Regulation Course, sponsored by Executive Enterprises, Inc., will be held at The Palliser, Calgary, AB. For more information contact Executive Enterprises, Inc. at (800)831-8333.

•7-8, Clean Air Act From A To Z, sponsored by Executive Enterprises, Inc., will be held at The Westin Oaks, Houston, TX. For more information contact Executive Enterprises at (800)831-8333.

•9-10, Maximizing Product Safety Workshop will be held at the Diagonal Data Corporation, Lakeland, FL. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.

•13-14, **New York State Association of Milk and Food Sanitarians Super Conference** will be held at the Sheraton Inn, Liverpool, NY. For more information contact Paul Dersam at (716)937-3432.

•13-15, **Sanitation and Safety for the 90's**, sponsored by The American Sanitation Institute, for food processors and warehousemen, will be held at the Hampton Inn-St. Louis Union Station. For more information and/or registration materials, contact Louann Morrow toll-free at (800)325-3371 or, in Missouri, (314)725-2555, or write The American Sanitation Institute, P.O. Box 24198, St. Louis, MO 63130.

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

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

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

•13-15, **Pennsylvania Association of Dairy Sanitarians and Dairy Laboratory Analysts Annual Conference** at the Keller Conference Center, Penn State University, University Park, PA. For more information, contact Sid Barnard, 8 Borland Lab, University Park, PA 16802, (814)863-3915.

•16-17, **Groundwater Contamination**, sponsored by Executive Enterprises, Inc., will be held at the Washington Hilton & Towers, Washington, DC. For more information contact Executive Enterprises, Inc. at (800)831-8333.

•18-22, **72nd Annual National Restaurant Association Hotel-Motel Show** will be held at the McCormick Place, Chicago, IL. For more information contact the NRA, 150 N. Michigan Avenue, Suite 2000, Chicago, IL 60601; (312)853-2525, FAX (312)853-2548.

•20-21, **The Hazardous Waste Regulation Course**, sponsored by Executive Enterprises, Inc., will be held at the Washington Hilton & Towers, Washington, DC. For more information contact Executive Enterprises, Inc. at (800)831-8333.

•21, **Dairy Cost Accounting Workshop** will be held at the Chicago O'Hare Marriott, Chicago, IL. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.

•22, **U.W. Dairy Manufacturer's Conference** to be held at the Mead Inn, Wisconsin Rapids, WI. For more information, contact Bill Wendorff, Dept. of Food Science, 1605 Linden Drive, Madison, WI 53706, (608)263-2015.

June

•5, **Tennessee Association of Milk, Water and Food Protection Annual Meeting**, will be held at the Ramada Airport, Nashville, TN. For more information contact Dennis Lampley at (615)360-0157.

•11-12, **Texas Association of Milk, Food and Environmental Sanitarians** will hold their Annual Meeting at the Howard Johnson, South, Austin, TX. For more information contact Janie Park at (512)458-7281.

•13-14, **Listeria and Food Safety**, sponsored by The Aseptic Processing Association, will be held in Laval, France. For more information contact the Conference Secretariat, ASEPT, B.P. 49, 53020 Laval Cedex, France.

•17-20, **Better Process Control School**. For more information contact Robert M. Grodner, Ph.D., Louisiana State University, Food Science Building, Baton Rouge, LA 70803-4280, (504)388-5206.

•24-25, **The Hazardous Waste Regulation Course**, sponsored by Executive Enterprises, Inc., will be held at the O'Hare Marriott, Chicago, IL. For more information contact Executive Enterprises at (800)831-8333.

•27-28, **Chemical Labeling Conference**, sponsored by Executive Enterprises, Inc., will be held at the Sheraton Plaza Chicago, Chicago, IL. For more information contact Executive Enterprises at (800)831-8333.

July

•11-18, **International Workshop on Rapid Methods and Automation in Microbiology, XI, and Mini-symposium July 11-12th** at Kansas State University. Contact Daniel Y.C. Fung, Director, Tel (913)532-5654 or FAX (913)532-5681, 207 Call Hall, KSU, Manhattan, KS 66506.

•16-18, **Texas Association of Milk, Food and Environmental Sanitarians** will hold a seminar entitled "Basic Pasteurization Course" will be held at the Le Baron Hotel, 1055 Regal Row, Dallas, TX. For more information contact Janie Parks of TAMFES at (512)458-7281.

•21-24, **International Association of Milk, Food and Environmental Sanitarians 78th Annual Meeting** to be held at the Galt House, Louisville, KY. For more information contact Julie at (800)369-6337 or (800)284-6336 (Canada).

August

•5-9, **Biotechnology: Principles and Processes**, will be held at the Massachusetts Institute of Technology, Cambridge, MA. For more information, please contact the Director of Summer Session, MIT, Room E19-356, Cambridge, MA 02139.

•12-15, **105th Annual International Meeting and Exposition of the Association of Official Analytical Chemists** will be held at The Pointe at South Mountain, Phoenix, Arizona. For more information contact the AOAC, Suite 400, 2200 Wilson Boulevard, Arlington, VA 22201-3301; (703)522-3032; FAX (703)522-5468.

September

•10-11, **Marketing Development Seminar** will be held at The Registry, Denver, CO. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.

10-12, Texas Association of Milk, Food and Environmental Sanitarians will hold a seminar entitled "Special Problems in Milk Plants" at the Howard Johnson, Plaza South, IH 35 at Woodward, Austin, TX. For more information contact Janie Parks of TAMFES at (512)458-7281.

•24-26, New York State Association of Milk and Food Sanitarians 68th Annual Conference will be held at the Sheraton Inn, Liverpool, NY (Syracuse). For more information contact Paul Dersam at (716)937-3432.

•29-Oct. 4, 8th World Congress of Food Science and Technology. The Westin Harbor Castle, Toronto, Canada. For further information, please write 8th World Congress, (IUFOST), 3340 Orlando Drive, Mississauga, Ontario, Canada L4V 1C7; or FAX (416)678-1229.

October

•1-4, Canadian Institute of Public Health Inspectors Annual Conference. For further information contact John Foruna, Public Health Inspector at Hamilton-Wentworth Regional Department of Public Health Services, P. O. Box 897, Hamilton, Ontario, Canada, L8N 3P6; (416)546-3570 or FAX (416)521-8093.

•6-9, Annual Meeting and Convention: Milk Industry Foundation and International Ice Cream Association will be held at the Marriott River Center, San Antonio, TX. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.

•16-17, Annual Conference of the North Central Cheese Industries Association will be held at the Earle Brown Center, University of Minnesota, St. Paul. For further information contact E. A. Zottola, Executive Secretary, NCCIA, P. O. Box 8113, St. Paul, MN 55108.

•26-30, Food & Dairy Expo 91, sponsored by Dairy & Food Industries Supply Association, to be held at the McCormick Place, Chicago. For more information contact DFISA, 6245 Executive Boulevard, Rockville, MD 20852-3938 (301)984-1444.

•29-30, Dairy Food Processors' Symposium will be held at the Palmer House, Chicago, IL. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.

November

•6-9, The Fundamentals of Selling & Merchandising will be held at the Holiday Inn, Chicago, IL. For more information contact the International Dairy Foods Association, 888 Sixteenth Street, NW, Washington, DC 20006; (202)296-4250.

To insure that your meeting time is published, send announcements at least 90 days in advance to: IAMFES, 502 E. Lincoln Way, Ames, IA 50010-6666.

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