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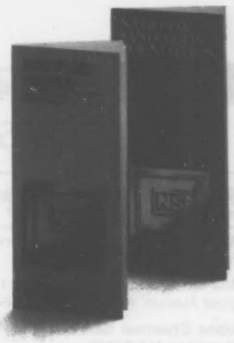

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Use of Lotus 1-2-3 in Evaluation of Various Aspects of Infra-Red Analysis of Milk Components

Vernal S. Packard

Department of Food Science and Nutrition
University of Minnesota
St. Paul, MN 55108

Introduction

Lotus 1-2-3 is perhaps the most widely used spreadsheet in business applications. As a program with good potential for statistical analysis, it can also be used to do some of the calculations common to infra-red calibration and monitoring. Moreover, graphics capabilities make possible the development of XY graphs that can provide quick, visual perspective of the status of infra-red adjustment based on comparisons with control samples analyzed by reference methods.

The following discussion centers on two different Lotus files developed specifically for evaluation of infra-red instruments used in the analysis of milk components. The first file performs two functions; it provides a measure of purging efficiency and also handles statistical calculations used in calibration or re-calibration functions. The second file is designed to do statistical calculations required to monitor the calibration status of infra-red instruments. Calculations for both purging efficiency and calibration are taken directly from Standard Methods for the Examination of Dairy Products (2). Calculations for monitoring infra-red status are based on statistics (and standards) established by the Association of Official Analytical Chemists (AOAC) (1) and on basic elements of regression analysis. The XY graphs are adapted from the Lotus graphics program, and reflect the general capabilities of that specific program.

All three programs come with provisions for entering data and/or producing appropriate reports. In addition, macros have been developed for ease of carrying out certain otherwise lengthy functions.

To use the files, you need an IBM-PC or compatible computer with suitable printer. With regard to the latter, the author has an Epson FX80 and the Printgraph function performs satisfactorily on it.

For the largest of these three program files - the one used to do regression and other statistics - 256K of memory is required.

These programs were originally constructed on the spreadsheet of a version 1.0 Lotus program. This version does not have built-in ability to perform a regression analysis. However, this statistic was designed into the program where necessary. Hence both files will function on either version of the Lotus program. They serve equally well, if designated to do so, from either the B drive of a two-drive PC or from the C drive of a hard disk.

To run the programs, you need a Lotus 1-2-3 program, properly installed. The author is currently operating with DOS version 3.0, and earlier versions should readily handle the program.

For purposes of this discussion, "accuracy" is the term used to identify the measure of agreement between reference/control results and instrument readings. "Precision" is the term used to describe how well the infra-red instrument repeats itself on the same sample of milk tested more than one time; it is a measure of repeatability.

Purging Efficiency

This is the simplest of the three programs. Certainly a computer is not essential for doing these calculations; a hand calculator could as readily be applied. However, the computer offers the advantage of providing a standardized format for entering data; it helps avoid confusion and error in dealing with test results.

Under procedures outlined in Standard Methods for the Examination of Dairy Products (2), purging efficiency - the completeness with which one sample is washed away before another one is accepted for analysis - is determined by testing, in alternate pairs, ten samples of pasteurized homogenized milk and ten samples of water. Purging efficiency is then calculated:

$$\% \text{ Purging Efficiency, water to milk} = \frac{(M_1 - W_2) \times 100}{(M_2 - W_2)}$$

$$\text{milk to water} = \frac{(M_2 - W_1) \times 100}{(M_2 - W_2)}$$

From the formula, it is apparent how readily one might confuse M_1 with M_2 or W_1 with M_1, etc. Exhibit 1 shows how the data entry and report appear in the computer program designed to do the calculations.

Data are entered as Test 1 and Test 2 of both milk and water analyses. Calculations are then performed by the computer. To get the report shown in Exhibit 1, you need only press the Alt and P keys; a macro does the steps involved in generating the report. Another macro, activated as Alt E, can be used to erase the old data in preparation for entering a new set of data. Please note, as well, that a message on the report indicates the necessity for the purging efficiency test to yield results of 99% or higher - a constant remainder of that fact.

Exhibit 1. Printout of Lotus 1-2-3 report for calculating purging efficiency of infra-red milk testing instruments.

	TESTING FOR PURGING EFFICIENCY			
	MILK		WATER	
Sample No.	Test No. 1	Test No. 2	Test No. 1	Test No. 2
-- 1--	3.2	3.3	0.1	0.05
-- 2--	3.5	3.55	0.2	0.1
-- 3--	4.8	4.95	0.3	0.1
-- 4--	2.5	2.5	0.05	0.05
-- 5--	3	3.05	0.1	0.05
-- 6--	3.5	3.5	0.05	0
-- 7--	3.7	3.75	0.1	0.08
-- 8--	2.6	2.65	0.05	0
-- 9--	3.4	3.4	0	0
--10--	3.1	3.2	0.1	0.03
SUMS	33.3	33.85	1.05	0.46
MILK 1-WATER 2	32.84			
MILK 2-WATER 2	33.39			
MILK 2-WATER 1	32.8			
MILK 2-WATER 2	33.39			
Percent Purging Efficiency:				
Water to Milk		98.35	Note: Purging Efficiency should be 99% or higher.	
Milk to Water		98.23		

Calibration Statistics

The AOAC procedure for calibration of infra-red instruments requires the analysis of at least 20 representative milk samples ranging widely in fat level. All samples must be analyzed in duplicate by both reference methods and the infra-red instrument. Statistical analysis involves the calculation of mean difference and standard deviation of the difference of the averaged infra-red vs. reference results. The values obtained must not exceed 0.05% and 0.06%, respectively (assuming *herd* samples are being analyzed). Assuming the criteria are met, performance of the equipment is then tested by analyzing in duplicate six to ten additional milk samples, and *both* accuracy and precision are measured.

Exhibit 2 shows the data entry and report generated by the calibration file. A reminder is provided regarding specifications. Two macros assist in producing the report and blanking (erasing) data from the data entry area of the spreadsheet.

The second step in calibration is the same process as would be used for regular monitoring of the calibration status of the instrument. For this reason, these two functions will be treated as one. A discussion of this computer file follows.

Monitoring Adjustment of Infra-Red Instruments

This file is considerably more complex than the preceding one, but is, nevertheless, simple and straightforward in its application.

In essence, the file produces a statistical profile of the agreement between either reference samples and instrument or duplicate analyses by the instrument. If the latter is being determined, it is necessary only to provide duplicate infra-red readings for any given component(s) in the cells where infra-red and control test results are otherwise called for. For example, under the heading FAT, you would simply provide duplicate readings, one under "IR Test," the other under "Cont. Test." Your evaluation would consider only the mean difference and standard deviation of the difference of that component. In fact, the file, as shown in Exhibit 3, produces values for slope and intercept as well as mean difference and standard deviation of the difference. The former are used only when comparing instrument with reference (control) test results. Because the specifications for calibration focus only on mean difference and standard deviation of the difference, though for *both* accuracy *and* precision tests, only these two measures need be addressed if the file is being used only as a second step in the calibration process. However, both slope and intercept give evidence of the status of instrument adjustment, and are good supplemental pieces of information to have at your disposal. In this file, slope and intercept are calculated on the basis of 0.0 as the ideal. In other words, the nearer these two values to 0.0, the better the instrument adjustment. This aspect will be considered in more detail later. First, please consider Exhibit 3 in overview.

Exhibit 2. Printout of Lotus 1-2-3 report of calculations of calibration statistics for infra-red milk testing instruments.

CALIBRATION OF INFRA-RED MILK TESTERS (STATISTICAL CALCULATIONS)

Sample No.	DUPLICATE REFERENCE TEST RESULTS Test No. 1	Test No. 2	Avg.	DUPLICATE INFRA-RED TEST RESULTS Test No. 1	Test No. 2	Avg.	Diff. IR - Ref.
-- 1--	3.4	3.5	3.45	3.35	3.35	3.35	-0.1
-- 2--	3.87	3.94	3.905	3.835	3.835	3.835	-0.07
-- 3--	4.46	4.51	4.485	4.435	4.435	4.435	-0.05
-- 4--	5.23	5.21	5.22	5.24	5.24	5.24	0.02
-- 5--	4.3	4.34	4.32	4.28	4.28	4.28	-0.04
-- 6--	3.77	3.85	3.81	3.73	3.73	3.73	-0.08
-- 7--	2.79	2.88	2.835	2.745	2.745	2.745	-0.09
-- 8--	4.89	4.92	4.905	4.875	4.875	4.875	-0.03
-- 9--	2.63	2.74	2.685	2.55	2.56	2.555	-0.13
--10--	3.44	3.55	3.495	3.45	3.45	3.45	-0.045
--11--	4.63	4.19	4.41	4.67	4.6	4.635	0.225
--12--	4.35	4.4	4.375	4.4	4.3	4.35	-0.025
--13--	3.45	3.54	3.495	3.4	3.33	3.365	-0.13
--14--	3.25	3.22	3.235	3.21	3.2	3.205	-0.03
--15--	4.1	4.3	4.2	4.13	4.05	4.09	-0.11
--16--	2.43	2.4	2.415	2.47	2.43	2.45	0.035
--17--	2.89	2.8	2.845	2.86	2.86	2.86	0.015
--18--	3.15	3.2	3.175	3.22	3.2	3.21	0.035
--19--	2.8	2.7	2.75	2.7	2.64	2.67	-0.08
--20--	3.5	3.45	3.475	3.4	3.54	3.47	-0.005

STATISTICAL ANALYSIS OF RESULTS:

Infra-Red vs. Reference:

Mean Difference . . . . -0.034
Std. dev., Diff. 0.078

Values obtained should not exceed a mean difference of 0.05% and a standard deviation of 0.06%

Data in this file is placed in the columns designated IR Test and Control Test. The program is designed to handle any number of samples from one to twelve. In the Upper Midwest, a 12-sample analysis is most frequently used. However, 6-, 8-, or 10-sample evaluations could as readily be made.

Data for infra-red readings of total solids are automatically calculated by the program, which adds fat to solids-not-fat readings for this purpose. Control total solids test results are assumed to be those made by the reference procedure i.e. AOAC, Method I (1).

After all data have been entered (for one or more components), the program calculates all of the values shown. That is, it gives a difference between IR and control test results for each sample. It provides a minimum, maximum, and range for each set of component data; it gives an average value for each column of figures. Lastly, it calculates slope, intercept, mean difference, and standard deviation of the difference for each component.

For both calibration of equipment and regular monitoring of equipment status, specification standards have been established by AOAC (1). These standards are shown in Exhibit 4. AOAC calls for an 8-sample evaluation, and requires only a measure of mean difference and standard deviation of the difference.

In essence, the mean difference is the average value of the data in each of the columns designated as Diff., taking into account the sign (whether + or −). In other words, all of the negative values are added, all of the positive values are added, the smaller value is subtracted from the larger, the result given the sign of the larger and divided by the number of samples involved.

Standard deviation of the difference, though more complex to calculate than mean difference, is a value that reflects two-thirds of the sample results. For example, consider the *difference* column of SNF results in Exhibit 3. The standard deviation of the difference is 0.063. In essence, about two-thirds of the difference values should fall *within* (be equal to or less than) that value. Indeed, eight samples lie within that boundary. Eight of twelve samples is, of course, two-thirds. Ninety-five percent of difference values will fall within two times this statistic.

Not always will the standard deviation of the difference be as perfect as that found for SNF in Exhibit 3. The fat component shows as much. Here, one sample (No. 9) is quite far removed from all the rest, and is in fact

Exhibit 3. Printout of Lotus 1-2-3 report of calculations used in monitoring adjustment of infra-red milk testing equipment.

---MILK COMPONENT ANALYSIS PROGRAM---

Plant Code:

Date: Batch No.:

Sample No.	--FAT-- IR test	Cont. test	Diff.	--PROTEIN-- IR test	Cont. test	Diff.	--LACTOSE-- IR test	Cont. test	Diff.	--SNF-- IR test	Cont. test	Diff.	--TOT. SOL.-- IR F+SNF	Cont. test	Diff.
-- 1--	3.64	3.58	0.06	3.43	3.42	0.01	4.76	4.74	0.02	8.4	8.36	0.04	12.04	11.8	0.24
-- 2--	3.71	3.7	0.01	3.2	3.21	-0.01	4.83	4.84	-0.01	8.65	8.73	-0.08	12.36	12.51	-0.15
-- 3--	4.2	4.19	0.01	3.36	3.42	-0.06	4.85	4.84	0.01	9.06	9.01	0.05	13.26	13.23	0.03
-- 4--	3.88	3.91	-0.03	3.11	3.14	-0.03	4.93	4.9	0.03	8.9	8.86	0.04	12.78	12.71	0.07
-- 5--	2.03	2.03	0	2.95	3.05	-0.1	4.95	4.97	-0.02	8.8	8.88	-0.08	10.83	11.13	-0.3
-- 6--	3.69	3.67	0.02	3.17	3.19	-0.02	4.87	4.87	0	8.75	8.67	0.08	12.44	12.4	0.04
-- 7--	3.1	3.11	-0.01	3.24	3.28	-0.04	4.99	5.05	-0.06	9.03	8.98	0.05	12.13	12	0.13
-- 8--	5.08	5.1	-0.02	3.17	3.2	-0.03	4.97	4.98	-0.01	8.92	8.92	0	14	13.8	0.2
-- 9--	5.85	6.1	-0.25	3.61	3.65	-0.04	4.95	4.92	0.03	8.77	8.77	0	14.62	14.75	-0.13
--10--	3.2	3.14	0.06	3.25	3.25	0	4.93	4.96	0.03	9.57	9.57	0	12.77	12.85	-0.08
--11--	3.45	3.4	0.05	3.2	3.1	0.1	4.9	4.92	-0.02	9.6	9.7	-0.1	13.05	12.94	0.11
--12--	3.23	3.15	0.08	3.3	3.35	-0.05	4.95	4.96	-0.01	9.46	9.38	0.08	12.69	13.05	-0.36
Min.	2.03	2.03	-0.25	2.95	3.05	-0.1	4.76	4.74	-0.06	8.4	8.36	-0.1	10.83	11.13	-0.36
Max.	5.85	6.1	0.08	3.61	3.65	0.1	4.99	5.05	0.03	9.6	9.7	0.08	14.62	14.75	0.24
Range	3.82	4.07	0.33	0.66	0.6	0.2	0.23	0.31	0.09	1.2	1.34	0.18	3.79	3.62	0.6
Average	3.76	3.76	-0.002	3.25	3.27	-0.022	4.91	4.91	-0.006	8.99	8.99	0.007	12.75	12.76	-0.017

STATISTICAL ANALYSIS OF RESULTS:

	FAT	PROTEIN	LACTOSE	SNF	TOT. SOL.
Slope	-0.061	-0.044	-0.214	-0.04	0.005
Intercept	0.227	0.122	1.045	0.366	-0.081
Mean Difference	-0.001	-0.022	-0.005	0.0066	-0.016
Std. Dev., Difference	0.086	0.048	0.026	0.063	0.19

Exhibit 4. AOAC specifications for accuracy and precision of infra-red instrument readings.

	COMPONENT (as %)			
Kind of Evaluation and Statistic:	Fat	Protein	Lactose	Total Solids
Infra-red vs. Reference:				
Mean Difference	.05	.05	.05	.09
Std. Dev., Diff.	.06	.06	.06	.12
Duplicate Infra-red Tests:				
Mean Difference	.02	.02	.02	.03
Std. Dev., Diff.	.02	.02	.02	.04

the only one to breach 0.86%, the value reflecting standard deviation of the difference. It is for this and similar reasons that a graphical representation can sometimes more adequately and more dramatically capture the true essence of instrument status. This is one of the major reasons for designing this Lotus file to print a graph of results. This concept is considered next.

Graphing Results

Figures 1 and 2 show graphs for fat and total solids data, respectively. These are graphs of a regression analysis comparing instrument with reference/control results.

Note first the line running directly across the graph at the 0.0 point. This is the "ideal" line. If instrument readings were identical to control results, the regression line

(the line designated by ---) would sit directly on top of this ideal line. Notice that it does not do so for the data in either Figure. Rarely if ever will it do so, although it can come close.

Next, please note the numbers found in the middle of the graph. These are the actual difference values (IR minus control tests) for each of the samples, *but in ascending order by test result*. The data have been rearranged, and appear on the graph in ascending order, from lowest to highest value of a set of data reflecting results on a given component. For example, look at the data for the fat component in Exhibit 3. The lowest reference test value of the twelve samples is 2.03. It happens that, at this level, the instrument read precisely the same as the control. Hence, you see a zero as the difference at the very beginning of the graph on Figure 1. The highest control value is 6.1%. At this level, the infra-red reading differed by -0.25%. That figure appears as the very last point on the graph. Difference values for all samples between these two extremes can be found in *ascending* order between them. The graph provides for differences ranging from 0.0 to plus or minus 0.5% (see numbers running up and down the vertical axis of the graph).

Perhaps the most significant aspect of the graph is the regression line itself. Please note that in Figure 1 it starts out high (at about +0.1) and ends low (at about -0.1). Very quickly you can assess the fact that at low fat tests the instrument was reading high; at high fat tests it was reading low. It was nearly perfect at a point somewhere between those two extremes.

Turn now, please, to Figure 2. The regression line in fact looks much better. It is running a little low (instrument readings are slightly lower than reference results with not much difference at low as at high levels of fat). However, the instrument, in these fictitious readings, is obviously out of control. The absolute difference between instrument and reference readings ranges up and down at significant levels over the entire range of test results. Obviously, some factor/setting needs attention.

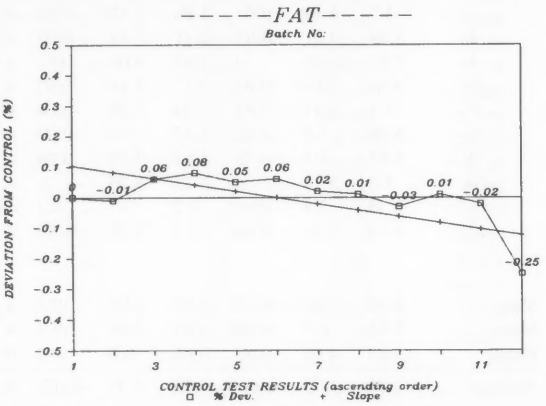

Figure 1. *Lotus 1-2-3 graphic representation of a regression analysis of reference (control) vs. infra-red methods for milkfat.*

Similarly, a variety of instrument reading characteristics can be visually assessed by graphic representation. This is an added advantage of this particular Lotus file. Additionally, macros are provided that will, in two key presses each, print the report shown in Exhibit 3, erase previously entered data, and go through all steps required for graphing each component results to the "printgraph" stage. Because a second disk/program is required to actually do the printing of the graph, a few steps in that process cannot be handled by a macro function.

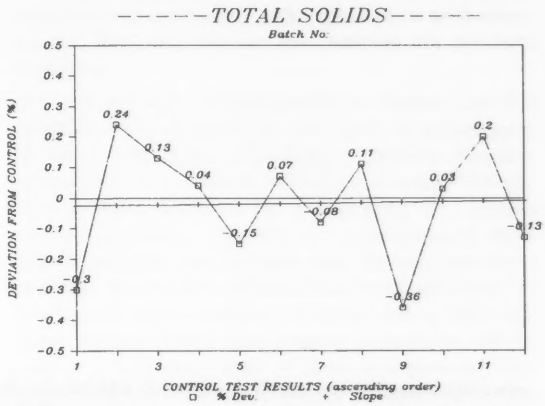

Figure 2. *Lotus 1-2-3 graphic representation of a regression analysis of refeerence (control) vs. infra-red method for total solids in milk.*

Copies of Files Available

If you have or are prepared to purchase a Lotus 1-2-3 program, the author would be happy to provide you with copies of the files described in this paper. If interested, please provide me with a 5 1/4 inch, formatted disk. I will copy the two files onto the disk and return it to you. Please keep in mind that one file - named CAPA - carries both the purging efficiency and infra-red calibration programs. The second file - named MCAP2 - handles secondary calibration functions, also the program for monitoring infra-red adjustment and the graphics for the regression analysis.

References

1. Association of Official Analytical Chemists. 1984. *Official Methods of Analysis*. Sidney Williams, ed., Washington, D.C.
2. Richardson, G.H. (ed.). 1985. *Standard Methods for the Examination of Dairy Products*, 15th ed., American Public Health Assoc., Washington, D.C.

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Microbial Food Safety

Ralph W. Johnson

Director
Division of Microbiology
Food Safety & Inspection Service
USDA

A primary objective of this workshop is to assess the current level of the microbial safety of food. Usually, this would be limited to foods produced and sold in the U.S.; however, the volume and variety of foods imported into the U.S. or exported to other countries by U.S. producers now require that we broaden our concern beyond our borders. We have a role in assuring that imported foods are reasonably safe and that foods produced in the U.S. and exported to other countries meet the safety concerns of the countries that receive them. Many differences of opinion exist domestically, but differences of food safety perception also exist in the International arena, resulting in trade restrictions or large economic losses.

Assessing the current level of food safety in the U.S. and throughout the food exporting countries of the world, it is clear that in 1985 our food supply is safer than it ever has been. This has come about through academia, which has poured highly-trained students into food processing, equipment engineering, and quality control areas of food production, and from the support of governmental bodies that have created research, regulatory, or marketing bodies to improve food quality and safety.

If, then, the microbial safety of our food supply is safer than it ever has been, why are we concerned? Scientific knowledge of the relationship of microorganisms and their toxins to food safety is growing at a tremendous rate, so we must face problems that we are just beginning to notice. With some of the tools available in our laboratories today, we can routinely find microorganisms and their toxins that were either impossible to detect or unknown ten or twenty years ago. Technological developments create new problems continually in the area of microbial food safety. In many instances, these are not truly new. It is our recognition of the problem that is new; the unrecognized problem often has existed for decades. Microbial food safety is not a static issue. Rather it is an ever-changing one and one that requires us not only to be knowledgeable about newly perceived threats to food safety but to develop to the best of our ability economic measures of control. We must also clearly recognize that control is not now and will never be perfect. The goal of science and education remains to strive to get as close to 100% as possible.

There are several areas of microbial food safety that have received recent attention. These require that we accelerate our efforts to reduce undesirable microbes or their toxins in the food supply. In addition to their recent emphasis, these areas represent risks that are new or relatively new when measured in terms of this century.

- *Population at Risk*. Populations throughout the world are continuing to grow and are concentrating heavily in metropolitan areas. Food processing establishments are similarly growing in size and production to more economically serve these population centers. The net result is that any accident or incident in food processing now may affect massive numbers of consumers. Because of better technology, such incidents will occur less frequently but when they do occur, they will be highly publicized because of the numbers involved. Two years ago at a Toxic Micro-organisms Panel Meeting of the United States-Japan Conference on the Development and Utilization of Natural Resources (UJNR), a food-borne outbreak that occurred in northern Japan was described that caused 9,500 illnesses. This massive outbreak occurred at a grand opening of a large modern supermarket that included a deli and restaurant. Heavy rains caused surface water to enter a well that supplied water to the facility. A chlorinator in the water system failed, and an alarm system to warn of the chlorinator failure also failed. This triple fault on a well-designed system resulted in contamination of

Presented at the Workshop on the Microbial Safety of Foods, Fort Washington, PA, April 17, 1985.

ready-to-eat products in the restaurant, deli, and fruit and vegetable areas.

A massive outbreak of human salmonellosis occurred during March of this year in the Chicago area from pasteurized 2% milk. More than 16,000 illnesses have been reported associated with a single day's production of a single dairy product, thus emphasizing the amplification of risk associated with high volume production. At this time, the cause of this outbreak has not been identified.

- *Immuno-deficiency*. Improvements in medical care and nutrition have increased the life span. A consequence of this is that cancer affects larger numbers. Immunosuppression is a common side-effect of cancer therapy; this condition increases the susceptibility of a portion of the population, not only to well-recognized foodborne pathogens but to many other bacteria not recognized as important or primary food-borne pathogens. In a relatively recent outbreak involving milk in New England, multiple deaths from properly pasteurized milk involved a high percentage of immuno-suppressed individuals. There is now an increased concern that the immuno-suppressed population could be susceptible to infections from the relatively common microorganism *Listeria monocytogenes*.
- *Antibiotic-Induced Illness*. For several years, investigators have observed that persons undergoing antibiotic therapy are more likely to develop enteric illnesses, often quite severe, from either endogenous or exogenous microorganisms. Enteric illness caused by *Clostridium dificile* is an example of endogenous involvement, while *Salmonella* appears to be an example of exogenous involvement. Apparently, while the healthy individual may be able to tolerate low levels of bacteria such as *Salmonella* in food without developing illness, persons on antibiotic therapy may develop serious illnesses under these same conditions. The percentage of consumers on antibiotic therapy is relatively high. Antibiotic-induced illness may result from bacteria that are naturally unaffected by the antibiotic in use or may result from bacteria that have acquired antibiotic resistance via medical or agricultural exposure. There is growing concern over the relative severity of antibiotic-induced illnesses caused by bacteria such as *Salmonella* bearing acquired antibiotic resistance. This issue is receiving a great deal of media attention in the U.S. today and has been a continual issue for years in the United Kingdom and Europe.

These and other subtle shifts in risks associated with microbial food safety are affecting the degree of concern for specific microorganisms. For decades, four microbes have been responsible for the majority of cases of food-borne infections or intoxications. These are *Salmonella, Staphylococcus aureus, Clostridium perfringins,* and *Clostridium botulinum*. They continue to cause the majority of food-borne problems or concerns even though they are easily controlled. Three of these, *S. aureus, C. perfringens,* and *C. botulinum* produce illness by producing toxins. In order to produce these toxins, they must multiply to enormous numbers in food products. Proper storage of food under refrigeration, particularly after cooking, is a simple, effective control measure. Because these three toxin producers are common in the food environment, gross failures of refrigeration are likely to result in problems. The numbers of persons affected will be proportional to the volume of food improperly held. In a home, the number is low, but if the fault occurs at the food processor or food service area, large numbers of consumers can be made ill. *C. botulinum* has always been a great concern in the food safety area, not so much because of the numbers of cases involved but because of its lethal toxin. *C. botulinum* has been stereotyped in the past as a microorganism that cannot grow in the presence of oxygen, and has thus been associated primarily with improperly canned food. Research studies and botulism outbreaks during recent years serve to alert us that *C. botulinum* can grow and produce its toxin in a variety of food products exposed to air, including fresh mushrooms, boiled eggs, pot pies, baked potatoes, and sauteed onions. There is some evidence that the size of botulism outbreaks is increasing.

The last of these four bacteria of high concern is *Salmonella* and it differs from the others in that it is infectious rather than toxigenic. Accordingly, a low number of cells can, under certain conditions, cause illness. It continues to be a common contaminant of food products, particularly raw meat and poultry. While it is rather easily destroyed by heat in moist food products, it continually causes both large and small outbreaks of illness. Based upon reports from the Centers for Disease Control, the Food Safety and Inspection Service of USDA perceives the current *Salmonella* problem as one that is persistent growing in regard to numbers of illnesses, growing in degree of seriousness, and is highly associated with meat and poultry. Even though the mood of international scientists, with regard to reducing the *Salmonella* problem, is less than optimistic, we intend to develop long-range plans to attempt to reduce *Salmonella* in raw meat and poultry. We expect to involve both industry and other governmental agencies in this effort. Two areas that are of high interest to us now are rendered animal feed proteins and carcass washing procedures. These can be automated to reduce or prevent contamination.

In addition to the big four microbial agents of food-borne infections or intoxications, another group needs to be carefully researched and watched with regard to their need for control. Most of these are invasive, readily destroyed by pasteurization, and enteric in nature, so the future plans of FSIS to reduce *Salmonella* would also reduce these newer or emerging pathogens in the food supply. Accordingly, the efforts of FSIS to reduce *Salmonella* reflect our concern for these emerging pathogens; thus the goal will be multifaceted.

- *Campylobacter* species, particularly *jejuni*, is now believed by national and international health organizations to cause more cases of human enteric illness than *Sal-*

monella. The human illness is generally milder than that caused by *Salmonella*, but the organism is also more prevalent in the environment.

It is particularly prevalent in wild birds and poultry. Research is underway in a number of universities and governmental agencies to determine whether certain strains are invasive or more invasive than others. *Campylobacter* are highly susceptible to heat and do not compete well with other bacteria in temperature-abused food; therefore, some optimism exists for control.

- *Yersinia* species. *Yersinia* species are extremely common in nature. Some strains of *Yersinia enterocolitica* cause enteric illness in man and are invasive. Fortunately, most strains are not invasive. The microorganism has been isolated from water, raw milk, pigs, pets, and other sources. While it is readily destroyed by heat and chemical agents, it has caused outbreaks from water and milk and is of particular concern in all types of food due to its ability to grow under refrigeration. The ability of invasive *Y. enterocolitica* strains to multiply in refrigerated food is a major concern for our food supply, where refrigerated shelf life is frequently long by design.
- *E. coli* 0157H7. The CDC has identified this microorganism as the causative agent of haemorrhagic colitis, a very serious enteric disease of humans. A number of outbreaks have occurred in Canada and the U.S., and the food supply is suspected as at least one of the sources of the microorganism. This strain of *E. coli* has been found once in uncooked ground beef. The method for isolation and identification of this serotype of *E. coli* from foods has not been good enough to study the degree of food involvement. We must conclude that this strain of *E. coli* may have some food involvement and that it has invasive and cytotoxic capacities resulting in serious human illnesses. It is easily destroyed by usual cooking practices and chemical sanitizers.
- *Aeromonas* species. Species of the genus *Aeromonas* have long been recognized as pathogens in fish and amphibians. During the past decade, some of the *Aeromonas* species have been associated with human pathogenicity. At this time, two species, *A. hydrophilia* and *A. sobria*, are on the verge of being considered causative agents of human gastroenteritis and could potentially be food-borne pathogens of major safety significance. They are invasive, produce enterotoxins, and are common to domesticated animals and their environment. Again, these are sensitive to usual cooking procedures and compounds.

In summary, the microbiological safety of our food supply is good. The quality of equipment, sanitation procedures, the educational level of food plant supervisors, the Federal and local inspection activities, and laboratory capabilities and the educational level of food plant supervisors are better than they have ever been. Given the massive volume of food consumed and the massive populations served, it is no surprise that the record is not perfect. The goal of those of us involved in food safety is to maintain the progress of our predecessors and to continue to make new contributions. We continue to have residual problems from the historic big four microbial agents even though they are controllable. In addition, we now recognize new problems that we didn't know about before but that undoubtedly existed. It is essential that efforts be made to continue to control microbial food problems, efforts must be directed toward scientific progress as well as strong consumer education efforts since many problems that do occur result from a lack of knowledge. From the standpoint of unresolved needs, FSIS now feels that pathogenic bacteria must be removed or reduced from meat and poultry carcasses at the earliest possible point in processing. We strongly support the Carcass Acquired Pathogen Elimination or Reduction System (CAPERS) project of ARS at the University of Missouri. New scientific knowledge of microbial adherence indicates that carcass sanitization may be essential to pathogen reduction.

TENTATIVE PROGRAM
74TH ANNUAL MEETING OF THE INTERNATIONAL ASSOCIATION OF MILK, FOOD AND ENVIRONMENTAL SANITARIANS

In Cooperation with the California Association of Dairy and Milk Sanitarians

Disneyland Hotel *AUGUST 2-6, 1987* **Anaheim, CA**

THURSDAY - JULY 30, 1987 Executive Board Meeting
FRIDAY - JULY 31, 1987 Executive Board Meeting

SUNDAY - AUGUST 2, 1987
Afternoon

Committees meet on Sunday afternoon and Monday morning. You need NOT be a committee member in order to attend a committee meeting.

Noon - 5:00 PM	Local Arrangements Committee
Noon - 5:00 PM	Registration
Noon - 2:00 PM	Food Service Committee
Noon - 2:00 PM	Education and Training Committee
1:00 - 4:00 PM	Farm Methods Committee
1:00 - 5:00 PM	Communicable Disease Affecting Man Committee
1:00 - 3:00 PM	Journal of Food Protection - Management Committee
2:00 - 4:00 PM	Water Quality and Waste Disposal Committee
2:00 - 4:00 PM	Interpretations Committee
3:00 - 5:00 PM	Council of State Sanitarians Registration Agencies Committee
3:00 - 5:00 PM	Dairy and Food Sanitation Management Committee
3:00 - 5:00 PM	EXHIBITS OPEN

SUNDAY - AUGUST 2, 1987
Evening

6:00 PM - 8:00 PM	EARLY BIRD RECEPTION
9:00 PM - 11:00 PM	EXECUTIVE BOARD

MONDAY - AUGUST 3, 1987
Morning

7:00 - 10:00 AM	NMPF - IMS Committee
8:00 - 10:00 AM	Sanitarians Joint Council
8:00 - 10:00 AM	Scientific Paper Committee
10:00 AM - Noon	NCIMS Laboratory Committee
10:00 AM - Noon	Nominations Committee
10:00 AM	Refreshment Break
8:00 AM - Noon	Executive Board
8:00 AM - 5:00 PM	Companion Hospitality
8:00 AM - 5:00 PM	Local Arrangements Committee
9:00 - 10:00 AM	Membership Committee
10:00 AM - Noon	Baking Industry Standards Committee
10:00 AM - Noon	NCIMS Problem 208 Study Committee

MONDAY - AUGUST 3, 1987
Morning

BUSINESS MEETING
9:00 AM California Association of Dairy and Milk Sanitarians

MONDAY - AUGUST 3, 1987
Afternoon
General Session - Leon Townsend, Presiding

1:00 PM DOOR PRIZE

1:05 PM — INVOCATION - Dennie Stueve, Mount Calvary Lutheran Church Pastor, Diamond Bar, CA

1:15 PM — WELCOME - William Dammameyer, U.S. Congressman 39th District, Fullerton, CA

1:30 PM — PRESIDENTIAL ADDRESS - Roy Ginn, Dairy Quality Control Inst., St. Paul, MN

2:00 PM — INTRODUCTION OF KEYNOTE SPEAKER - John Bruhn, University of California, Davis, CA

2:05 PM — IVAN PARKIN LECTURESHIP - "FOOD SAFETY & NUTRITION ISSUES" - Bernie Schweigert, Ph.D., University of California, Davis, CA

2:45 PM — BREAK

3:00 PM — DOOR PRIZE

3:05 PM — BUSINESS MEETING - ROY GINN

1. Report of Secretary
2. Executive Manager Report
3. Committee Reports
   a) JFP Editor
   b) JFP Management
   c) DFS Management
   d) Prof. & Ed. Devp.
   e) Affiliate Council
   f) Nominations
   g) Resolutions
4. 3-A Symbol Council
5. Old Business
6. New Business

MONDAY - AUGUST 3, 1987
Evening

6:00 PM — MEXICAN FIESTA

TUESDAY - AUGUST 4, 1987
Morning - Food Protection Session
Michael Wehr - Chairperson

8:25 AM — DOOR PRIZE

8:30 AM — THE OCCURRENCE AND SIGNIFICANCE OF MOLDS & MOLD GROWTH IN FOODS - Lloyd B. Bullerman, University of Nebraska, Lincoln, NE

9:00 AM — ANTIMICROBIAL EFFECT OF CHLORINE ON *LISTERIA MONOCYTOGENES* IN PHOSPHATE BUFFER AND BRUSSEL SPROUTS - R. E. Brackett, University of Georgia, Experiment, GA

9:20 AM — THE MICROBIOLOGY OF SLOW-COOKED, STUFFED - E.F. Eckner*, E.A. Zottola, and R.B. Gravani, University of Minnesota, St Paul, MN

9:40 AM — MOLDS INVOLVED IN THE DEVELOPMENT OF "BLUE-EYE" DISEASE OF STORED POPCORN - Martha J. Lundell* and Lloyd Bullerman, University of Nebraska, Lincoln, NE

10:00 AM — BREAK

10:15 AM — DOOR PRIZE

10:20 AM — IMPROVED SELECTIVE PLATING MEDIUM FOR DETECTION OF SALMONELLAE FROM FRESH AND CURED POULTRY SAMPLES - J.S. Bailey*, J.Y. Chiu, N.A. Cox and R.W. Johnston, USDA, Athens, GA

10:40 AM — IMPORTANCE OF STATISTICAL QUALITY CONTROL IN FOOD PROCESSING - Clifford (Chip) Kloos, Beatrice, Hunt-Wesson, Inc, Fullerton, CA

11:10 AM — EFFECTIVENESS OF USING COLIFORMS AS INDICATOR ORGANISMS - Dr. Russell S. Flowers, Silliker Labs, Inc., Chicago Heights, IL

11:40 AM — COMMITTEE REPORT: FOOD EQUIPMENT SANITARY STANDARDS - Duaine B. Shaw, Penn. Dept. of Environmental Resources, Harrisburg, PA

11:50 AM — COMMITTEE REPORT: BAK-

ING INDUSTRY SANITARY STANDARDS - Martyn A. Ronge, Martyn Ronge & Assoc., Northbrook, IL

TUESDAY - AUGUST 4, 1987
Morning - Milk Sanitation Session
William W. Coleman II, Chairperson

8:25 AM — DOOR PRIZE

8:30 AM — PROCESSING OF FLUID MILK - Sid Barnard, Pennsylvania State University, University Park, PA

9:00 AM — ASSESSMENT OF THE MICROBIAL QUALITY OF DAIRY POWDER USING THE IMPEDANCE TECHNIQUE - N. Tsang*, R. Firstenberg-Eden and M. Lamk, Bactomatic, Inc., Princeton, NJ

9:20 AM — FIELD EVALUATION OF A MODIFIED FARM INSPECTION PROGRAM - Randall Daggs*, Wisconsin Bureau of Environmental Health, Madison, WI

9:40 AM — HEAT RESISITANCE OF *LISTERIA MONOCYTOGENES* IN ARTIFICIALLY-INCUBATED AND NATURALLY-CONTAMINATED RAW MILK - Jeffrey M. Farber*, Gregory W. Sanders, Bureau of Microbial Hazards, Ottowa, Ontario, Canada, Douglas B. Emmons and Robin C. McKellar, Food Research Center, Ottowa, Ontario, Canada

10:00 AM — BREAK

10:15 AM — DOOR PRIZE

10:20 AM — CLEAN ROOM CONCEPTS - Robert M. Darrah, Safeway Stores, Inc., Oakland, CA

10:50 AM — MICROBIOLOGICAL CONTAMINATION OF SWEET WATER & GLYCOL COOLING SYSTEMS USED IN THE HTST PASTEURIZER - A.A. Airoldi*, R.K. Lindenthal and E.A. Zottola, University of Minnesota, St Paul, MN

11:10 AM — SURVIVAL OF *LISTERIA MONOCYTOGENES* IN COLD-PAK CHEESE FOOD DURING REFRIGERATED STORAGE - Elliott T. Ryser* and Elmer H. Marth, University of Wisconsin-Madison, Madison, WI

11:30 AM — USE OF MICROWAVE OVEN FOR IN-HOME PASTEURIZATION OF MILK - Kathleen M. Knutson* and Elmer H. Marth, University of Wisconsin, Madison, WI

11:50 AM — COMMITTEE REPORT: SANITARY PROCEDURES - Dick Whitehead, Sanitary Procedures, Brandon, MS

TUESDAY - AUGUST 4, 1987
Morning - Food Tampering and Protective Packaging Symposium
Robert Gravani and Dick Swanson
Co-Convenors

8:30 AM — WELCOME AND OBJECTIVES - R.B. Gravani, Cornell University, Ithaca, NY

8:45 AM — HISTORY AND UPDATE OF FOOD TAMPERING INCIDENCE IN U.S. - Richard C. Swanson, Food and Drug Administration, Rockville, MD

9:30 AM — CURRENT STATUS OF TAMPER EVIDENT FEATURES AVAILABLE FOR PACKAGED FOODS - Joseph H. Hotchkiss, Cornell University, Ithaca, NY

10:15 AM — BREAK

10:30 AM — DOOR PRIZE

10:35 AM — PRODUCT WITHDRAWAL AND COMPANY LIABILITY IN FOOD TAMPERING INCIDENCE - George M. Burditt, Esq, Burditt, Bowles & Radzius, Chicago, IL

11:20 AM — CONSUMER ATTITUDES TOWARD TAMPERING AND

TAMPER EVIDENT FOOD PACKAGING - Mona Doyle, President, The Consumer Network, Philadelphia, PA
THIS SYMPOSIUM IS BEING COSPONSORED BY THE PACKAGING MACHINERY MANUFACTURERS INSTITUTE

11:50 AM — SUMMARY AND DISCUSSION

TUESDAY - AUGUST 4, 1987
Afternoon - Milk Sanitation Session
Sid Barnard, Chairperson

1:25 PM — DOOR PRIZE

1:30 PM — SANITATION PROGRAMS ON THE FARM - Joe Miranda, CREPACO, Cerritos, CA

2:00 PM — MILK SUPPLY MANAGEMENT - Dr. Jim Gruebele, Dairyman's Cooperative Creamery Association, Tulare, CA

2:30 PM — SURVIVAL OF *LISTERIA MONOCYTOGENES* DURING THE MANUFACTURE & RIPENING OF COLBY CHEESE - Ahmed E. Yousef* and Elmer H. Marth, University of Wisconsin-Madison, Madison, WI

2:50 PM — Topic to be announced in final program - Joseph Smucker, USFDA, San Franciso, CA

3:10 PM — BREAK

3:25 PM — DOOR PRIZE

3:30 PM — ELIMINATING CROSS-CONNECTIONS BETWEEN RAW & PASTEURIZED PRODUCTS IN DAIRY PLANTS - Roger W. Dickerson, Jr., Food and Drug Administration, Cincinnati, OH

3:50 PM — COLI TRAK (TM), A NEW TEST FOR COLIFORM ESTIMATION - J.P. DesRosier*, N.J. Salts and N.R. Ward, BIO-Control Systems, Inc., Kent, WA

4:10 PM — MICROBIOLOGICAL QUALITY OF CANADIAN FROZEN DAIRY PRODUCTS - M.A. Johnson*, U.T. Purvis, R. Foster and O. Diep, Field Operations Directorate, Ottawa, Ontario, Canada

4:30 PM — COMMITTEE REPORT: FARM METHODS - Maynard David, Diversey/Wyandotte, Wyandotte, MI

TUESDAY - AUGUST 4, 1987
Afternoon - Food Protection Session
Ron Case, Chairperson

1:25 PM — DOOR PRIZE

1:30 PM — THE RETAIL FOOD INDUSTRY - Charles Stauffer, Safeway Inc., Oakland, CA

2:00 PM — THE RELATIONSHIP OF SANITATION KNOWLEDGE TO PROFITS IN MEAT DEPARTMENTS OF A RETAIL SUPERMARKET CHAIN - R.B. Gravani, Cornell University, Ithaca, N.Y.

2:20 PM — ATTACHMENT OF *LISTERIA MONOCYTOGENES* AND *YERSINIA ENTEROCOLITICA* TO STAINLESS STEEL AT VARIOUS TEMPERATURES AND pH VALUES - P.J. Herald* and E.A. Zottola, University of Minnesota, St Paul, MN

2:40 PM — INPROVING THE EFFICIENCY OF THE BOT-ELISA TEST - C.N. Huhtanen, Eastern Regional Research Center, Philadelphia, PA

3:00 PM — BREAK

3:15 PM — DOOR PRIZE

3:20 PM — SAFETY OF REFRIGERATED FOODS? - K.E. Stevenson, National Food Processors Association, Dublin, CA

3:40 PM — ASSESSING THE MICROBIOLOGICAL SAFETY OF MODIFIED ATMOSPHERIC PACKAGING; SPOILAGE VS PATHOGENICITY - Joe Hotchkiss, Cornell University, Ithaca, NY

4:00 PM — COMMITTEE REPORT: COMMUNICABLE DISEASES AFFECTING MAN - Frank Bryan, Consultant, Tucker, GA

TUESDAY - AUGUST 4, 1987
Afternoon - Biosensors and Their Potential Use in Food
Microbiology Symposium
Russ Flowers - Chairperson

Speakers and topics to be announced in final program.

TUESDAY - AUGUST 4, 1987
Evening

7:00 PM — PAST PRESIDENT'S DINNER

WEDNESDAY - AUGUST 5, 1987
Morning - Food Protection Session
Dr. Patton Smith, Chairperson

8:25 AM — DOOR PRIZE

8:30 AM — PANEL DISCUSSION - CRISIS MANAGEMENT - Roy Ginn, Moderator; Legal - Douglas Englebretson, Land O'Lakes, Inc., Minneapolis, MN; Public Relations - Ian Mitroff, University of S. California, Los Angeles, CA; Quality Assurance - Ron Case, Kraft, Inc., Glenview, IL

9:45 AM — BREAK

10:00 AM — DOOR PRIZE

10:05 AM — EFFECTS OF COMPETITIVE MOLDS ON GROWTH AND AFLATOXIN PRODUCTION BY *ASPERGILLUS FLAVUS* AND *ASPERGILLUS PARASITICUS* - Lloyd B. Bullerman* and Shi-Jenq Lee, University of Nebraska, Lincoln, NE

10:25 AM — RAPID DETECTION OF SALMONELLA IN FOODS USING THE GENE-TRAK ASSEY IN CONJUNCTION WITH A MODIFIED ENRICHMENT PROCEDURE - R.H. Deibel*, R.J. Siakel, C. Kowalewoki, Chem Bio Consultants and Labs, Chicago, IL & M.A. Mazola, Gene Trak Systems, Framingham, MA

10:45 AM — PROCESSING OF FRESH FRUITS & VEGETABLES - Ed Yates, California League of Food Processors, Sacramento, CA

11:15 AM — SAFETY OF ETHNIC FOODS (HACCP) - Frank Bryan, Consultant, Tucker, GA

WEDNESDAY - AUGUST 5, 1987
Morning - Milk Sanitation Session
Dr. Wyatt Smith, Chairperson

8:25 AM — DOOR PRIZE

8:30 AM — PRODUCER FUNDED DAIRY PRODUCT RESEARCH - Joe O'Donnel, Dairy Research Foundation, Rosemont, IL

9:00 AM — A STANDARD "ANTIBIOTIC FREE" MILK - Stanley E. Charm, Penicillin Assays, Malden, MA

9:20 AM — THE INCIDENCE OF ANTIBIOTICS OTHER THAN PENICILLIN IN PRODUCER RAW AND FINISHED MILK PRODUCTS - H.M. Wehr*, N.J. Corristan, M. Park, D. Pederson and S.E. Charm, Oregon Department of Agriculture, Salem, OR

9:40 AM — FDA'S, FY 87 AGED HARD CHEESE PATHOGEN SURVEILLANCE SAMPLING PROGRAM - PROGRESS REPORT - Johnnie G. Nichols, FDA, Washington, D.C.

10:00 AM — BREAK

10:15 AM DOOR PRIZE

10:20 AM BEHAVIOR OF *LISTERIA MONOCYTOGENES* IN SKIM MILK DURING FERMENTATION - Michelle M. Schoock* and Elmer H. Marth, University of Wisconsin-Madison, Madison, WI

10:40 AM SURVIVAL OF *LISTERIA MONOCYTOGENES* IN SIMULATED MILK COOLING SYSTEMS - R.K. Lindenthal* and E.A. Zottola, University of Minnesota, MN

11:00 AM SELECTION OF BACTERIOLOGICAL TEST FOR MONITORING THE CLEANING OF MILK PIPELINES - G.F. Senyk*, S.M. Kozlowski and D.K. Bandler, Cornell University, Ithaca, NY

11:20 AM NICIMS 1987 CONFERENCE REPORT - Jim Kennedy, Missouri State Milk Board, Jefferson City, MO

WEDNESDAY - AUGUST 5, 1987
Morning - Water Quality Symposium
Marcia L. McGlochilin, Moderator

8:25 AM DOOR PRIZE

8:30 AM WELCOME AND OBJECTIVES - Marcia McGlochin, President of California Dairy Industry Assoc., California COOP Creamery, Petaluma, CA

8:45 AM WATER SOURCES FOR THE CONSUMER - Kenneth B. Kasner, Asst. Engineer in Charge of Water Quality Division, Los Angeles Dept. of Water and Power, Los Angeles, CA

9:15 AM WATER SUPPLIES OF THE FUTURE - Bill Kervahn, Control System Manager, Metropolitan Water District of Southern California, Los Angeles, CA

10:00 AM BREAK

10:15 AM DOOR PRIZE

10:20 AM OVERVIEW OF CONTAMINANTS DISTRIBUTION IN SOUTHERN CALIFORNIA COASTAL WATERS - Jack Anderson, S. California Coastal Water Research Project Authority, Long Beach, CA

10:50 AM NEW METHOD OF PURIFYING WATER - Tom Underbrink, City of Pasadena, Pasadena, CA

11:20 AM QUALITY OF UNDERGROUND DRINKING WATER SUPPLIES IN CALIFORNIA - Harry Collins, Ph.D., California Department of Health Services, Sacramento, CA

WEDNESDAY - AUGUST 5, 1987
Afternoon - Food Service Sanitation Session
Robert Sanders, Chairperson

1:25 PM DOOR PRIZE

1:30 PM USING HACCP TO PREVENT FOOD POISONING - Charles A. Bartleson, Department of Social & Health Services, Olympia, WA

2:00 PM PANEL: SAFETY AND QUALITY OF PREPACKAGED PRODUCE - Ms. Jan DeLyser, Executive Director, Fresh Produce Council of Southern California, Los Angeles, CA

2:30 PM REVIEW OF RAPID COOLING SYSTEMS - W. Joel Simpson, Dobbs Houses, Inc., Memphis, TN

3:00 PM BREAK

3:15 PM DOOR PRIZE

3:20 PM TEMPERATURE SENSING DEVICES - R. Paul Singh, University of California, Davis, CA

3:50 PM UNICODE UPDATE - Art Banks, FDA Food Services, Washington, D.C.

4:20 PM COST OF REGULATORY COURT ACTION & LEGAL SUITES TO THE FOOD INDUS-

TRY - Ewen C.D. Todd, Health Protection Branch, Ottowa, Ontario, Canada

WEDNESDAY - AUGUST 5, 1987
Afternoon - Environmental Protection Session
Richard Tate, Chairperson

1:25 PM	DOOR PRIZE
1:30 PM	BOTTLED WATER QUALITY - Bob Kelsey, Quality Assurance Manager, Arrowhead Water Company, Los Angeles, CA
2:00 PM	HEAVY METALS IN SOIL - Dick Burau, University of California, Davis, CA
2:30 PM	AIR QUALITY - Mike Kohut, South Coast Air Quality Management District, El Monte, CA
3:00 PM	BREAK
3:15 PM	DOOR PRIZE
3:20 PM	FOOD PROCESSING - WASTE TREATMENT - Dr. George York, Department of Food Science & Technology, University of California, Davis, CA
3:50 PM	Topic to be announced in final program. - Bill Batten, Thermaco Inc., Asheboro, N.C.
4:10 PM	PACKAGED ICE - A GROWING FOOD PROTECTION PROBLEM - Charles W. Felix, Leesburg, VA

WEDNESDAY - AUGUST 5, 1987
Afternoon - Listeria and Emerging Food Pathogens
"What Have We Learned and What Is Next?"
Al Huggins & C.W. Donnelly
Co-Convenors

1:25 PM	DOOR PRIZE
1:30 PM	INTRODUCTIONS AND ANNOUNCEMENTS - Alan Huggins, Dairy Research Foundation, Rosemont, IL
1:40 PM	THERMAL INACTIVATION OF INTRACELLULAR LISTERIA - C.W. Donnelly and V. Kelly Burning, University of Vermont, Burmington, VT
2:10 PM	FOOD SAFETY RESEARCH AND EDUCATIONAL PRIORITIES FOR THE DAIRY INDUSTRY - Alan Huggins, Dairy Research Foundation, Rosemont, IL
2:40 PM	UPDATE ON FDA DAIRY INITIATIVES - Jerome Kozak, Food and Drug Administration, Washington, DC
3:10 PM	BREAK
3:20 PM	DOOR PRIZE
3:25 PM	ANNOUNCEMENTS
3:30 PM	EUROPEAN PERSPECTIVE ON LISTERIA AND EMERGING PATHOGENS - Dr. David Mossel, University of Utrecht, Utrecht, The Netherlands
4:00 PM	UPDATE ON EMERGING PATHOGENS FOODS - Michael P. Doyle - University of Wisconsin-Madison, Madison, WI

WEDNESDAY - AUGUST 5, 1987
Evening

6:00 - 7:00 PM	RECEPTION
7:00 PM	ANNUAL AWARDS BANQUET

SPOUSE/FRIEND ACTIVITIES

SUNDAY - August 2, 1987
Evening

6:00 PM - 8:00 PM EARLY BIRD RECEPTION (Cheese & Wine - Featuring California Cheeses)

MONDAY - AUGUST 3, 1987
Evening

6:00 PM MEXICAN FIESTA

WEDNESDAY - AUGUST 5, 1987
Evening

6:00 - 7:00 PM RECEPTION
7:00 PM ANNUAL AWARDS BANQUET

SPECIAL EVENTS PROGRAM
Companeros (Companions)
SATURDAY AND SUNDAY - AUGUST 1 & 2, 1987

9:00 AM - 1:00 AM DISNEYLAND - Special group tickets provide entrance to Disneyland via a monorail ride for unlimited use of rides and attractions. Spend a day at Disneyland and go back to your hotel room to relax. Return to the park for the electrical parade which is held each night around 9 p.m. This part of the program is provided on the weekend so the whole family can enjoy the fun. Special prices for Disneyland good only on Saturday and Sunday, August 1 & 2. Adults: $14.25; Children: ages 3-12, $10.75.

MONDAY - AUGUST 3, 1987

9:30 AM - 3:30 PM SOUTH COAST AREA TOUR - Tour the Sout Coast area of Orange County including San Juan Capistrano and Laguna Beach. Visit the Old Mission at San Juan Capistrano and the Sawdust Festival at Laguna Beach. Many other attractions. Lunch is not included. Cost: $12/person.

TUESDAY - AUGUST 4, 1987

8:30 AM - 3:30 PM A DAY OF BEAUTY TOUR - A bus tour to the Merle Norman Classic Beauty Collection at San Sylmar is scheduled. San Sylmar is a treasure house of functional fine art everything inside has been restored to perfect working order... a unique tribute to days gone by. Sorry, children under 12 are not permitted. San Sylmar is a treasure house of beauty, please dress accordingly (no jeans, shorts, halter-tops, or thongs). Child care is available from the Disneyland Hotel for a fee, contact Wendy extension 5527, at the hotel for more information.

On the return trip, a stop will be made at Lawry's Center for lunch and a tour of their processing facilities.

The only costs are for lunch and bus transportation. $26/person.

WEDNESDAY - AUGUST 5, 1987

ORANGE COUNTY SHOPPING MALLS - Shuttle bus tours of Orange County Shopping Malls. This will be by individuals or small groups. Information on malls and shuttle buses will be available at the registration table. Cost will be nominal.

THURSDAY - AUGUST 6, 1987

DAIRY TOUR - Tour of California-style dairies in the Chino and Corona area of Southern California. Also, a visit will be made to Golden Cheese Company of California in Corona. Bus transportation and lunch will be provided.

Program Committee

IAMFES Chairperson . . . . . Leon Townsend
Program Coordinators . . . . . John Bruhn
Joe Smucker

Local Arrangements Committee

Local Arrangements . . . . . Austin Olinger
General Chairperson . . . . . Joe Miranda
Registration . . . . . Howard Eastham
Dick Harrell
John Bruhn
Helene Rubin
Finance . . . . . Jack Michelson
Don Gottschalk
Early Bird Reception . . . . . Paul Virgin
Milk Breaks . . . . . Paul Virgin
(Includes Coffee Hours for Companeros)
Special Events . . . . . Austin Olinger
Donna Marincovich
Marcia McClochin
Visual Aids . . . . . Don Gottschalk
Exhibitor Liason . . . . . Wayne Baragry

IAMFES AMES OFFICE STAFF

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Margaret Marble
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Becky Grinder . . . . . Membership Sales
Nancy Durand . . . . . Membership Sales
Margaret Doyle . . . . . Membership Sales

SPECIAL THANKS TO THE

California Association of Dairy and Milk Sanitarians

The California Local Arrangements Committee

REGISTRATION TIMES

Saturday, August 1 - 8:00 AM - 5:00 PM
Sunday, August 2 - 8:00 AM - 6:00 PM
Monday, August 3 - 8:00 AM - 5:00 PM

ADVANCE REGISTRATION FEES

	Member	Companion(s) Each	Student	Non Member
Registration	___$30	___$10	___Free	___$50
Early Bird Reception*	___Free	___Free	___Free	___Free
Mexican Fiesta**	___$21	___$21	___$21	___$21
Banquet and Reception	___$22	___$22	___$22	___$22

*Indicate attendance
**Children 12 and under $12.50 each. No._____

NOTE, all prices are at least 30% higher at the door. Advance register NOW and Save $ $ $ $. All fees refundable if cancelled prior to July 1, 1987.

EXHIBIT HOURS

Set-up	Sunday, August 2	noon-5 pm
Open	Sunday, August 2	7-9 pm
	Monday, August 3	9 am-noon
	Tuesday, August 4	11 am-1 pm
	Tuesday, August 4	4-6 pm
	Wednesday, August 5	11 am-2pm
Take-down	Wednesday, August 5	2:30 pm

AMES OFFICE PERSONNEL CHANGE

Suzanne Trcka, five-year employee of IAMFES, has taken a new position with Nelson Electric in Ames. She will be acting as their office manager and eventually computerizing their operation. Best wishes for success in her new venture.

Margaret Thornton Marble (Margie), who joined the IAMFES staff and in the latter part of 1986, has replaced Suzanne as Associate Editor of Dairy and Food.

Margie attended the University of Iowa and Des Moines Area Community College, majoring in business. Previous to IAMFES, Margie was with Texas Instruments, Dallas.

Listeria Workshops Completed

More than 1,000 persons from all segments and levels of the dairy industry have attended the five regional listeria workshops sponsored in part by the International Ice Cream Association (IICA). The fifth workshop was held in mid-January in Ft. Lauderdale, FL.

"The workshops were an important and integral step towards successfully controlling the listeria problem, and at the same time, will help minimize or eliminate the likelihood of future microbiological concerns," said Glenn Witte, IICA vice president and responsible for the Association's scientific and health/safety activities.

At the workshops Witte had emphasized the fact that there has not been a single, documented illness caused by or traceable to ice cream, which in a few instances, has been shown to contain *Listeria monocytogenes*.

"When the Food and Drug Administration began its intensified inspections of the dairy industry in April 1986," said Witte, "no one expected to detect listeria in ice cream."

"Many believe that the viability of the organism, or its ability to cause illness, is eliminated by frozen conditions," Witte went on to say. "Furthermore, in the few instances where listeria has been found in ice cream, the organism numbers have been extremely low - as evidenced by the special testing procedures needed to be able to even detect its presence."

The current listeria testing methodology for ice cream necessitates using a rapid growth medium designed to increase the number of organisms present to a detectable level.

The Association, in order to make the extremely useful information presented at the workshops available to anyone interested in the dairy industry, will make a videotape of one of the workshops in the near future. Ordering information will be announced in the near future.

IICA is the trade association for manufacturers and distributors of ice cream and other frozen dessert products. The Association's activities range from lobbying to market research. Its 210 member companies produce an estimated 85 percent of the ice cream and ice cream-related products consumed in the Untied States.

Futuristic Meat Treatment Needs Work, USDA Researcher Says

Irradiation kills bacteria, including Salmonella, in meats. But it will be a while before consumers find irradiated meat on supermarket shelves, according to a U.S. Department of Agriculture food scientist.

Recent research indicates that irradiation also destroys vitamins, and there are other problems, such as packaging, to be worked out, said Donal Thayer, a microbial physiologist and director of the USDA's Food Safety Research Unit. He discussed the technique during a recent visit to the University of Wisconsin-Madison.

Irradiation bombards food with gamma rays or other forms of ionizing radiation. The radiation destroys disease-causing organisms in the food, allowing it to be stored without refrigeration. The technique is now used to kill insects in spices and produce. A mandatory package logo, which looks like a flower blossom, signifies that the contents have been irradiated.

Salmonella is responsible for one-quarter of the food poisonings reported annually in the United States. It causes nausea, vomiting and diarrhea, though it's seldom fatal.

Irradiation, even at relatively low doses, drastically reduces the levels of Salmonella in chicken meat, Thayer said. His research team used gamma rays from a radioactive cesium source to treat mechanically deboned chicken meat. The data from these experiments were used to generate "model systems" from which to make predictions.

Vacuum and temperature are critical in packing and packaging, he said. When the meat was packed in the presence of air, temperature had a great effect on

the amount of Salmonella present. A vacuum slightly reduced the effect of temperature.

The researchers also looked at the effects of low to medium radiation doses on thiamine and other B vitamins in bacon. The army, among others, is interested in shelf-stable bacon products, he said.

Thiamine was destroyed quickly at the irradiation levels required to kill *Clostridium botulinum* bacteria, which cause botulism poisoning. Frying also destroys thiamine. Irradiation levels required for safe extended shelf life destroy nearly half the thiamine in bacon. When it's fried after irradiation, there's virtually no thaimine left, Thayer said. However, bacon fried before irradiation loses less thiamine.

"Some kind of effect occurs when bacon is fried prior to irradiation," he said. For unknown reasons, the remaining thiamine is more stable and resistant to degradation by irradiation, according to Thayer.

"A lot of questions are coming out of these studies," he said.

Some tradeoff may have to be made between nutrition and the convenience of unrefrigerated storage. "Where you need all the thiamine in pork, that would be a concern," Thayer said, but pork provides only 9 percent of a U.S. consumer's thiamine. Labels noting the nutritional changes may be necessary when irradiated pork is marketed, he said.

Only about 15 percent of the thiamine is lost from pork at irradiation levels required for trichina control, he added. Trichina cysts can cause trichinosis in people who eat undercooked pork.

Chicken loses fewer B vitamins when irradiated at levels that allow extended shelf life, Thayer noted.

Several large meat-packers are interested in irradiated meat, Thayer said. But marketing won't happen until someone develops packaging for foods to be irradiated, and the U.S. Food and Drug Administration approves it.

Thayer was the 1986 Halpin lecturer. Halpin lectures are sponsored by the UW-Madison Poultry Science Department in honor of J.G. Halpin, chairman of the department from 1909 to 1952.

American Backflow Prevention Association Prepares for Annual Conference

The third annual American Backflow Prevention Association Conference will focus on increased awareness of cross connections which contribute to contamination of potable water supplies. The Conference will be held in Costa Mesa, California, April 28-30.

Following numerous situations of public water supply contamination, cross-connection control is becoming a legal requirement for many cities and states. Insurance protection for water contamination no longer exits, leaving cities and private citizens financially responsible for contaminants that backflow into the public water supply. Procedures for backflow protection and prevention are in great demand. The Conference will address questions raised in the past year and offer solutions to specific situations.

The first of 12 technical sessions scheduled for the Conference features the technical manager and standards officer at the Water Research Centre in England. This is the first combined effort of England and America to formulate a more comprehensive approach to cross-connection control, based on our shared knowledge.

Other speakers include Environmental Protection Agency officials, public utility managers and legal consultants.

The American Backflow Prevention Association has been in operation since 1984, with regional directors all over the United States and Canada. The major concern of ABPA is protecting the public water supply from backsiphonage and backpressure backflow of hazardous materials that can be inadvertently introduced into the public drinking water system by a consumer. Contamination ranges from insecticides to embalming fluid, and the situations of occurrence are numerous. One of the most common cross-connections stems from residential use of common hose attachments.

For more information, contact: Elizabeth Gold-Rasmussen at 303-451-0980 or Stuart Asay at 303-457-2272.

"Fat-Alert" Campaign

For the past twenty-five years, the American Heart Association has been warning consumers that the American high-fat, high-cholesterol diet increases the likelihood of heart disease and strokes and raises blood pressure to a dangerous level. In 1985 nearly one million Americans died of heart disease - and most of the victims were on high-fat diets.

This past August the AHA recommended that Americans reduce their consumption of fat to thirty percent of their caloric intake. The Food Marketing institute also advised consumers to reduce the fat in their diet as a preventive measure against cancer.

To help Americans take the risk out of their diet, Holly Farms Consumer Information Center (HFCIC), headquartered in Wilkesboro, North Carolina, is launching a "Fat Alert" campaign - an educational program designed to provide consumers with a set of easy-to-follow guidelines for making the shift to a low-fat diet.

"We've invited nutrition expert Annette Warpeha to travel to major U.S. cities as our spokesperson for the "Fat Alert" campaign," said Dr. Kenneth N. May, President and C.E.O. of Holly Farms. Ms.

Warpeha will alert Americans to the importance of lowering their fat intake and explain how to design a personalized low-fat diet which preserves individual eating preferences and cuts down on the amount of fat and cholesterol they consume. The "Fat Alert" campaign will follow guidelines set by the American Heart Association which advocates gradual but steady reduction of fat consumption through subtle modifications of the diet," Dr. May added.

A registered dietitian and frequent lecturer on nutrition, health and behavior modification, Ms. Warpeha will discuss such topics as: how much fat is too much; why all fats are not alike (and how they're different); how to replace fatty food with equally tasty substitutes; and how packing labels disguise high fat content. "Fat Alert" cooking suggestions - low-fat, low-calorie recipes and cooking methods which reduce fat intake - also will be highlighted.

For a set of low-fat chicken recipes and for a "Fat Alert" booklet, write to Holly Farms Consumer Information Center, P.O. Box 88, Wilkesboro, North Carolina 28697.

Holly Farms Poultry Industries, Inc., with headquarters in Wilkesboro, North Carolina, is a subsidiary of the Federal Company in Memphis, Tennessee. Holly Farms is the largest marketer of branded chicken in the United States and operates a total of eight poultry processing plants in North Carolina, Virginia and Texas.

Food Science Facts
For The Sanitarian

Dr. Robert B. Gravani
Cornell University
Ithaca, NY

CHEMICAL FOODBORNE DISEASES

Even though bacterial foodborne diseases accounted for more than 66% of the confirmed outbreaks reported to the Centers for Disease Control (CDC) from 1972 to 1978 (1,2), chemical, parasitic and viral foodborne diseases are also very important. These agents were collectively responsible for about 35% of the outbreaks and caused more than 3,600 reported cases of illness during those years. Figure 1 shows how chemical, parasitic and viral foodborne diseases fit into an overall classification scheme. Since the illnesses caused by these agents need to be better understood by food and nutrition professionals and consumers, the causes and prevention of the diseases will be reviewed in this and the next issue of *Food Science Facts*.

Chemical poisonings usually occur when people consume poisonous substances that occur naturally in some foods or that may be intentionally or accidentally added to foods during harvesting, processing, transportation, storage or preparation (3,4). Chemical food poisonings accounted for about 24% of the confirmed outbreaks of foodborne illness in the U.S. from 1972 to 1978 (1,2). It is important for people who work with food to be aware of chemical food poisoning and ways to prevent it from occurring.

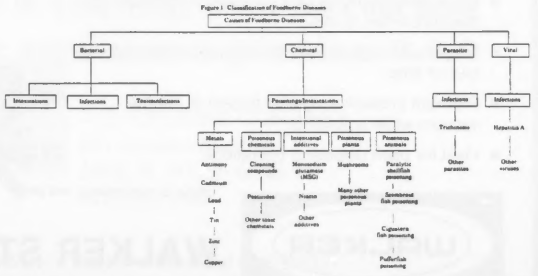
Five major types of chemical food poisoning agents, including metals, poisonous chemicals, intentional food additives, poisonous plants and poisonous animals, will be highlighted and reviewed in this issue of *Food Science Facts*.

Metals

Although small quantities of mineral elements are necessary for human health, excessive amounts of some metals can be toxic (5,6). These toxic metals can get into food through the use of equipment and utensils that are made from unsuitable materials. Acid foods such as fruit juices, fruit punches, carbonated beverages, sauerkraut, tomato juice and fruit gelatin have been involved in chemical poisonings (6). When these acid foods are prepared or stored in equipment containing antimony (gray enamelware), cadmium (plated utensils, refrigerator shelves), lead (glazed earthenware or pottery), tin (uncoated tin containers) and zinc (galvanized containers) the metals dissolve in the food (3,5,6).

Other metals such as copper, which is used to safely carry potable water, can cause gastric disturbances when acid foods or carbonated liquids come in contact with it (5,6). This has occurred in vending machines and carbonated beverage dispensers which were equipped with faulty backflow preventer valves.

The incubation period of metal poisonings ranges from 5 minutes to 8 hours, but is usually less than 1 hour (3,7). Although the symptom of each metal poisoning vary, there are some common gastrointestinal disturbances that are due to the action of the metal in the gut. The salts of the metals can be corrosive and irritate the gastric mucosa, typically resulting in vomiting (7). There may also be nausea, diarrhea, abdominal pain and a metallic taste associated with the poisoning (3,7).



Recently, a classic case of heavy metal poisoning occurred in a junior high school home economics class in California (7). The home economics instructor prepared and stored some homemade punch (consisting of pineapple, pink grapefruit, lemon juice, Kool-Aid® , tropical fruit punch, sugar and water) in a galvanized metal container. The interior of the container was corroded, exposing the underlying metal to the acid ingredients of the punch. Twenty-nine junior high students became ill within the first few minutes after ingesting the punch. Zinc at a level of 2,000 ppm was found in the punch (7).

Metal poisoning can be prevented by:

- using only approved equipment and utensils for preparing, storing, transporting or cooking foods;
- purchasing enameled cookware, earthenware and pottery that are approved for food contact;
- being sure that backflow preventers are installed and properly functioning in vending machines and carbonated beverage dispensers.

Poisonous Chemicals

Since a wide variety of chemicals is used in food processing plants, foodservice establishments, retail stores and homes, it is important to recognize the tremendous benefits and hazards of some of these products (5,6). Chemical compounds (such as cleaners, detergents, sanitizers, pesticides and food additives) used for their intended purposes and in the recommended amounts can be beneficial; however, when used for the wrong purpose or in excessive amounts, they can cause illness and sometimes death.

Cleaning Compounds

Detergents, cleaning compounds, polishes and sanitizers should be handled properly. When these and other chemicals find their way into food, it is usually through inadequate training, neglect, poor housekeeping practices or a variety of other reasons (5,6). People working with food should use these products with care and respect.

Pesticides

Today, many types of specialized pesticides are used to kill insects and rodents where food is grown, processed, stored, prepared and sold. Most pesticides are toxic chemicals, and many can be harmful to humans. They should be handled carefully and safely; in food processing plants, food service establishments and retail stores, they should be applied only by state-certified applicators (5,6). Improperly used pesticides have caused poisonings when they were accidentally mixed in flour (8) and sprayed on oatmeal (9). The indiscriminate use of aerosol pesticides around foods, packaging materials and in food preparation areas should not be overlooked as a source of potential problems (5,6). Label directions providing information on how to use these products should be followed exactly.

Intentional Food Additives

Food additives are used to enhance the flavor, texture, nutritive quality and appearance of foods, as well as to ensure their keeping quality. One food additive, monosodium glutamate (MSG), commonly used to enhance the flavor of foods, particularly oriental foods, has been reported to cause illness when used in excessive amounts (5,6,10). When people who are sensitive to MSG consume from 1.5 - 3.0 g in foods, they can develop the symptoms of MSG poisoning (10,11,12). Since many of these reported outbreaks occur in oriental restaurants (where MSG is commonly used as a flavor enhancer), this type of poisoning is often referred to as "Chinese Restaurant Syndrome" (10,11).

When sensitive individuals eat foods containing excessive amounts of MSG on an empty stomach, the symptoms appear from a few minutes to 2 hours (usually less than 1 hour) after ingestion (3,11). The symptoms include burning sensations in the chest, neck, abdomen or extremities, sensations of lightness, numbness and pressure of the face, and a feeling of chest pains. Flushing of the face, tingling sensations, dizziness, headache and nausea have also been reported (3,10,11). Duration of the illness is usually less than 24 hours and is commonly 2 to 7 hours (3,10). No lasting adverse effects have been reported (12).

Niacin, a B vitamin, is a food additive that is routinely used to enrich grain products to prevent human pellagra (13). When present in excessive amounts, it has caused foodborne illness. Niacin poisoning, like other chemical poisonings, usually occurs from a few minutes to one hour after ingesting foods containing large amounts (100-300 mg) of this vitamin (3,13,14). The symptoms include intense flushing, itching and burning of the face and upper trunk, abdominal discomfort, and sometimes puffing of the face and knees. The symptoms last for a short period of time, usually about an hour with no permanent effects (3,13,14).

Several years ago, an outbreak was reported in Monroe County, New York, where persons who consumed bagels at a brunch became ill (15). An investigation determined that when the flour used for the bagels was enriched at the bakery, a large quantity of niacin was added from an improperly labeled container. Laboratory analysis revealed that each bagel contained about 15 times the Recommended Dietary Allowance for niacin and this excessive amount caused the illness (15).

Chemical foodborne disease caused by poisonous chemicals and intentional additives can be prevented by (5,6):

- using all chemicals for their intended purposes and in the amounts recommended on the label;
- reading and following label directions carefully and accurately;
- storing toxic chemicals in a separate place, away from food preparation and storage areas;
- keeping toxic chemicals properly labeled and in their original containers whenever possible;

• *not* storing or transporting chemicals in containers used to hold food; and
• having state-certified applicators handle and apply pesticides.

Poisonous Plants and Animals

When thinking of chemical food poisoning, it is easy to overlook the fact that many plants and animals used for human food contain natural substances that have toxic properties. In most cases, these foods are avoided, but through lack of understanding, carelessness or misuse, the food may be consumed and poisoning can occur (6,16). Although poisonous plants and animals are present in our environment, proper vigilance keeps them from becoming a significant threat to public health.

Poisonous Plants

A large number of plants are known to cause adverse effects in humans, but most of them are not commonly eaten. Most serious plant intoxications occur as a result of individuals gathering wild foods in the woods (17). People with little knowledge of botany sometimes experiment, taste and ingest unknown plants or plants that are similar in appearance to edible wild varieties (17). Although plant poisonings do not cause a large number of outbreaks, it is important for food professionals to be aware of this category of foodborne diseases.

Plant poisonings are complex, affect different parts of the body and cause a wide variety of symptoms (17). The gastrointestinal system, mouth and liver are most often affected by the ingestion of poisonous plants. Some plant toxins also affect the kidneys, blood, cardiovascular system and the nervous systems (17).

Common plant foods such as rutabagas, turnips, cabbage, kale, broccoli, mustard and other related vegetables contain goitrogens that are capable of blocking the body's abilities to properly absorb adequate amounts of iodine (6,16). When these foods are consumed in normal amounts they cause no problems, but when eaten in excessive amounts for prolonged periods, they can lead to abnormal conditions (6,16). Cooking destroys most of the goitrogenic activity. Even though there are a great number of toxic substances naturally present in plant foods, few hazards exist for healthy people who consume a normal diet (6,16).

Plants and plant parts that have caused human illnesses include Jimson weed, daffodil bulbs, yews, peyote cactus, apricot pits, hemlock, mountain laurel, rhododendron, azalea, mistletoe, rhubarb leaves and many others (3,17). The proper identification of plants, before they are eaten, is very important in preventing these types of foodborne illnesses (17).

The recent trends in eating ethnic foods along with a demand for fresh vegetables and unique plant foods have stimulated a new interest in the use of mushrooms in food cookery (18). With this interest, many people have begun foraging for wild mushrooms which can lead to serious consequences for the uninformed, amateur mushroom hunter.

Although mushroom poisonings occur sporadically in the U.S., outbreaks result when toxic mushrooms, mistaken for edible species, are gathered and eaten (18). Many people naively believe that mushrooms can be easily identified, that all the toxins present can be inactivated by cooking, or that local folklore concerning the location of edible varieties can be trusted (19). There are approximately 5,000 fleshy mushrooms that grow in the U.S. and of these only about 100 are known to produce toxic effects when eaten; fewer than a dozen mushrooms are considered deadly (20).

Mushroom poisoning is very complex. It involves many toxins which possess different properties and can be very uncomfortable, if not deadly. There is no visible sign on any mushroom that indicates whether or not it is toxic. There are visible features that certain groups of poisonous mushrooms share, but no generalization can be applied to all poisonous mushrooms (20). The best way to prevent mushroom poisoning is to never eat a mushroom that has not been identified by an experienced and competent mycologist (20).

Poisonous Animals

It is thought that toxic animals are responsible for more foodborne outbreaks than poisonous plants (6). The tissues of some animals, particularly fish and shellfish, can be naturally toxic to humans even when the meat is fresh. Between 1972-1978, one-half of the outbreaks of chemical foodborne disease were attributed to fish or shellfish toxins (1). Usually, the animal does not show any outward signs of illness and there is no simple way to determine whether a particular animal is poisonous. Most animal toxins are heat stable and are not destroyed by cooking (6,16). Four important foodborne diseases caused by poisonous animals are discussed below.

Paralytic Shellfish Poisoning

Paralytic shellfish poisoning is caused by a neurotoxin produced by certain unicellular algae called dinoflagellates (21,22). The dinoflagellates principally responsible for producing the potent paralytic shellfish toxin (also called saxitoxin) are *Gonyaulax cantenella* and *Gonyaulax tamarensis* (21,22). When the right combination of temperature, salinity, illumination, pH and various food products in the water occurs, these organisms reproduce rapidly (22). When excessive growth occurs, the pigments contained in the algae can cause the water to take on a reddish-brown color. This phenomenon is known as a "red tide" and is often associated with paralytic shellfish poisoning (21,22,23). When filter feeding shellfish such as mussels, clams, scallops and oysters feed on toxic dinoflagellates, they concentrate the neurotoxin in their digestive glands and become toxic to humans (21,22). The amount of toxin in the shellfish depends upon the number of poisonous dinoflagellates in the water and the amount of water filtered by the shellfish 22). The toxin is bound in the shellfish and causes them no harm, but is released when the shellfish are eaten by humans (22). Usual methods of shellfish

cookery including steaming, boiling, baking or frying do not destroy the saxitoxin (21).

Paralytic shellfish poisoning occurs primarily in temperate regions. It has been reported on the west coast of the U.S. between May and October and on the east coast between July and September (21).

The symptoms of shellfish poisoning usually become apparent in less than 1 hour (often within 30 minutes) after eating the toxic mollusks. The symptoms begin with a numbness in the lips, tongue and fingertips. This is followed by numbness in the legs, arms and neck with a general lack of muscular coordination. Other symptoms include dizziness, weakness, drowsiness, incoherence and headache. Respiratory distress and muscular paralysis become more severe as the disease progresses and death can result from respiratory paralysis (3,22).

In the U.S. most victims of paralytic shellfish poisoning are tourists and picnickers who gather shellfish for their own consumption (21). Commercially harvested shellfish have seldom been involved in outbreaks (21).

Health agencies monitor the level of toxin in shellfish during the danger periods (May through October) by collecting samples of mollusks and testing them in the laboratory. If shellfish exceed the safe levels for toxin, the growing area is quarantined and their sale is prohibited (21). In May of 1985, several shellfish beds were closed in the coastal waters of Connecticut and Maine when sampling revealed high concentrations of saxitoxin in these mollusks (24).

Since poisonous shellfish cannot be detected by appearance, odor or any method other than chemical analysis, the best way to prevent paralytic shellfish poisoning is to follow public health agency restrictions on the harvesting of shellfish (21,22,23).

Scombroid Fish Poisoning

This foodborne disease is not caused by fish who become toxic in their habitat, but is caused by the products of bacterial action on the muscles of certain fish after they are caught (22). Scombroid fish poisoning can be caused by scombroid fish such as species of tuna, mackerel, bonito and sometimes by the non-scombroid mahimahi (3,21,22,25,26). These fish normally contain large amounts of the amino acid histidine in their muscle tissues (21,25,26). Under certain environmental conditions, bacteria can convert the histidine in the muscle to histamine. High levels of histamine as well as other heat stable byproducts of bacterial action are thought to be responsible for scombroid fish poisoning (21,25,26).

After the fish are caught, they may be contaminated with bacteria from their skins, the fishing gear, boats or holds (27). If the fish are promptly and properly refrigerated, the bacterial production of histamine is greatly retarded (27). If not, the bacterial conversion of histadine to histamine can occur. Although there are many bacteria that are capable of converting histidine to histamine, *Proteus morganii* has frequently been recovered from fish incriminated in outbreaks of scombroid poisoning (21).

The symptoms of scombroid fish poisoning begin within a few minutes to an hour (usually within 30 minutes) after the toxic fish is ingested (3,21,25,26,27). The illness is characterized by a variety of symptoms that vary in frequency and occurrence. The symptoms can affect the skin (and can cause rash, edema and local inflamation), gastrointestinal tract (abdominal cramps, nausea, vomiting and diarrhea) and the neurological system (headache, palpitations, tingling, flushing, or burning and ditching) (3,25,26,27,28). Most people suffering from scombroid poisoning will experience only a few of these symptoms (28). The illness is generally short lived and recovery usually occurs within 8-12 hours, although some deaths have been reported.

Fish contaminated with "scombrotoxin" may sometimes have a sharp or peppery taste or show signs of honeycombing indicating decomposition (3,25). However, these signs cannot be relied on in all cases, since contaminated flesh may have a normal taste and appearance(25).

Since histamine and related compounds are heat resistant, cooking the contaminated fish cannot be relied upon to prevent illness (21). Prompt and proper refrigeration from the time the fish are caught until they are preserved or processed is essential to prevent scombroid fish poisoning (21,25,26,27). Several outbreaks of this poisoning occur each year off the coast of Long Island when sport fisherman improperly chill scombroid fish.

Ciguatera Fish Poisoning

Ciguatera fish poisoning is caused by a neurotoxin called ciguatoxin that is found in tropical and subtropical reef fish (21,22,25,26,27). Although over 400 fish species have been reported to cause this poisoning, only grouper, skipjack and related species, and red snapper have been consistently reported as vehicles in the U.S. from 1970 to 1978 (21,26). Most of the reported cases ate fish caught from the waters near Florida and Hawaii (21,26). This poisoning also occurs in the Caribbean and Pacific Islands.

Ciguatera poisoning is one of the most complex fish poisonings because of the sporadic and unpredictable nature of the toxicity as well as difficulty in identifying the source of the poison (22,23). Toxicity of a particular fish species will often vary in time and geographic location (23). A fish may be toxic at one reef but safe at another (21,23). Almost all of the fish involved in this type of poisoning are reef or shore species and most are edible (22). It is thought that the fish do not produce the toxin within their bodies, but acquire it through the food chain (22). Current theories suggest that toxic dinoflagellates are a possible source of ciguatoxin (21).

Large fish are more likely to be toxic and to have a higher concentration of toxin (21). The most toxic part of the fish is usually the liver, followed by the intestines, then the testes or ovaries. The muscles are the least toxic (21,25,26,27). The first symptoms of ciguatera poisoning usually occur from a few minutes to 30 hours (average

is 1 to 6 hours) after eating the toxic fish. The symptoms vary greatly but include abdominal cramps, nausea, vomiting and watery diarrhea. In some cases initial symptoms include numbness and tingling of the lips, tongue, nose and throat and a metallic taste (3,25,26,27). Headache, prostration, chills, fever, sensory disturbances and general muscular pain also result. Unusual temperature sensitivities and temporary paralysis have also been reported. Most symptoms subside within a few days, but weakness and sensory disturbances may persist for long periods depending on the severity of the poisoning. Some deaths have been reported (3,22,25,26,27).

Ciguatoxin is heat stable and moves through the food chain without affecting the fish that carry it. There is no reliable method of detecting poisonous fish by their appearance. Methods of preservation like salting and drying as well as cooking procedures such as baking, boiling or frying will not inactivate the toxin (21).

Preventative measures include the following (3,21):

- avoid purchasing fish that have a history of ciguatoxin in the region where this poisoning is frequently reported;
- avoid eating the liver, intestines, roe and gonads of tropical fish;
- avoid eating unusually large reef fish; and
- follow the advice of regional public health agency officials on what fish may be toxic.

Pufferfish Poisoning

Pufferfish poisoning is carried by a variety of fish that are commonly known as pufferfish, globefish, swellfish, balloonfish, fugu and many other names (22,23,25,27). These names come from their ability to inflate themselves to a nearly spherical shape when disturbed (23,25,27). These fish are highly toxic and contain a neurotoxin called tetrodotoxin (22,23,25,27). They are so highly poisonous that the U.S. Food and Drug Administration has banned them from the U.S. There are about 30 species of pufferfish distributed around the world, but most of the poisonous ones are caught along the coasts of Japan and China (22). The toxin is found mainly in the ovaries, liver, intestine, skin and spawn of the fish (22,25,27). The amount of tetrodotoxin in the fish is lowest in the summer months and increases during the winter with a peak just before spawning (22).

Since these fish are considered a delicacy in Japan, the Japanese government strictly regulates the sale of pufferfish and licenses individuals who are properly trained in the identification and removal of the poisonous organs without contaminating the white meat (22).

The symptoms of pufferfish poisoning usually begin with a tingling or prickling sensation of the fingers, toes, lips and tongue within a few minutes after eating the poisonous fish (22). Nausea, vomiting, diarrhea and gastric pain may appear in some cases. As the illness progresses, reflexes are lost, respiratory distress increases and muscular paralysis occurs. If the dose is sufficient, death results from respiratory paralysis (3,22,25,27). Most of the deaths that have been reported in Japan occurred because of ignorance and carelessness in the handling and preparation of the poisonous fish. It is rare that anyone is poisoned from eating fish prepared by licensed pufferfish handlers (22). When traveling Japan, be sure the fugu is prepared by a licensed individual in a reputable restaurant.*

*Author's note - On a recent trip to Japan, the author had the pleasure of watching the preparation of fugu by a licensed chef. No adverse reactions occurred after eating the results of his efforts.

Summary

Chemical foodborne diseases including those caused by metals, poisonous chemicals, intentional food additives, poisonous plants and poisonous animals can be prevented by awareness, education, and the knowledge of the causes of these illnesses.

References

1. Sours, H.E. and D.G. Smith. Outbreaks of foodborne disease in the United States, 1972-1978. *J. of Infect. Diseases*, 142:122-125, 1980.
2. Gravani, R.B. The causes and costs of foodborne disease. *Professional Perspectives*, Division of Nutritional Sciences, Cornell University. Nov./Dec., 1985, 8 pp.
3. Bryan, F.L. *Diseases Transmitted by Foods - A Classification and Summary*. 2nd Ed. Centers for Disease Control, Atlanta, GA, 1982, 101 pp.
4. Gravani, R.B. Bacterial foodborne diseases. *Professional Perspectives*. Division of Nutritional Sciences, Cornell University, Jan./Feb., 1986, 13 pp.
5. Gravani, R.B. Chemical foodborne disease metals and chemical products. *Food Science Facts*. Institute of Food Science, Cornell University, 109:1-3, 1982.
6. Longree, K. *Quantity Food Sanitation*. 3rd Ed. New York: Wiley Interscience, 1980, 456 pp.
7. Division of Environmental Health, Stanislaus Co., CA. Heavy metal poisoning at a high school home economics "food" class. *California Morbidity*, 41:1, 1985.
8. Centers for Disease Control. Organic phosphate poisoning - Brookshire, Texas. *Morbidity and Mortality Weekly Report*, 17(40):376, 1968.
9. Centers for Disease Control. Diazinon poisoning - Hawaii. *Morbidity and Mortality Weekly Report*, 19(13):130-131, 1970.
10. Schaumburg, H.H., R. Byck, R. Gerstl, and J.H. Mashman. Monosodium L-glutamate: Its pharmacology and role in Chinese restaurant syndrome. *Science*, 163:826-828, 1969.
11. Centers for Disease Control. Foodborne Disease Outbreaks, Annual Summary 1981. Issued June, 1983, 41 pp.
12. Harper, A.E. Amino acids of nutritional importance. In *Toxicants Occurring Naturally in Foods, 2nd Ed. Washington DC: National Academy of Sciences, 1973, pp. 130-152.*
13. *Hayes, K.C. and D.M. Hegsted. Toxicity of the vitamins. In Toxicants Occurring Naturally in Foods*. 2nd Ed. Washington, DC: National Academy of Sciences, 1973, pp. 235-253.
14. Gosselin, R.E., H.C. Hodge, R.P. Smith, M.N. Gleason. *Clinical Toxicology of Commercial Products*. 4th Ed. Baltimore, MD: The Williams and Wilkens Co., 1976, p. 173.
15. Centers for Disease Control. Niacin intoxication from pumpernickel bagels - New York. *Morbidity and Mortality Weekly Reports*, 32(33):305, 1983.
16. Gravani, R.B. Chemical foodborne disease - Toxic plants and animals. *Food Science Facts*. Institute of Food Science, Cornell

University, 110:1-3, 1982.
17. Kunkel, D.B. Poisonous plants. In *Clinical Management of Poisoning and Drug Overdose*. L.M. Haddad and J.F. Winchester, Eds. Philadelphia, PA: W.B. Saunders Co., 1983, pp. 317-335.
18. Russo, J.A. and R.B. Gravani. Mushroom Poisoning - A Review for Sanitarians. Institute of Food Science, Cornell University. Manuscript in preparation for publication, 1986, 25 pp.
19. Kulig, K. and B.H. Rumack. Mushrooms. In *Clinical Management of Poisoning and Drug Overdose*. L.M. Haddad and J.F. Winchester, Eds. Philadelphia, PA: W.B. Saunders Co., 1983, pp. 294-303.
20. Lincoff, G. and D.H. Mitchel. *Toxic and Hallucinogenic Mushroom Poisoning*. New York: Van Nostrand Reinhold Co., 1977, 267 pp.
21. Bryan, F.L. Epidemiology of foodborne disease transmitted by fish, shellfish and marine crustaceans in the United States, 1970-1978. *J. Food Protection*, 43:859-876, 1980.
22. Schantz, E.J. Seafood toxicants. In *Toxicants Occurring Naturally in Foods*. Washington, DC: National Academy of Sciences, 1973, pp. 424-447.
23. Haddad, L.H., R.F. Lee, O.J. McConnell and N.M. Targett. Toxic marine life. In *Clinical Management of Poisoning and Drug Overdose*. L.M. Haddad and J.F. Winchester, Eds. Philadelphia, PA: W.B. Saunders Co., 1983, pp. 303-317.
24. Shellfish closings due to evidence of paralytic shellfish poisoning. *Food Chemical News*, June 24, 1985, p. 2.
25. Halstead, B.W. *Poisonous and Venomous Marine Animals of the World*. Princeton, NJ: Darwin Press, 1978, 1043 pp.
26. Hughes, J.M. and M.H. Merson. Fish and Shellfish Poisoning. *N. Engl. J. of Med.*, 295:1117-1120, 1976.
27. Banner, A.H. Hazardous marine animals. In *Forenzic Medicine: A Study in Trauma and Environmental Hazards, Vol. 3, Environmental Hazards*, C.G. Tedeschi, W.G. Eckert and L.G. Tedeschi, Eds. Philadelphia, PA: W.B. Saunders Co., 1977, pp. 1378-1436.
28. Taylor, S.L., J.Y. Hui and D.E. Lyons. Toxicology of scombroid poisoning. In *Seafood Toxins*. E.P. Ragelis, Ed. Washington, DC: American Chemical Society, 1984, pp. 417-430.

New Product News

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

NEM's New Film Program Course On Sanitation And Hygiene

• National Education Media, Inc. (NEM), the world's leading producer of audio-visual training programs for the foodservice industry, has created a new, eight-program Sanitation/ Hygiene Course for Foodservice Personnel.

Programs in this course stress the key responsibility of each foodservice employee - in the kitchen and dining room alike - for protecting the health of guests. The course provides a complete Sanitation/Hygiene and Public Health curriculum by covering topics ranging from the biological reasons for sanitation procedures to the importance of personal grooming and cleanliness.

At the heart of the course are new versions of the two top-selling motion pictures ever produced on the subject: "Sanitation and Hygiene: Why the Importance?" and "Sanitation and Hygiene: Basic Rules." The next two programs feature valuable general lessons for kitchen personnel on rodent and insect control and the care and cleaning of kitchen equipment. Two additional programs are directed specifically at those kitchen personnel responsible for the operation of dish machines and for the handwashing of kitchen utensils and glassware. The next program spells out basic sanitation and hygiene responsibilities for food servers. Rounding out the course is a program that shows all foodservice personnel how to maintain standards of personal grooming and hygiene.

According to NEM president Jack Copeland, "The first rule of foodservice is: "keep it clean.' For nearly two decades our programs have been driving home this vital message to foodservice employees and students throughout the world. It's a practical, universal message that cannot be compromised by any successful foodservice operation."

A NEM System Course Notebook integrates all of the programs in the curriculum. This notebook brings together the Study Guides, Leader's Guides and Lesson Plans for each program. It also furnishes complete instructions for administering the entire course, in either motion picture, videocassette, filmstrip or slide-tape versions.

Customers of the course's program include foodservice operations, schools and hospitals. In addition, health departments have used the programs extensively to show these organizations recommended sanitation and hygiene procedures.

Additional information on this course and other foodservice training programs can be obtained by contacting National Educational Media, Inc., 21601 Devonshire Street, Chatsworth, CA 91311. Telephone: 818-709-6009 or 1-800-245-6009 (outside of California).

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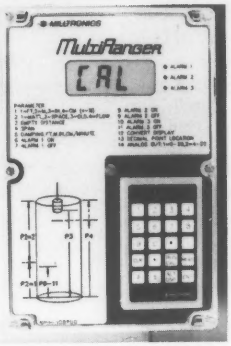

Multiranger

• Milltronics introduces the latest in multifunction level detection. Measure level, differential level, flow, and control multiple pump stations with one set of programmable electronics. Multiranger is applicable to liquids as well as solids. Its electronics enclosure is sealed, and the programmer is removable for convenience in operating additional units. Effective range includes span of 12" through 45 feet. Automatic features are standard with multiranger; velocity/vapor compensation nonvolatile EEPROM memory, tamper-proof security code, and volume conversion are normal inclusions. For free application review, contact: Milltronics, Inc., 709 Stadium Drive East, Arlington, TX 76011. Telephone: 817-277-3543:Telex: 758312.

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Prevent Food Poisoning Bacteria in Dairy Products

• Train your fluid milk plant receiving, processing, packaging and clean-up employees with the new 30 minute cassette, 140 slide set. Processing Fluid Milk was written by Sidney E. Barnard, Extension Food Science Specialist-Dairy with review by fifteen persons in industry, state and federal regulatory, and educational institutions. Photography was by Ronald Matason, photographer for Penn State's College of Agriculture Information Service. You will receive a cassette tape with 1,000 HZ for automatic slide changing and a written script. The slide set will help you train your plant personnel in practices to meet federal and state regulations and standards. Use it at employee meetings or on an individual basis. The slide set, script and cassette tape are available for $100. A purchase order or check payable to: The Pennsylvania State University should be sent to: Sidney E. Barnard, 8 Borland Laboratory, University Park, PA 16802. Telephone: 814-863-3915.

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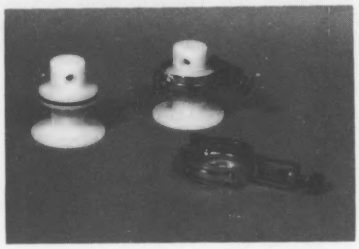

Double-Seat Priming Valve

• For those of you who have return pump CIP systems, you will find this excellent double-seat priming valve to be a fine addition to your return pump applications. This valve will prevent air lock and can easily be vented to a drain to prevent excessive moisture or CIP solutions on the floor. The valve is constructed of FDA approved Delrin®. Remember, solution contact surfaces have an inside radius of 1/4" or more.

For more information, contact: Robert L. Wulfkuhle, Hartel Corporation, 201 North Main Street, P.O. Box 41, Fort Atkinson, WI 53538. Telephone: 414-563-8461; TWX: 910-2260-3734.

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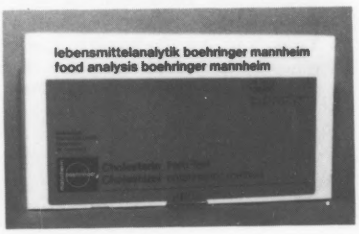

Cholesterol

• Dietary intake of cholesterol and the impact of that intake on health has recently become an area of concern. Boehringer Mannheim Biochemicals now offers a rapid, simple colorimetric method for the determination of cholesterol in a variety of foods.

The kit comes complete with all the necessary reagents to perform 25 to 50 cholesterol determinations and includes a standard solution and detailed package insert for added convenience. Instructions are included for preparing samples of many types of foods including noodles, milk, eggs and others.

For more information, contact: Kristen Kinkade, Boehringer Mannheim Biochemicals, P.O. Box 50816, Indianapolis, IN 46250. Telephone: 317-849-9350 or 800-428-5433.

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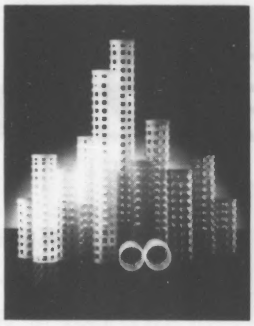

GW Plastics Now Offers Molded Filter Cores

• GW Plastics, a leading producer of precision injection molded thermoplastic components, is now marketing a line of center cores for cartridge filter applications.

Jim Symonds, Manager of Market Development, says that the molded cores have been proven in service for many filtering applications. They are strong, economical and chemical resistant.

GW Plastics' filter cores are available in both a thin-wall and standard-wall version, in lengths from 3.563 inches to 30 inches, and in a variety of materials including polymers suitable for higher temperature and strength applications.

According to Symonds, GW Plastics will produce other lengths of filter cores on a special request basis.

For more information, contact Jim Symonds, GW Plastics, Inc., P.O. Box 56, Bethel, VT 05032. Telephone: 802-234-9941.

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Model MSI-6260 "Trans-Weight" Radio Telemetry Crane Scale

• The MSI-6260 "Trans-Weigh" radio telemetry crane scale is designed to provide a remote weight display for overhead crane hook loads.

The battery powered crane hook unit is linked to a digital indicator via an advanced radio telemetry package eliminating the need for cumbersome power and data cables. Crane loads up to 150 tons and can be measured from a distance instantaneously and accurately without festooning or using cable take-up apparatus. Typical applications for Trans-Weigh are where operator accessibility or visibility to a scale below the hook is prohibited or when data collection through a printer or computer is required.

The scale's digital indicator is housed in stainless steel and sealed for water tight integrity. Using AC or DC power, the indicator features include: Push button ON/OFF, Zero, Tare, Print, and Accumulation. A standard 20 mA current loop output or optional RS232C is available.

The crane hook transmitting unit consists of a heavy duty trinocular load cell protected in a NEMA IV cast aluminum housing. A top lifting eye and swivel hook round out the remainder of the package. Powered by a 12 VDC rechargeable battery, the transmitting unit will operate up to 50 hours continuously between recharging. Transmission distances to 300 feet are easily achieved while maintaining an 0.1% applied load accuracy consistent with NBS HB-44. Unlike other systems on the market, Trans-Weigh will not require end user F.C.C. licensing.

For more information, contact: Measurement Systems International, 12622 Interurban Avenue South, Seattle, WA 98168. Telephone: 206-433-0199; Telex: 32-8005.

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New Bacteria-Free, Unitized Sanitary Tubing Assembly

• Norton Performance Plastics, Akron, Ohio and Sani-Tech, Andover, N.J. have entered an agreement to develop and market a line of unitized, bacteria-free flexible sanitary tubing assemblies under the Sani-Tech® /Tygon® name.

Sani-Tech/Tygon tubing assemblies combine industry preferred Tygon® tubing with the unique connective technology developed by Sani-Tech to eliminate bacteria traps normally found at conventional connection sites.

Sani-Tech produces lightweight non-metallic, non-conductive tubing assemblies, gauges, supports, valves, pumps, spigots, connectors and adaptors compatible with most conventional stainless steel systems.

Norton Performance Plastics, manufacturer of Tygon tubing, is a world-wide organization involved in the processing, development and marketing of superior, technically advanced polymers for use in applications requiring exceptional performance characteristics.

For more information, contact: Ms. Meg DuPont, Sani-Tech, P.O. Box 1010, Andover, NJ 07821. Telephone: 201-597-1313.

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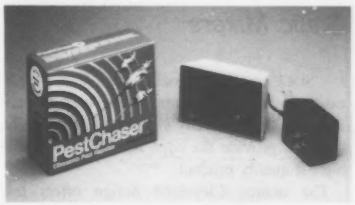

PestChaser® Rodent Repeller Model PC110S

• The PestChaser® Ultrasonic Repeller generates high frequency sound which cannot be heard by human beings or common pets.

This inexpensive non-toxic approach creates an acoustically uncomfortable environment which, given a choice, rodents and other affected pests will avoid. A high quality, well designed ultrasound generator like the PestChaser® can quickly repel rodents from a sound protected area and can provide an ongoing repellent protection.

PestChaser® is the only product of this type Registered for sale by the Canadian Agriculture Dept. for use against rats and mice. Three-year warranty. List $34.95.

For more information, contact: W.L. Robertson, Sonic Technology Products, Inc., 120 Richardson Street, Grass Valley, CA 95945. Telephone: 916-272-4607.

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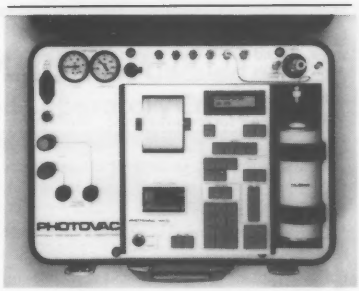

Portable G.C.s With Capillary Columns

• Photovac's award winning series of portable G.C.s are now available with capillary columns.

Extensive field testing has demonstrated appreciable improvements in peak resolution, compound identification and sensitivity. This allows single sample analysis of a greater number of volatile organics per run and therefore better utilizes the automatic sampling, compound identification, quantification and self-calibrating capabilities of these field proven G.C.s.

For more information, contact: Photovac International, Inc., 741 Park Avenue, Huntington, NY 11743. Telephone: 516-351-5809.

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Static Mixers

• Static mixing technology has found application in many segments of the food processing industry. In today's competitive markets, they can provide the edge needed to yield the highest quality product.

The unique Cleveland design offers low capital cost, low energy usage, through minimum pressure drop, and zero maintenance.

This static mixer is distinguished by its inherent ability to achieve a uniform controlled degree of shear and flow - quite unlike mechanical impellers.

The precise geometric arrangement of fixed elements and baffles provides mathematically predictable mixing. The unique element shape provides lower-cost mixing than competitive shapes for both laminar and turbulent flow regimes.

For critical applications, edge-sealed elements are used. Other options include removable, sanitary, and special element designs.

Injectors and sparge systems are used for specific volume, density, and viscosity ratios.

Jacketed units for heating and cooling are optional. SHELL & TUBE designs are engineered for viscous heat transfer problems.

Materials of construction include 316 SS, Teflon, PVC, fiberglass, as well as special alloys.

Food Processing applications include:

Dilution of syrups, molasses, honey, orange juice, Heating of chocolate, Blending tomato puree, Blend cheese and whey, salad dressings, Blend fruit into yogurt,

Ice cream production - blend butterfat stabilizers and emulsifiers

N_2 sparging for cream cheese, mayonnaise, gelatin

Create marbleizing or layering effect

Disperse H_2SO_4 or NaOH into cottonseed, soybean, linseed, soapstock

Carbonate soda, water or beer and other beverages

Enhance phase contact of acid/vegetable oil during stripping

Disperse CO_2 during bolting process

Dilute fruit juice concentrate during packaging

For more information, contact: Cleveland Static Mixing Systems Division of EMI, Inc., P.O. Box 912, Clinton, CT. Telephone: 203-669-1199

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Affiliate News Calendar

1987

April 22-24, SOUTH DAKOTA ENVIRONMENTAL HEALTH ASSOCIATION ANNUAL MEETING, to be held in Aberdeen, SD. For more information, contact: Stan Iwagoshi, South Dakota Dept. of Health, 1320 S. Minnesota Ave., Suite A, Sioux Falls, SD 57105. 605-335-5037.

April 28, ASSOCIATED ILLINOIS MILK, FOOD AND ENVIRONMENTAL SANITARIANS SPRING EDUCATION SEMINAR, a joint conference with the Chicago Dairy Technology Society, to be held at The Holiday Inn, Rolling Meadows, IL 60008. 312-259-5000. For more information contact: Dr. Clem Honer, Gorman Publishing Company, 8750 West Bryn Mawr Ave., Chicago, IL 60631. 312-693-3200.

May 18-20, THE PA DAIRY SANITARIANS & LABORATORY DIRECTORS ANNUAL MEETING, to be held at Penn State University, J. O. Keller Convention Center, State College, PA. For more information contact: Sidney Barnard. 814-863-3915.

August 2-7, CALIFORNIA ASSOCIATION OF DAIRY AND MILK SANITARIANS BUSINESS MEETING, to be held at the Disneyland Hotel in Anaheim, CA. For more information contact: Richard Harrell at 213-757-9719 or Austin Olinger at 818-968-9621.

September 15-16, 1987 ANNUAL CONVENTION OF THE SOUTH DAKOTA STATE DAIRY ASSOCIATION, to be held at Howard Johnson's, Sioux Falls, SD. For more information contact: Shirley W. Seas, South Dakota State Dairy Association, University Dairy Building, Brookings, SD 57007. 605-688-5420.

September 17-18, MINNESOTA SANITARIANS ASSOCIATION ANNUAL MEETING, to be held at the Earle Brown Center, Univ. of Minnesota, St. Paul Campus. For more information contact: Roy E. Ginn, Dairy Quality Control Inst., 2353 N. Rice St., Room 110, St. Paul, MN 55113. 612-484-7269.

September 21-23, NEW YORK STATE ASSOCIATION OF MILK & FOOD SANITARIANS ANNUAL MEETING, to be held at the Sheraton Inn Syracuse, (Liverpool, NY). For more information contact: Paul J. Dersam. 716-937-3432.

September 30-October 2, KANSAS ASSOCIATION OF SANITARIANS ANNUAL MEETING, to be held at the Holidome in Lawrence, Kansas. For more information contact: John M. Davis. 316-268-8351.

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SOUTH COAST AREA TOUR
August 3, Monday
9:30 a.m. - 3:30 p.m.

Tour the South Coast area of Orange County including San Juan Capistrano and Laguna Beach. Visit the Old Mission at San Juan Capistrano and the Sawdust Festival at Laguna Beach. Many other attractions. Lunch is **not** included. Cost: $12/person.

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August 4, Tuesday
8:30 a.m. - 3:30 p.m.

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On the return trip, a stop will be made at Lawry's Center for lunch and a tour of their processing facilities.

The only costs are for lunch and bus transportation. $26.00

ORANGE COUNTY SHOPPING MALLS
August 5, Wednesday

Shuttle bus tours of Orange County Shopping Malls. This will be by individuals or small groups. Information on malls and shuttle buses will be available at the registration table. Cost will be nominal.

DAIRY TOUR
August 6, Thursday

Tour of California-style dairies in the Chino and Corona area of Southern California. Also, a visit will be made to Golden Cheese Company of California in Corona. Bus transportation and lunch will be provided.

SOCIAL EVENTS THROUGHOUT THE MEETING

Cheese & Wine Reception, Sunday Evening
Mexican Fiesta, Monday Evening
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IAMFES

74th Annual Meeting
August 2-6, 1987
Disneyland Hotel
Anaheim, CA

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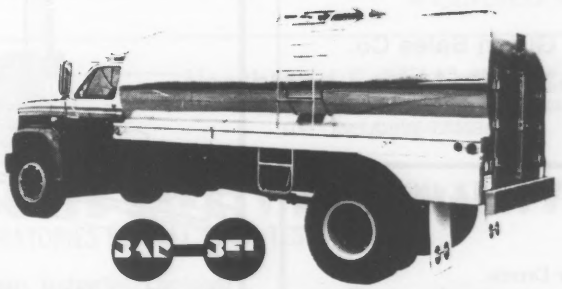

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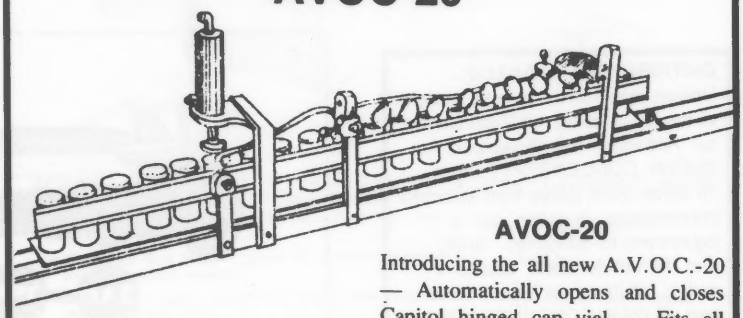

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READER CIRCLE NO. 299

Abstracts of papers in the April Journal of Food Protection

To receive the* Journal of Food Protection *in its entirety each month call 1-800-525-5223, ext. A or 515-232-6699, ext. A in Iowa.

Toxicology Studies of Irradiation-Sterilized Chicken, Donald W. Thayer, John P. Christopher, L. A. Campbell, Dan C. Ronning, Robert R. Dahlgren, Gordon M. Thomson and Eugen Wierbicki, Eastern Regional Research Center, Agricultural Research Service, U.S. Department of Agriculture, 600 East Mermaid Lane, Philadelphia, Pennsylvania 19118

J. Food Prot. 50:278-288

Results of nutritional, genetic, and toxicological studies of shelf-stable chicken sterilized by ionizing radiaiton are presented. No evidence of genetic toxicity or teratogenic effects in mice, hamsters, rats, and rabbits was observed. There was an unexplained reduction in the hatchability of eggs of *Drosophila melanogaster* reared on gamma-irradiated meat. No treatment-related abnormalities or changes were observed in dogs, rats, or mice during multigeneration studies. These nutritional, genetic, and toxicological studies did not provide definitive evidence of toxicological effects in mammals due to ingestion of chicken meat sterilized by ionizing radiation.

Efficacy of Germicidal Hand Wash Agents in Use in a Meat Processing Plant, M. E. Stiles and A. Z. Sheena, Department of Food Science, The University of Alberta, Edmonton, Alberta, Canada T6G 2P5

J. Food Prot. 50:289-295

The in-use efficacy of a selected range of germicidal hand wash agents was tested in a meat processing plant. The hand washes included non-germicidal soaps and germicidal agents containing chlorhexidine, iodophor and Irgasan DP 300 as active ingredients. A laboratory study was done under controlled conditions with standardized procedures for hand washing; in the meat plant, "normal" (unstandardized) hand wash procedures were followed. Levels of contamination on hands varied markedly between work units. Only in the meat cutting area could a significant difference be attributed to hand wash agents against transient-type bacteria on workers' hands. The hand wash agent with 4% chlorhexidine gluconate, the iodophor with 0.75% available iodine and the gel containing 0.3% Irgasan DP 300 were the only products that gave a significantly better reduction of transient bacteria than non-germicidal soap. Transient bacteria were detected on hands after washing, indicating that under the in-use conditions in the meat processing plant, hand wash techniques did not remove all of these bacteria from hands. The plant workers generally indicated a dislike for the iodophor products as hand germicides.

Aerobic Plate Counts of 100-ml Samples in Plastic Bags, Sophia G. Campbell and Paul A. Hartman, Department of Microbiology, Iowa State University, Ames, Iowa 50011

J. Food Prot. 50:296-299

Counts from samples that contained low numbers of bacteria were determined by mixing the samples with double-strength agar media in 42-oz (1.2-L) Whirl-Pak bags. The bag-plate method was compared with other direct-plating methods and the most-probable-number and membrane filtration procedures. Results obtained by using the bag method were as reliable as methods commonly used for analysis of samples that contain low numbers of viable bacteria.

***Campylobacter jejuni* in Vacuum Packaged Processed Turkey,** Gwen N. Reynolds and Frances A. Draughon, Department of Food Technology and Science, University of Tennessee, P.O. Box 1071, Knoxville, Tennessee 37901-1071

J. Food Prot. 50:300-304

This study evaluated the effect of vacuum packaged storage at 4°C upon survival of *Campylobacter jejuni* in processed turkey roll and turkey ham. Turkey ham and turkey roll samples were sliced, inoculated with *C. jejuni,* vacuum packaged, and stored at 4°C for up to 28 d. Three different strains of *C. jejuni* were evaluated. After appropriate incubation, the inoculated samples were analyzed for culturable *C. jejuni*. Control samples were analyzed for aerobic plate count and enterococci. Culturable *C. jejuni* decreased significantly during vacuum packaged storage at 4°C over time ($P<0.05$). A significant difference in viability existed between the three test strains used ($P<0.05$). Higher levels of *C. jejuni* were detected in the turkey roll than the turkey ham. Aerobic plate counts and enterococci increased significantly during storage ($P<0.05$) providing competition for *C. jejuni*. Though survival of *C. jejuni* decreased over time, greater than 500 viable cells per gram were detected with some strains for up to 28 d.

Sodium Benzoate in the Control of Growth and Aflatoxin Production by *Aspergillus parasiticus*, Fathy E. El-Gazzar and Elmer H. Marth, Department of Food Science and The Food Research Institute, University of Wisconsin, Madison, Wisconsin 53706

J. Food Prot. 50:305-309

Sodium benzoate, 0.0, 0.1, 0.2, 0.3 or 0.4%, was added to a glucose-yeast-salts medium which was inoculated with 1 ml of a spore suspension containing 10^8 conidia of *Aspergillus parasiticus* NRRL 2999 and then was incubated at 28°C. Cultures were analyzed after 3, 7 and 10 d for mycelial dry weight, pH and accumulation of aflatoxin B_1 and G_1. Amounts of aflatoxin produced were determined using reversed-phase high performance liquid chromatography (HPLC). The percentage of inhibition or stimulation by the additive was used to make comparisons between treatments and control. Generally, increasing the concentration of sodium benzoate increased the percentage of inhibition at the end of incubation (10 d). However, the average accumulation of mycelial dry weight was greater in the presence of benzoate than in its absence, with the greatest increase occurring when the medium contained 0.3% sodium benzoate.

Effect of Garlic and *Lactobacillus plantarum* on Growth of *Salmonella typhimurium* in Egyptian fresh Sausage and Beefburger, T. El-Khateib and H. Abd El-Rahman, Department of Food Control, Faculty of Veterinary Medicine, Assiut University, Assiut, Egypt

J. Food Prot. 50:310-311

The effects of 3.4 and 5% garlic on the behavior of *Salmonella typhimurium* in Egyptian fresh sausage and beefburger held at 25°C were investigated. Four per cent garlic was bacteriostatic in both products; 5% garlic caused a decrease in the count of organisms of 1 log cycle within 4 d. Counts of *S. typhimurium* in fresh sausage containing *Lactobacillus plantarum* (10^7/g) increased 1 log cycle after 24 h, then the count remained constant through 4 d at 25°C. *L. plantarum*, together with 0.3% glucono-delta-lactone and 2.5% nitrate curing salt, resulted in a 1-log decline in counts during a storage period of 4 d at 25°C.

Microbial Growth in Surimi and Mince made from Atlantic Pollock, Steven C. Ingham and Norman N. Potter, Department of Food Science, Cornell University, Ithaca, New York 14853

J. Food Prot. 50:312-315

Surimi preparation from minced Atlantic pollock decreased protein, fat, and NaCl levels and increased moisture and carbohydrate levels of the mince. Aerobic plate counts and psychrotrophic counts of samples from three trials stored at 5 and 13°C were initially similar, but reached higher levels in surimi with time. The pH of surimi tended to decrease relative to that of mince during storage at both temperatures. Careful handling and storage are equally important for both products if microbiological quality is to be maintained.

Migration of Contaminants from Milk Tubes and Teat Liners, Risto M. Ruuska, Hannu Korkeala, Helena Liukkonen-Lilja, Tapani Suortti and Kalevi Salminen, Department of Food and Environmental Hygiene, College of Veterinary Medicine, P.O. Box 6, SF-00551 Helsinki, Finland, Food Research Laboratory, Technical Research Centre of Finland, and Veterinary Department Ministry of Agriculture and Forestry

J. Food Prot. 50:316-320

The survey tested migration of contaminants from various flexible tubes and teat liners used in milk production. A total of 19 samples were analyzed through sensory evaluation and in migration tests with different simulant liquids. Plasticizers were dissolved in diethyl ether or tetrahydrofuran and analyzed in high performance liquid chromatography (HPLC). The most widely used polyvinyl chloride (PVC) tubes contained 37-40% di-2-ethylhexyl phthalate (DEHP) as plasticizer. In some tubes DEHP was to a great extent replaced by a polymeric plasticizer. DEHP was analyzed with reverse phase HPLC directly from milk in a procedure in which a piece of tube was soaked in milk for 1, 3 and 6 d. Tubes containing polymeric plasticizer lost less DEHP into milk, but relatively more than the tubes plasticized only by DEHP. The evaporation residue for migration tests to water was significantly greater for polyadipate tubes compared with tubes plasticized only by DEHP. The evaporation residue from the water extract of the tubes plasticized by polymeric plasticizer was by mass-spectral analysis found to consist of various hydrolyzation products of polyester from 1,3-butandiol and adipic acid. The results obtained are discussed in the light of toxicological problems connected with plasticizers.

Origin and Prevalence of *Campylobacter jejuni* in Ducks and Duck Meat at the Farm and Processing Plant Level, Manouchehr Kasrazadeh and Constantin Genigeorgis, Department of Epidemiology and Preventive Medicine, School of Veterinary Medicine, University of California, Davis, California 95616

J. Food Prot. 50:321-326

The epidemiology of *Campylobacter jejuni* colonization in poultry at the farm remains unclear. In this study, over a 6-month period, we evaluated the prevalence and possible ways of transmission of *C. jejuni* in a duck farm and a processing plant, belonging to the same company. *C. jejuni* was isolated from fecal ducking samples as early as the 4th day of age while the birds were still on wire. Practically all the birds became positive after the 11th day of age. Based on egg and fecal duckling sample analysis and feeding and water trials with farm and university feed and water, colonization of the birds by *C. jejuni* did not originate from the hatchery. Central feed and water was not a source of colonization for the ducklings. Wild birds and flies were also excluded as a source because their entrance to the houses was improbable during the first 5 days. Ducklings placed in sterile university brooders, located inside the farm brooder houses away from the other birds and given university feed and water were colonized by the 6th and 7th day. The most probable source of colonization by *C. jejuni* was the *C. jejuni* carrier rats and mice found in abundance on the premises. The prevalence of *C. jejuni* in rat fecal contents was 86.7%, and rat and mice droppings were found in the feeding and watering troughs. In the processing plant, *C. jejuni* was isolated from 96.7% of feather picker drip water samples. Isolation rates of *C. jejuni* for the liver, gizzard, heart, and skin samples were 34, 20, 6 and 6.7%, respectively, which are considerably lower than the rates reported for the chickens and turkeys. These lower rates were probably due to passage of the carcasses through two tanks of hot wax after defeathering.

Transfer of Firmly Attached ^{32}*P-Salmonella typhimurium* from Raw Poultry Skin to Other Surfaces, M. O. Carson, H. S. Lillard and M. K. Hamdy, United States Department of Agriculture, Agricultural Research Service, Richard B. Russell Agricultural Research Center, P.O. Box 5677, Athens, Georgia 30613 and Food Science Department, University of Georgia, Athens, Georgia 30602

J. Food Prot. 50:327-329

Salmonellae adhere firmly to poultry skin during processing. Loosely attached bacteria cross-contaminate work surfaces. This study was undertaken to determine if firmly attached bacteria present a health hazard through transfer to work surfaces. Attached ^{32}P-labeled *S. typhimurium* cells were serially rinsed with 2 to 4 L of *Salmonella*-free potable tap water or with sterile 0.85% NaCl. Rinsing removed 61 to 89% of attached labeled cells. However, after rinsing, 11 to 39% of cells remained attached, and of these, 3 to 10% were able to detach and transfer from skin to stainless steel surfaces. It was concluded that large rinse volumes may not remove all attached salmonellae from poultry skin surfaces and the potential for cross-contamination does exist.

Risk of Growth and Toxin Production by *Clostridium botulinum* Nonproteolytic Types B, E, and F in Salmon Fillets Stored Under Modified Atmospheres at Low and Abused Temperatures, Genero W. Garcia, Constantin Genigeorgis and Seppo Lindroth, Department of Epidemiology and Preventive Medicine, School of Veterinary Medicine, University of California, Davis, California 95616

J. Food Prot. 50:330-336

In factorial design experiments we inoculated fresh salmon fillets with a spore pool of 13 nonproteolytic strains of *Clostridium botulinum* type B, E, and F at 6 levels (10^{-1} to 10^{4}/50 g of fillet), and incubated at 1, 4, 8, 12 and 30°C under modified atmospheres (MA) of vacuum, 100% CO_2 and 70% CO_2 + 30% air for up to 60 d. The earliest time we detected toxin in the fillets at 30, 12 and 8°C, irrespective of MA, was after 1, 3-9 and 6-12 d of storage and required 10^{0}-10^{3}, 10^{1}-10^{3}, 10^{1}-10^{2} spores/fillet. The probability (P) of toxin production was significantly ($P<0.05$) affected by temperature (T), MA storage time (ST), MA × T, MA × ST and T × ST. Only type B toxin was detected in the toxic fillets. No toxin was detected in fillets stored at 4°C for up to 60 d. Toxin detection coincided with spoilage at 30°C, but preceded spoilage at 8 and 12°C, and followed spoilage at 4°C. Using linear and logistic regression analysis, best fit equations were derived relating the length of the lag phase and P of toxin production to T, ST, MA and spore inoculum level.

Quantitation of Growth of Mold on Cheese, Ahmed E. Yousef and Elmer H. Marth, Department of Food Science and the Food Research Institute, University of Wisconsin-Madison, Madison, Wisconsin 53706

J. Food Prot. 50:337-341

Earlier work by others indicated that a mold colony grows radially at a constant rate on solid media. This concept was used in our study to develop a method for quantifying growth of mold on cheese. The ability of molds to grow on cheeses or pasteurized process cheese made with or without addition of sorbate was compared. Cheeses tested were mild Cheddar, aged Cheddar, aged-smoked Cheddar, brick and pasteurized process cheese. Pasteurized process cheeses were made from the natural cheeses by addition of water and a phosphate salt, then the mixture was heated. Some pasteurized process cheese from mild Cheddar was made to contain 0-500 ppm sorbic acid. Natural cheeses were sliced under aseptic conditions and were placed in sterile petri-plates. The hot and molten pasteurized process cheeses were poured into petri-plates. A spore suspension of *Aspergillus parasiticus* or *Penicillium camemberti* was inoculated onto the center of the cheese slice or pasteurized process cheese, and plates were covered and incubated at 22°C. The radius of mold colonies was measured at 24-h intervals. Data were analyzed by linear regression and lag period and rate of radial growth were calculated. Mold colonies grew radially at constant rates on cheeses and pasteurized process cheese. Lag in growth of each mold was longest on aged Cheddar cheese and pasteurized process cheese made from it, whereas it was shortest on mild Cheddar, brick and pasteurized process cheeses made therefrom. *A. parasiticus* grew faster on all cheeses and

pasteurized process cheeses than did *P. camemberti*. Aged Cheddar cheese and pasteurized process cheese made from it effectively slowed the growth of both molds that were studied. Pasteurized process cheese containing sorbic acid inhibited growth of both molds. Generally, the higher the concentration of sorbic acid in the pasteurized process cheese, the slower was mold growth and the longer was the lag period.

Using the Straight-Line Semilogarithmic Microbial Destruction Model as an Engineering Design Model for Determining the F-Value for Heat Processes, I. J. Pflug, Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles Avenue, St. Paul, Minnesota 55108

J. Food Prot. 50:342-346

The objective of this review paper is to support the use of the semilogarithmic microbial destruction model as a tool for arriving at an appropriate heat process F_T-value. Both "science" and "engineering" are important in preserving food; however, the actual heat processing of the food product is an engineering operation and requires an engineering approach. The characteristics of an engineering design model are discussed and are contrasted with the requirement of a model to fit scientific data. A case is made for the use of the simple semilogarithmic model as an engineering design model for determining the heat process F_T-value. An example is presented regarding how the model can be used to understand the effect of a change in product initial microbial load on the number of observed failures.

Endpoint of a Preservation Process, I. J. Pflug, Department of Food Science and Nutrition, University of Minnesota, 1334 Eckles Avenue, St. Paul, Minnesota 55108

J. Food Prot. 50:347-351

In this report a case is made for food microbiologists to define or locate the endpoint of a preservation process using a numerical specification rather than descriptive terms. Examples of numerical specifications are presented. It is recommended that the specification be on the basis of one unit where the endpoint specification is the probability of a nonsterile unit (PNSU). Procedures for experimentally establishing or verifying the preservation process necessary to produce the endpoint specification are described.

Calendar

1987

April 22-24, NATIONAL DAIRY PROMOTION & RESEARCH BOARD ANNUAL MEETING, to be held in Washington, DC. For more information, contact: Ron Hamel, 2111 Wilson Blvd., #600, Arlington, VA 22201.

April 22-24, INDUSTRIAL BIOLOGICAL WASTEWATER TREATMENT SYSTEMS, to be held in Atlanta, GA. For more information, contact: The Center For Professional Advancement, 46 West Ferris Street, East Brunswick, NJ 08816. 201-238-1600.

April 26-28, LA-MS DAIRY PRODUCTS ASSOCIATIONS, INC. ANNUAL CONVENTION (JOINT), to be held at the Broadwater Beach Hotel, Biloxi, MS. For more information, contact: Gerald Simmons, P.O. Box 1006, Baton Rouge, LA 70821 or Edward W. Custer, P.O. Drawer AX, Miss. State, MS 39762.

April 27-28, MOLD MONITORING AND CONTROL FOR FOOD PROCESSORS, to be held in Manhattan, Kansas. For more information, contact: Office of Registrar, Sanitation Education Department, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750 or 800-633-5137.

April 27-30, AOAC SPRING TRAINING WORKSHOP AND EXPOSITION, to be held at the Skyline Hotel, 101 Lyon Street, Ottawa, Ontario, Canada. For more information, contact: Graham MacEachern, Agriculture Canada, Laboratory Service Building 22, Central Experimental Farm, Ottawa, Ontario, Canada K1A-0C5 (613) 994-1991 or James Lawrence, Health & Welfare Canada, Health Protection Branch, Tunneys Pasture, Ottawa, Ontario, Canada K1A-0L2. 613-990-8495.

April 27-May 1, INDUSTRIAL EMISSION AND AIR QUALITY MONITORING, to be held in Toronto. For more information, contact: The Center For Professional Advancement, 46 West Ferris Street, East Brunswick, NJ 08816. 201-238-1600.

April 28, ASSOCIATED ILLINOIS MILK, FOOD AND ENVIRONMENTAL SANITARIANS SPRING EDUCATIONAL SEMINAR, a joint conference with the Chicago Dairy Technology Society, to be held at The Holiday Inn, Rolling Meadows, IL 60008. 312-259-5000. For more information, contact: Dr. Clem Honer, Gorman Publishing Company, 8750 West Bryn Mawr Ave., Chicago, IL 60631. 312-693-3200.

April 28-30, 3RD ANNUAL AMERICAN BACKFLOW PREVENTION ASSOCIATION CONFERENCE, to be held in Costa Mesa, CA. For more information, contact: Elizabeth Gold-Rasmussen or Stuart Asay, P.O. Box 835, Broomfield, CO 80020-0835. 303-451-0980 or 303-457-2272.

April 29, FOOD SAFETY AND SANITATION WORKSHOP FOR THE FOOD PROCESSING AND FOOD SERVICE INDUSTRIES, to be held at the Inn at the Park, Anaheim, CA. For more information, contact: Kathryn Boor, Food Science and Technology, UCD, Davis, CA 95616. 916-752-1478.

April 29, CORNELL'S INSTITUTE OF FOOD SCIENCE SPRING CONFERENCE, to be held at the White Plains Hotel in White Plains, NY. For more information, contact: Dr. John Kinsella, Chairman, Institute of Food Science, Dept. of Food Science, Stocking Hall, Ithaca, NY 14853. 607-255-7616.

May 3-5, GEORGIA DAIRY PRODUCTS ASSOCIATION ANNUAL CONVENTION, to be held at the Callaway Gardens, Pine Mountain, GA. For more information, contact: Pat Hamlin, P.O. Box 801, Macon, GA 31208

May 3-5, TENNESSEE - KENTUCKY DAIRY PRODUCTS ASSOCIATION ANNUAL CONVENTION, to be held at the Opryland Hotel, Nashville, TN. For more information, contact: T. Harold Rose, Tenn. Dairy Products Assn., 4117 Crestridge Dr., Nashville, TN 37204.

May 3-8, FOOD MICROSTRUCTURE, to be held at the Hamilton Convention Center in Hamilton, Ontario, Canada. For more information, contact: Om Jahari at the SEM Office, Chicago, IL 60666-0507. 312-529-6677.

May 4-6, TECHNIQUES IN MEASUREMENT, to be held in Palo Alto, California. Pre-registration required. For more information, contact: Herbert Stone, President, Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833 or Telex WUI 6502215776 (access MCI).

May 4-7, HAZARDOUS WASTE MANAGEMENT, to be held in New Jersey. For more information, contact: The Center For Professional Advancement, 46 West Ferris Street, East Brunswick, NJ 08816. 201-238-1600.

May 4-8, AIB'S SAFETY SEMINAR, to be held in Manhattan, KS. For more information, contact: Office of Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750 or 1-800-633-5137.

May 4-8, NATIONAL CONFERENCE ON INTERSTATE MILK SHIPMENTS, to be held at the St. Louis Marriott, St. Louis, MO. For more information, contact: Herb Vaux, 1235 Medinah Drive, Ft. Meyers, FL 33907.

May 5-7, THE ADMINISTRATIVE ASSISTANT, to be held in New Jersey. For more information, contact: The Center For Professional Advancement, 46 West Ferris Street, East Brunswick, NJ 08816. 201-238-1600.

May 11-14, WESTERN NEW YORK IFT SYMPOSIUM, Better Process Control School, Rochester, NY. For more information, contact: Donald L. Downing, Cornell University - NYSAES, Geneva, NY 11456. 315-787-2273.

May 11-14, PURDUE ASEPTIC PROCESSING AND PACKAGING WORKSHOP. For more information, contact: James V. Chambers, Food Science Department, Smith Hall, Purdue University, West Lafayette, IN 47907. 317-494-8279.

May 11-15, APPLICATIONS AND TROUBLESHOOTING MICROPROCESSOR CONTROL CIRCUITS, to be held in Manhattan, Kansas. For more information, contact: Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, KS 66502. 913-537-4750 or 800-633-5137.

May 12-14, PENNSYLVANIA ASSOCIATION OF MILK DEALERS 1987 CONVENTION, to be held at the Hotel Hershey, Hershey, PA. For more information, contact: Earl Fink, 100 Walnut Street, Harrisburg, PA 17101.

May 12-15, WORKSHOP IN INSTRUMENT SERVICE AND REPAIR, to be held at the Anderson training facility and dairy processing plant in Fultonville, NY. For more information, contact: Michael D. Cunningham, Anderson Instrument Company, Inc., R.D. 1, Fultonville, NY 12072. Telephone: 518-922-5315.

May 17-19, 23RD ANNUAL SEMINAR AND EXPO OF THE INTERNATIONAL DAIRY-DELI ASSOCIATION, to be held in Miami Beach, FL. For more information, contact: The International Dairy-Deli Association, P.O. Box 5501, Madison, WI 53705. 608-238-7908.

May 17-20, CANADIAN INSTITUTE FOR FOOD SCIENCE & TECHNOLOGY ANNUAL MEETING, to be held at the Hamilton Convention Centre, Hamilton, Ontario. Theme: Biotechnology - Challenge for the Food Industry. For more information, contact: Dr. V. F. Rasper, Conference Chairman, Department of Food Science, University of Guelph, Guelph, Ontario N1G 2W1. 519-824-4120.

May 17-20, DAIRY INSTITUTE OF CALIFORNIA ANNUAL SPRING MEETING, to be held at La Quinta Resort in Palm Springs, CA. For more information, contact: Robert D. Boynton, Suite 718, 1127 - 11th Street, Sacramento, CA 95814.

May 18-20, EVALUATION AND CONTROL OF PROCESS HAZARDS, to be held in New Jersey. For more information, contact: The Center For Professional Advancement, 46 West Ferris Street, East Brunswick, NJ 08816. 201-238-1600.

May 19-21, THE ADMINISTRATIVE ASSISTANT, to be held in Chicago, IL. For more information, contact: The Center For Professional Advancement, 46 West Ferris Street, East Brunswick, NJ 08816. 201-238-1600.

May 19-21, BASIC PASTEURIZATION COURSE, to be held at the Travellodge in El Paso, Texas, 915-544-3333. For more information, contact: Ms. Janie Park, TAMFES, P.O. Box 2363, Cedar Park, Texas 78613-2363. 512-458-7281.

May 27-29, AQUATIC TOXICITY REDUCTION IN INDUSTRIAL EFFLUENTS, to be held in New Jersey. For more information, contact: The Center For Professional Ad-

vancement, 46 West Ferris Street, East Brunswick, NJ 08816. 201-238-1600.

May 31-June 3, NEW YORK STATE DAIRY FOODS INC. ANNUAL MEETING, to be held at the Nevele Country Club, Ellenville, NY. For more information, contact: Edmund J. Towle, 41 State Street, Albany, NY 12207.

May 31-June 4, AMERICAN SOCIETY OF BREWING CHEMISTS 53RD ANNUAL MEETING, to be held at the Hyatt Regency in Cincinnati, Ohio. For more information, contact: ASBC Headquarters, 3340 Pilot Knob Road, St. Paul, MN 55121. 612-454-7250 or Telex (MCI/WUI) 6502439657.

June 1-4, HAZARDOUS WASTE MANAGEMENT, to be held in Los Angeles, CA. For more information, contact: The Center For Professional Advancement, 46 West Ferris Street, East Brunswick, NJ 08816. 201-238-1600.

June 1-4, INCINERATION OF HAZARDOUS AND NON-HAZARDOUS WASTE, to be held in Chicago, IL. For more information, contact: The Center For Professional Advancement, 46 West Ferris Street, East Brunswick, NJ 08816. 201-238-1600.

June 1-5, INDUSTRIAL EMISSION AND AIR QUALITY MONITORING, to be held in Atlanta, GA. For more information, contact: The Center For Professional Advancement, 46 West Ferris Street, East Brunswick, NJ 08816. 201-238-1600.

June 2-4, THE ADMINISTRATIVE ASSISTANT, to be held in the San Francisco Bay Area, CA. For more information, contact: The Center For Professional Advancement, 46 West Ferris Street, East Brunswick, NJ 08816. 201-238-1600.

June 15-17, FLORIDA DAIRY PRODUCTS ASSOCIATION ANNUAL CONVENTION, to be held at the Boca Raton Hotel & Club, Boca Raton, FL. For more information, contact: J. R. Antink, 14 E. Washington St., Suite 315, Orlando, FL 32801.

June 15-18, BASIC FOOD PLANT MICROBIOLOGY, to be held in Manhattan, Kansas. For more information, contact: Melinda Enns at 1-800-633-5137 or write: Registrar, American Institute of Baking, 1213 Bakers Way, Manhattan, Kansas 66502.

June 17-19, ARKANSAS DAIRY PRODUCTS ASSOCIATION 52ND ANNUAL CONVENTION, to be held at the Holiday Inn Lake Hamilton, Hot Springs, AR. For more information, contact: Floyd Smith, P.O. Box 4187, Asher Ave. Station, Little Rock, AR 72214.

July 10-18, SEVENTH INTERNATIONAL WORKSHOP ON RAPID METHODS AND AUTOMATION IN MICROBIOLOGY, to be held at Kansas State University, Manhattan, KS. For more information, contact: Dr. Daniel Y.C. Fung, Director of the workshop. 913-532-5654.

July 14-16, BASIC PASTEURIZATION COURSE, to be held in San Antonio, Texas. Location to be announced. For more information, contact: Ms. Janie F. Park, TAMFES, P.O. Box 2363, Cedar Park, Texas 78613-2363. 512-458-7281.

July 27-30, LIQUITEC EXPO '87 TECHNICAL WORKSHOPS AND EDUCATIONAL SEMINARS, to be held at the Philadelphia Civic Center. For more information, contact: Liquitec Expo '87, Box 630, West Paterson, NJ 07424. 201-256-0011.

August 2-4, WEST VIRGINIA DAIRY PRODUCTS ASSOCIATION ANNUAL MEETING (75TH ANNIVERSARY), to be held at the Greenbrier, White Sulphur Springs, WV. For more information contact: Paul M. Smith, Room 1054 Ag. Sci. Bldg., Box 6108, Morgantown, WV 26506-6108.

August 2-6, IAMFES 74TH ANNUAL MEETING, to be held at the Disneyland Hotel, Anaheim, California. For more information, contact Kathy R. Hathaway, IAMFES, Inc., PO Box 701, Ames, IA 50010. 800-525-5223, in Iowa 515-232-6699.

August 5-7, IOWA DAIRY FOODS ASSOCIATION ANNUAL CONVENTION, to be held at the Village West, Lake Okoboji, IA. For more information, contact: John R. Brockway, 1805 74th Street, Des Moines, IA 50322.

August 9-14, ANNUAL MEETING OF THE SOCIETY FOR INDUSTRIAL MICROBIOLOGY, to be held at The Hyatt Regency Hotel, Baltimore, Maryland. For more information, contact: Mrs. Ann Kulback, SIM, P.O. Box 12534, Arlington, VA 22209. 703-941-5373.

August 16-18, WISCONSIN DAIRY PRODUCTS ASSOCIATION, INC. JOINT ANNUAL MEETING & CONVENTION WITH MIDWEST DAIRY PRODUCTS ASSOCIATION, INC., to be held at The Abbey on Lake Geneva, Fontana, WI. For more information, contact: Norm E. Kirschbaum, 1400 E. Washington Ave., Suite 185, Madison, WI 53703.

August 16-18, MICHIGAN DAIRY FOODS ASSOCIATION ANNUAL CONVENTION, to be held at Boyne Highlands Resort, Harbor Springs, MI. For more information, contact: Frank Koval, 748 N. Cedar St., Lansing, MI 48906.

August 31-September 4, 71ST ANNUAL SESSIONS OF THE INTERNATIONAL DAIRY FEDERATION, to be held in Helsinki, Finland. For more information, contact: Harold Wainess, Secretary, U.S. National Committee of the IDF (USNAC, 464 Central Avenue, Northfield, IL 60093. 312-446-2402.

September 1-2, FOOD PROCESSING WASTE CONFERENCE, Radisson Hotel, Atlanta, GA. For more information, contact: Edd Valentine or Chuck Ross, Georgia Tech Research Inst., Economic Development Laboratory, Environmental, Health and Safety Division, O'Keefe Building, Atlanta, GA 30332. 404-894-3412.

September 8-10, BASIC PASTEURIZATION COURSE, to be held at the Viscount Hotel in Houston, Texas, 713-526-4571. For more information, contact: Ms. Janie F. Park, TAMFES, P.O. Box 2363, Cedar Park, TX 78613-2363. 512-458-7281.

September 9-10, NEBRASKA DAIRY INDUSTRIES ASSOCIATION ANNUAL CONVENTION, to be held at the Best Western Regency West, Omaha, NE. For more information, contact: Michael Liewen, 134 Filley Hall, University of Nebraska, Lincoln, NE 68583-0919.

September 9-10, UNITED DAIRY INDUSTRY ASSOCIATION ANNUAL MEETING, to be held at the Marriott O'Hare, Chicago, IL. For more information, contact: Edward A. Peterson, 6300 N. River Road, Rosemont, IL 60018.

September 10-13, DAIRY PRODUCTS INSTITUTE OF TEXAS FALL BOARD OUTING, to be held at Horseshoe Bay Resort, TX. For more information, contact: Glenn R. Brown, 201 Vaughn Building, Austin, TX 78701.

September 14-15, ASSOCIATED ILLINOIS MILK, FOOD, AND ENVIRONMENTAL SANITARIANS FALL SEMINAR AND ANNUAL MEETING, a joint conference with the Chicago Dairy Technology Society. For more information, contact: Dr. Clem Honer, Secretary Associated Milk, Food and Environmental Sanitarians, Gorman Publishing Co., 8750 W. Bryn Mawr, Chicago, IL 60631. 312-693-3200.

September 14-17, AOAC TO HOLD 101ST ANNUAL INTERNATIONAL MEETING, to be held at The Cathedral Hill Hotel, in San Francisco. For more information, contact: the AAOAC office at 1111 N. 19th St., Suite 210, Arlington, VA 22209. 703-522-3032.

September 20-23, NATIONAL DAIRY COUNCIL OF CANADA 70TH ANNUAL CONVENTION, to be held at the Quebec Hilton, Quebec, Canada. For more information, contact: Dale A. Tulloch, 141 Laurier Avenue West, Ottawa, Ontario, Canada K1P 5J3.

September 24-25, SWEETENERS IN FOODS: SENSORY, PROCESSING AND HEALTH ASPECTS, to be held at Kansas State Union, Kansas State University, Manhattan, KS. For more information, contact: Dr. Carol Setser or Dr. Karen Penner, Department of Foods and Nutrition, Justin Hall, Kansas State University, Manhattan, KS. 913-532-5508.

September 28-29, SEMINAR ON "CONTEMPORARY QUALITY ASSURANCE," jointly sponsored by the International Dairy Federation and USNAC. To be held in McCormick Place, Chicago, IL. For more information, contact: Harold Wainess, Secretary, U.S. National Committee of the IDF (USNAC), 464 Central Avenue, Northfield, IL 60093. 312-446-2402.

October 5-9, 13TH INTERNATIONAL SYMPOSIUM OF THE IUMS-ICFMH & FECS-WPFC, "Toxins in Foodborne Disease" and "Microbiology of Drinking Water," to be held in Halkidiki, Greece. For more information, contact: Prof. J. A. Papadakis, Omirou 24, 10672 Athens, Greece.

October 18-21, CORNELL SYMPOSIUM ON CHEESE BIOTECHNOLOGY AND

INTERNATIONAL FOOD DEVELOPMENT, to be held at Cornell University, Ithaca, NY. For more information, contact: Richard A. Ledford, Chairman, Department of Food Science, Cornell University, Ithaca, NY 14853-7201. 607-255-7616.

October 19-21, DESCRIPTIVE ANALYSIS, to be held in Palo Alto, California. Preregistration required. For more information, contact: Herbert Stone, President, Tragon Corporation, 365 Convention Way, Redwood City, CA 94063. 415-365-1833 or Telex WUI 6502215776 (access MCI).

November 8-11, DAIRY INSTITUTE OF CALIFORNIA ANNUAL FALL MEETING, to be held at The Lodge, Pebble Beach, CA. For more information, contact: Robert D. Boynton, Suite 718, 1127 - 11th Street, Sacramento, CA 95814.

November 10-12, BASIC PASTEURIZATION COURSE, to be held in Texarkana, Texas. Location to be announced. For more information, contact: Ms. Janie F. Park, TAMFES, P.O. Box 2363, Cedar Park, Texas 78613-2363. 512-458-7281.

November 15-18, SOUTHERN ASSOCIATION OF DAIRY FOOD MFRS., INC. 73RD ANNUAL CONVENTION, to be held at Colonial Williamsburg Foundation, Williamsburg, VA. For more information, contact: John E. Johnson, P.O. Box 10506, Raleigh, NC 27605

November 30-December 3, NATIONAL MILK PRODUCERS FEDERATION ANNUAL MEETING, to be held at the Hyatt Regency, New Orleans, LA. For more information, contact: James C. Barr, 1840 Wilson Blvd., Arlington, VA 22201.

November 30-December 4, THE FIRST LATIN AMERICAN CONGRESS ON FOOD MICROBIOLOGY AND THE I ARGENTINE SYMPOSIUM ON PRESERVATION OF FOODS, to be held in Buenos Aires, Argentina. For more information, contact: Dr. Ricardo Sobol, Secretary General, Bulnes 44 P.B. "B", 1176 Buenos Aires, Argentina. Additional information: Dr. Fernando Quevedo, 525 Twenty Third St., N.W., Washington, D.C. 20037.

December 8-11, WORKSHOP IN INSTRUMENT SERVICE AND REPAIR, to be held at the Anderson training facility and dairy processing plant in Fultonville, NY. For more information, contact: Michael D. Cunningham, Anderson Instrument Company, Inc., R.D. #1, Fultonville, NY 12072. Telephone: 518-922-5315.

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October 9-13, AACC ANNUAL MEETING, to be held at the Hotel InterContinental San Diego, in San Diego, California. For more information, contact: Raymond J. Tarleton, American Assoc. of Cereal Chemists, 3340 Pilot Knob Road, St. Paul, MN 55121. 612-454-7250.

July 31-August 4, IAMFES 75th ANNUAL MEETING, to be held at the Hyatt Regency Westshore, Tampa, FL. For more information contact Kathy R. Hathaway, IAMFES, Inc., P.O. Box 701, Ames, IA 50010. 800-525-5223, in Iowa 515-232-6699.

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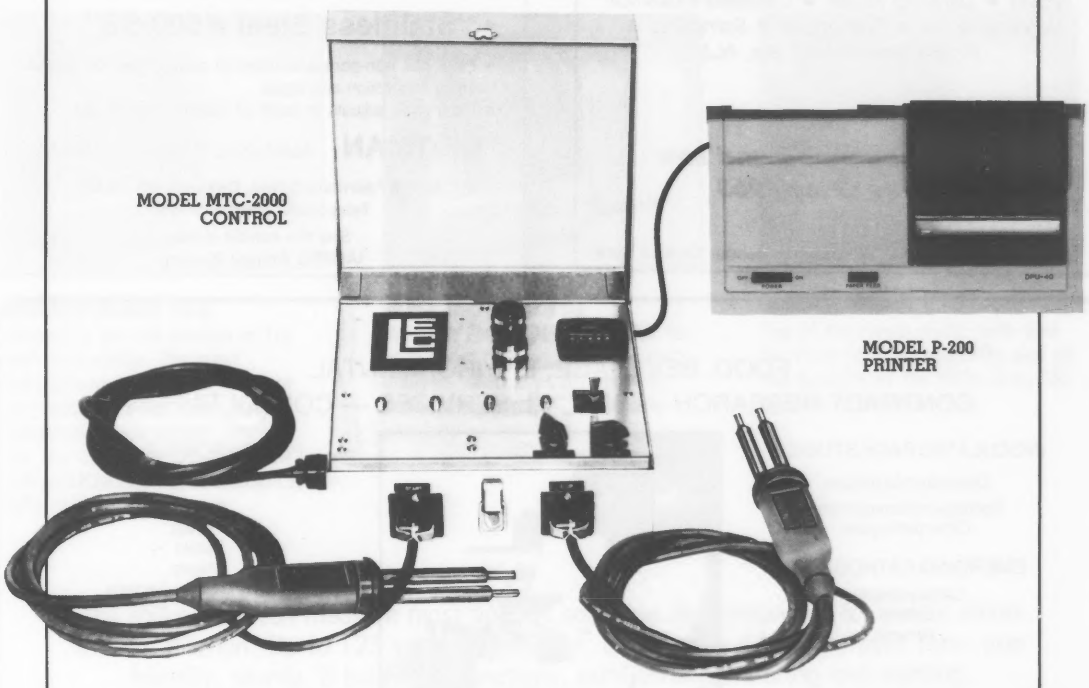

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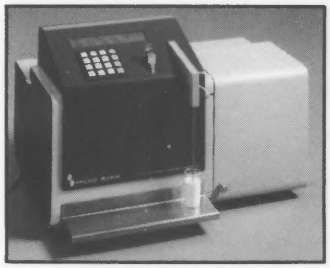

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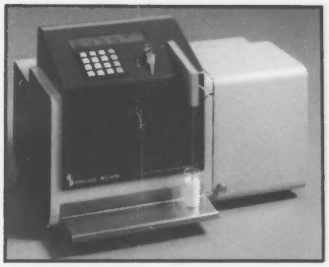

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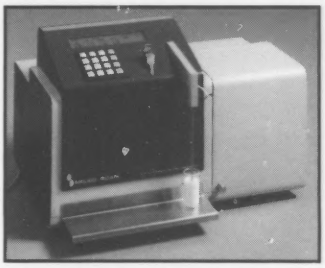

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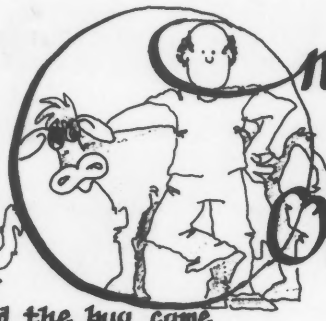

One Cow, One Cow, that father bought for two zuzim, One Cow, One Cow,

And the bug came
and infected the cow
that father bought
for two zuzim.
ONE COW, ONE COW.

And the tetracycline came
and killed the bug
that infected the cow
that my father bought
for two zuzim.

And the child came
and drank the milk
that contained the tet'
that killed the bug
that infected the cow
that my father bought
for two zuzim.

And the test was needed
to save the child
that drank the milk
that contained the tet'
that killed the bug
that infected the cow
that my father bought
for two zuzim.

And Stanley came
and invented the test
that saved the child
that drank the milk
that contained the tet'
that killed the bug
that infected the cow
that my father bought
for two zuzim.
ONE COW, ONE COW,