

VOLUME 17

NO. 6

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Journal of

MILK and FOOD TECHNOLOGY

Official Publication

International Association of Milk and Food Sanitarians, Inc.

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Old Cornell University Bulletin

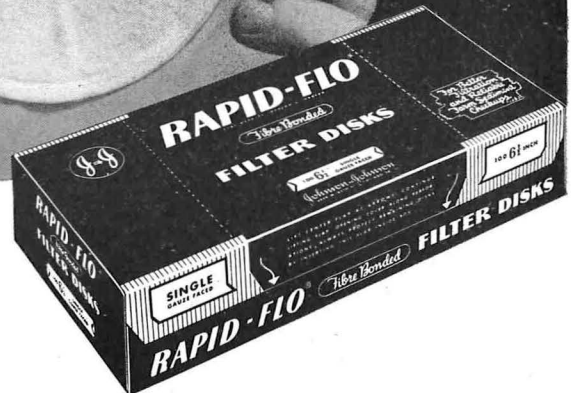
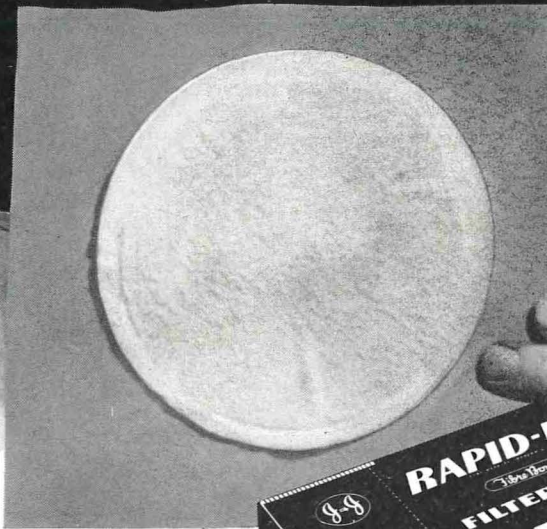
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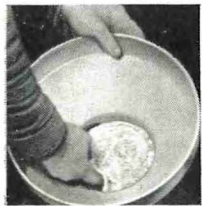
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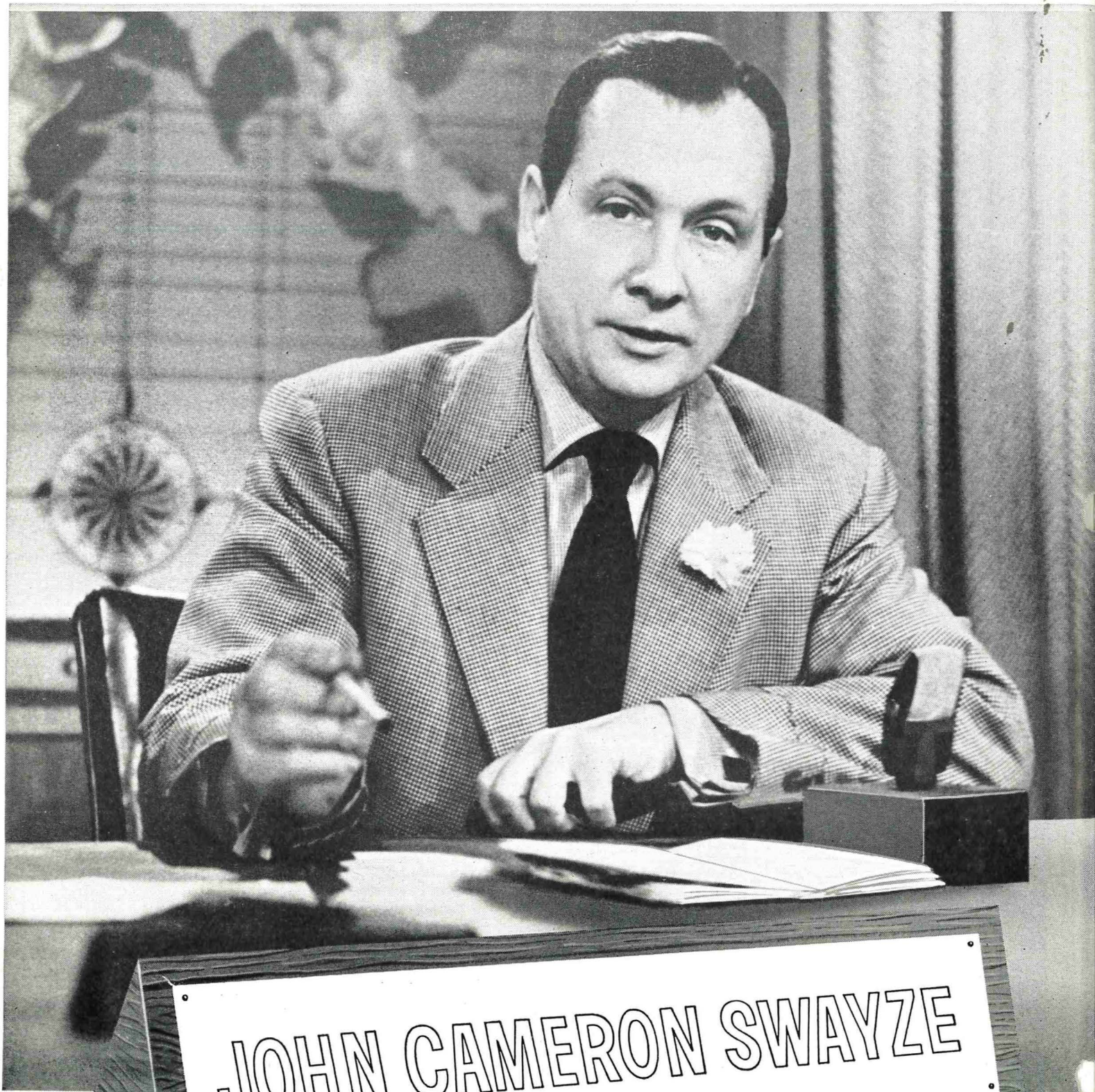
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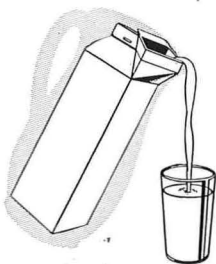


JOHN CAMERON SWAYZE

ANALYST BRINGS NEWS OF

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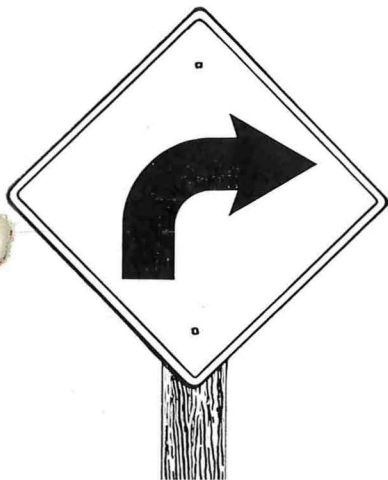
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No. 6

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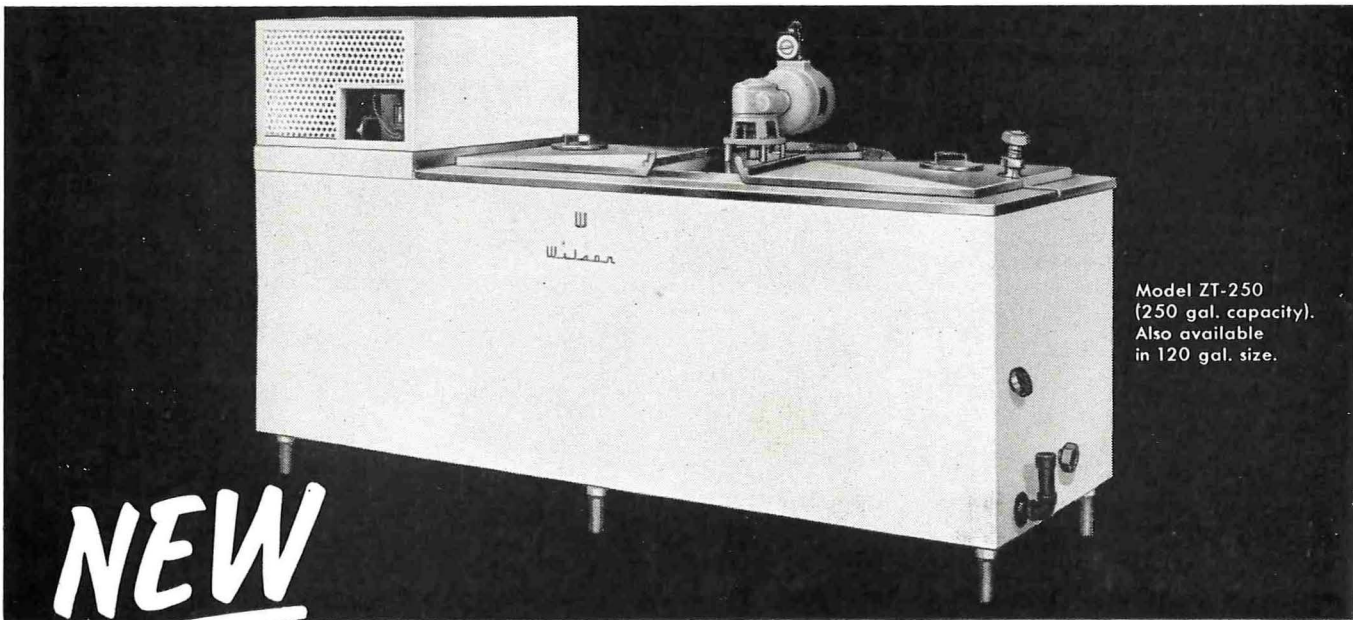
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Editorial Notes

TRIBUTE TO HAROLD S. FIELDER PAID BY COMMITTEE CO-WORKERS

A special tribute was paid to the memory of Harold S. Fielder, formerly Chairman of the Technical Committee of Dairy Industries Supply Association, at the opening of a recent meeting of the 3-A Sanitary Standards Committee in Bear Mountain, N.Y. Attending were representatives of the International Association of Milk and Food Sanitarians, of the U.S. Public Health Service, and of the Sanitary Standards Sub-Committee of Dairy Industry Committee.

Representatives from each of the three groups eulogized Mr. Fielder, a former Cherry-Burrell Corp. executive, who had been instrumental in development of 3-A Sanitary Standards for dairy equipment for many years.

Speaking for the International Association of Milk and Food Sanitarians, Mr. C. A. Abele said:

"There was never any doubt as to reasons for Harold Fielder's interest in a specific provision of a tentative draft of a sanitary standard, or of a proposal of sanitarians with respect to a dimension or specification. His interest was first, last, and always that of equipment for fabricators. Nevertheless, he never failed to justify his position with a cogent reason. Because of his obvious sincerity he commanded the respect of everyone—even those whose proposals he had opposed.

"I voice the sentiment of the Committee on Sanitary Procedure when I state that Harold Fielder set us an example in collaboration in the drafting of 3-A Sanitary Standards; and that as long as a single one of us who knew him remains on the Committee, his memory will be green."

Mr. J. D. Faulkner, speaking on behalf of the U.S. Public Health Service, said:

"To those of us in the Public Health Service who knew Harold Fielder and were long associated with him in joint endeavors; he exemplified to the highest degree those forward looking individuals in industry who place the public interest above personal considerations. He knew well both the positive and negative relationships which milk has to the public's health, and from this knowledge stemmed his zeal and leadership to work cooperatively with health and sanitarians' groups toward common solutions to mutual problems. His contributions were manifold, both in the field of improvements in the sanitary design and construction of dairy equipment, and in the development of new knowledge to aid us with our technical problems. No other individual on our 3-A Committee worked harder to make the sanitary standard program a success; and his belief in this activity, his enthusiasm, and his objectivity, have been an inspiration to us all. His death has deprived all of

us of a guiding spirit, an unselfish co-worker, and a warm friend. We will miss his leadership time and again in the years to come."

Mr. A. E. Nessler spoke as follows on behalf of the Sanitary Standards Sub-Committee of Dairy Industry Committee:

"We in the DIC-SSS group remember Harold Fielder as one of our outstanding members. With an experience of 40 years, beginning in 1913, in the dairy industry, Harold had the kind of 'know how' necessary to the smooth functioning of this kind. This experience, coupled with a keen mind, and an unbiased and broad-minded attitude made him especially valuable in ironing out the various differences which were bound to arise in a group as large as this. Trained as an engineer at the University of Illinois, with his first dairy industry experience in sales, he progressed in his lifetime through the various steps of Engineering and Manufacturing to Development Engineering and Research. He brought to our committee, from this rich background, his knowledge, salesmanship, and spirit of cooperation for which we all remember him. We remember him also for his fine command of the English language. Much of the phraseology in our various standards had its inception in the eloquence of our departed associate. We will miss him greatly on this committee for the ideas and stability he would have contributed. We will miss him even more as a congenial friend who commanded the respect and admiration of all of us."

Following the tributes, a period of silence was observed. The tributes then were made a part of the official records of the committee, and their content was transmitted to Mr. Fielder's widow.

SALARY SCALES FOR "SANITARIANS"

An article has recently appeared in *Public Health Reports** on salary trends in local health departments. A group of graduate sanitarians and public health engineers attending the School of Public Health, University of Michigan, has made the following comments:

The article states that in 1952 annual salaries for sanitarians varied from \$1800 to \$6305. It is unthinkable that any full-time qualified sanitarian would work for \$1800. Therefore, we suggest that in any future studies a differentiation be made between professional sanitarians (who have at least a bachelor's degree with a major in sanitary science, chemistry, the physical sciences, or the biological sciences), and

**Public Health Reports*, March 1954.

the "sanitary inspectors" (who do not have the basic academic training upon which an environmental health program must be based). It is self-evident that "sanitarians" and "sanitary-inspectors" should not be lumped together, as the two groups have wide divergence in academic background, professional status, and duties. The academic status of qualified sanitarians (as defined above) is equal to that of other professional health workers. It would be indicated to define and describe professional job classifications in future studies.

That the term "sanitarian" was not properly defined in the study is further indicated by the \$3364 median annual salary listed in the article. The writers know of but few health departments which had, in 1952, a *base* pay for qualified professional sanitarians as low as that given as median in the article.

Certainly qualified sanitarians should not be degraded by marking them as a component of non-professional politically appointed personnel, as was done by stating that "this group (sanitarians) is the least professionalized in the sense of generally accepted prerequisites".

In reference to the statement "Training is most frequently obtained after initial employment", we wish to emphasize that qualified sanitarians have received at least as much training prior to initial employment as the majority of individuals in other professional

classifications. Certainly the talents of qualified sanitarians must be (and have been) successfully utilized in the attainment of the goals of all environmental health programs.

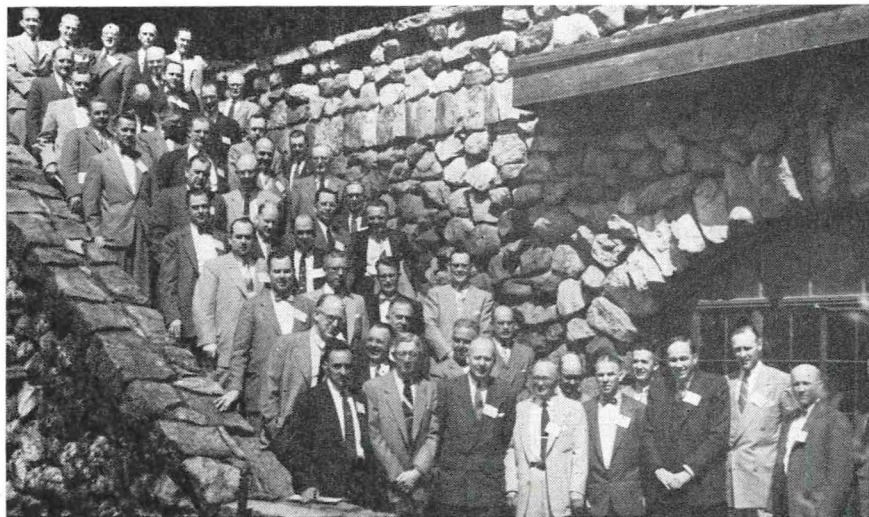
Had the term "sanitarian" been properly defined in this study, it seems certain that the status of qualified sanitarians would have been reflected by considerably higher salary range.

Sanitarians have had a proud history and have made notable contributions to public health programs throughout the world. Thomas Sedgwick, Earle Phelps, M. P. Horwood, C. E. A. Winslow, and S. C. Prescott are but a few of the sanitarians who have made sizeable contributions to the public health movement. The success of qualified sanitarians has been due to their having a broad background in the basic sciences which form the backbone of any environmental health program.

This incident is reported here to illustrate the principle that this matter of identification and rating of sanitarians possesses aspects that warrants pause and reflection before precipitate action is taken in the setting up of professional standards for sanitarians. Specifically, the instant case discourages competent sanitarians from seeking higher professional status through graduate study.

The suggestion for a classification on sanitary-inspectors (or equivalent name) merits consideration.

J. H. SHRADER



RECESS TIME AT SESSION WHICH STUDIED 3-A SANITARY STANDARDS

Here are some of the representatives of the Committee on Sanitary Procedure of International Association of Milk and Food Sanitarians, officials from the Milk, Food and Shellfish Sanitation Program, Division of Sanitary Engineering Services, U.S. Public Health Service, and men from Dairy Industry Committee's Sanitary Standards Sub-Committee who met at Bear Mountain, N.Y., late in April, to study proposed new or revised 3-A Sanitary Standards for a wide variety of milk handling, dairy processing and dairy products distributing equipment. In the three days of solid sessions, the group pictured here took a further significant step toward a possible early formation of a 3-A Sanitary Standards Symbol Administrative Council, subject to approval by IAMFS, DIC, and Dairy Industries Supply Association.

FORTY-FIRST ANNUAL MEETING
HOTEL MORTON — ATLANTIC CITY, N.J., OCT. 21-23, 1954

PROBLEMS OF INSECTICIDES IN FOODS*

C. C. COMPTON, PH. D.

*Julius Hyman and Company Division, Shell Chemical Corporation,
Denver, Colorado*

The necessity for using insecticides for the growing and protection of food and fiber crops has been established. We do not have effective insecticidal chemicals for the control of all plant pests and old compounds must be improved or new compounds developed. Residues in foods must be avoided and intensive research since the advent of World War II have made it possible to employ insecticidal chemicals efficiently and safely. Education of farmers and others in the proper use of insecticidal chemicals is presently of paramount importance.

In 1915, Dr. S. A. Forbes, first State Entomologist of the State of Illinois, wrote, "The struggle between man and insects began long before the dawn of civilization, has continued without cessation to the present time, and will continue, no doubt, as long as the human race endures." This struggle is due to the fact that both man and insects must have food in order to survive and that both want the same food. Insects have first access to our food supply for they attack plants as soon as they are planted in the soil and even attack the seeds as soon as they are sown. If there is to be food for human and animal consumption crops must be protected in some manner from the time the seeds are sown or young plants transplanted in the field until the edible portion is ready for consumption. The period required to produce edible food may cover three or four months or more. During all this time crops are subject to insect attack, not by one or two species of the pests but by as many as ten, twenty, or even 100 different species. Were it not for insect control, man would have to survive on what is left after the insects had obtained all they wanted. He would have to be satisfied to eat varying amounts of insect fragments and excrement from the insects and numerous fungi and bacteria developing in the insect-damaged tissues.

Recent figures have shown that at the time this country was settled, out of every ten inhabitants nine were required to produce food for

the group. By 1940 this had been reversed and one man was producing enough food for himself and nine other individuals. Now each food producer must produce enough for himself and fourteen others. This increase in efficiency in food production has been due to many factors one of which has been the intelligent use of insecticides along with other insect control measures. As our country developed in agriculture we were able to move westward into new territory as rapidly as soil fertility was depleted and use long rotations of crops to reduce losses from insects. We no longer can follow this plan and with an increase in population of 6 to 7 thousand per day we must make more efficient use of our productive land. As our agriculture becomes more intensified we encourage insect development. We must therefore look forward to the increased use of chemicals for insect and disease control as well as their use for weed control, for producing color, for making fruit stick, for defoliants, etc.

NECESSITY FOR USING INSECTICIDES

This group is fully aware of the necessity for using insecticides. Insect species that damage crops run into the thousands. In spite of great effort to control insects by cultural, mechanical, ecological and biological control methods it is agreed by the best informed men in the country that the use of insecticides is essential. Man must make intelligent use of all these methods if we are to insure an adequate food supply for our ever increasing population.

Our efforts to control injurious insects have been puny compared to reductions in insect populations by meteorological phenomena. Man has never eradicated a single insect species by employing every means at his command, the combined use of cultural, mechanical, ecological, biological, and chemical control methods. Our prospects for so doing seem dim at present.

Great progress has been made in the development and use of insecticidal chemicals and the greater part of this progress has been made



Dr. C. C. Compton was born in Vermont and completed his undergraduate work at the University of Connecticut, did graduate work in plant physiology at the University of Chicago, and completed his graduate work in entomology at the University of Illinois. He was associated with the Illinois State Natural History Survey for 24 years before joining the staff of the Julius Hyman Company and later the Shell Chemical Corporation.

in the past ten years. I quote from the report of the Food Protection Committee of the National Academy of Sciences, December 1952, "Today, approximately 100 pesticidal chemicals are in use or available for use, and over 30,000 pesticide formulations have been registered for labeling and use by the Insecticide Division of the U. S. Department of Agriculture.

"Each pesticidal chemical and each pesticide has its distinct advantages, disadvantages, and special uses. Therefore, just as the physician and the pharmacist require a generous assortment of pharmaceuticals for the compounding of prescriptions, so, too, the agriculturist and the pesticide dealer should have ready access to the largest possible assortment of chemicals so that they may likewise prescribe specific treatments to fit specific conditions. Many new pesticides have been developed which are more effective for specific purposes than are the materials previously used for those same purposes. The use of these new chemicals in agriculture parallels developments in the field

*Presented at the 40th Annual Meeting, International Association of Milk and Food Sanitarians, Inc., East Lansing, Mich., Sept. 1-3, 1953.

of medicine where sulfa drugs and the new antibiotics are now frequently recommended and used in the place of the less efficient drugs which were in common use a few years ago."

USE OF DIFFERENT INSECTICIDES NECESSARY

The problem of insect control with chemicals would be much less complicated if we could employ a single poison to control all pests. This is not possible since different species of insects vary greatly in their susceptibility to insecticidal chemicals. Insecticides that are highly effective in the control of certain insect species are totally ineffective in controlling other species. For example, at a given rate of application DDT will kill a very high percentage of the tomato hornworm, *Protoparce quinquemaculata*, but is almost completely ineffective against the tobacco hornworm, *Protoparce sexta*. Here we have two species of insects belonging to the same genus, looking so much alike only entomologists can tell them apart; indeed the larvae of both species are normally found feeding on the same tobacco plant at the same time over much of the tobacco growing areas of the United States. There are innumerable examples of marked differences in insect susceptibility to insecticides. We do not yet understand just why this difference in species susceptibility occurs.

Laymen and entomologists alike are well aware that numerous insecticidal chemicals are required to give adequate control of the various pests and to produce crops of the quantity and quality desired. Insecticidal chemicals that give adequate and economical control of many of our major pests are now on the market. Other major pests are still troublesome because present chemicals are inadequate for one reason or another. New chemicals are being developed and will continue to be developed that will be more satisfactory for controlling certain insects and perform satisfactorily against those pests that are not handled well by present day insecticides. Time will not permit enumerating here the many requirements of an insecticide other than its property of killing insects for our time today must be devoted to problems more closely associated

with residues with which this paper is primarily concerned.

DEVELOPMENT OF

NEW INSECTICIDAL CHEMICALS

Less than ten years ago we were dependent upon a few rather unstable botanicals such as pyrethrum and rotenone and a number of stable and very persistent metallic salts such as arsenic lead, calcium arsenate, sodium fluosilicate, etc. These insecticides were effective in controlling some of our troublesome pests but left much to be desired in controlling many others. It was necessary to employ these older insecticides at relatively high application rates with the result that residues presented a serious problem. The newer insecticides starting with DDT followed by a rather imposing list of chlorinated hydrocarbons, phosphates, and so forth, have given us much better tools to work with in that they are little, if any, more hazardous to use than many of the older insecticides and are generally much more effective in controlling insects. Each one has its own particular and peculiar properties and most of them have found important places in agriculture. Present day insecticides are less stable or more volatile than those derived from metallic salts with the result that residues diminish from the time of application.

The newer insecticides vary materially in their toxicity to warm-blooded animals. For many purposes however the inherent toxicity of a given compound when examined from the standpoint of actual use is not indicative of its relative safety. The Food Protection Committee of the National Academy of Sciences states as follows: "The inherent toxicity of a pesticide or pesticidal chemical to warm-blooded animals may have little or no direct bearing on the final food hazard. Many of the more toxic materials are applied at times when the edible portion of the crop is not exposed. As a rule, such chemicals are applied in proportionately smaller amounts than are less toxic materials and frequently the more toxic compounds are short-lived. In other words, they may be quickly destroyed through chemical change or lost through decomposition or evaporation. It would not, therefore, be in the public interest to unduly restrict the use of these valuable pesticides strictly on the

basis of their inherent toxicity to warm-blooded animals. Fruit and vegetable growers should not be denied the right to use a pesticidal chemical, no matter how poisonous, provided its use as recommended does not present a hazard to plant life, individuals, or the public health."

INSECT RESISTANCE TO INSECTICIDES

To complicate the picture further we are running into instances of insects becoming resistant to certain of the new chemicals or even to several chemicals. This is not too surprising for insects have long been known to build up a tolerance to certain chemicals. Many years ago the black scale in California developed a tolerance to hydrocyanic acid gas, the San Jose scale built up a tolerance to lime sulfur, and the codling moth to arsenate of lead. The common house fly in the past few years has built up a strong resistance to DDT, and once developed this resistance is rather quickly extended to include the other chlorinated hydrocarbons. Among agricultural pests the Colorado potato beetle and the imported cabbage worm seem to have developed a certain amount of resistance to DDT. I do not believe these examples indicate that all insects will eventually build up resistance to any one insecticide or that any one pest will build up a resistance to all insecticides. The matter of resistance in insects adds one more problem to those we already have and points to additional justification for the availability of an assortment of insecticidal chemicals and insecticide formulations for use in insect control programs.

PROBLEM OF FLAVOR CHANGES

This is somewhat of a controversial subject since off-flavor in fruits and vegetables attributable to the use of pesticides is of rare rather than a common occurrence. That distinctively objectionable off-flavors have occurred with certain chemicals cannot be denied. Minute changes in flavor have occurred where the differences were not objectionable and did not affect the edibility or marketability of the product. Off-flavor may be defined as any gross departure from the normal in a fruit or vegetable to be eaten fresh or cooked, canned or frozen, which would render it unacceptable to the consumer.

Minute variations in taste which are as often judged superior as judged inferior by a taste panel could hardly be classified as objectionable. Variations in taste between varieties of fruits and vegetables, variations in taste of fruits and vegetables grown in different sections of the country, and year to year variations in fruits and vegetables grown in any section of the country are recognized. Irish potatoes grown in New England, Florida, or Idaho have certain taste variations. Apples, citrus fruits, and many others are noted for variations in tastes. Insecticides can hardly be held responsible for variations less than normally occur in the foregoing situations.

Flavor changes are not always evident in the fresh fruit or vegetable but may be evident after processing such as canning, freezing, or storing. Certain chemicals have been known to react with metal containers to produce off-flavors and spoilage through action of the chemical on the metal causing corrosion. Off-flavors are not often caused as a direct result of insecticidal residues, and the possibility of their occurring in the future will be greatly reduced once tolerances are established for specific chemicals. Taste evaluations are but one of the requirements that an insecticidal chemical must meet before it can be marketed. The agricultural chemical industry is aware of this problem and has already taken steps to determine possibility of off-flavor through cooperative studies with the food technologists of several of our leading state universities. It should be gratifying to food sanitarians to know that specific data have been and will be accumulated relative to the possible effect of insecticidal chemicals on food flavors.

RESIDUES IN FOODS

Residues in foods including feed and forage for animals as well as in food and food products to be consumed by humans presents problems of great importance. We have made notable strides in the past few years not only in avoiding food and forage contamination by the proper use of insecticides but also in developing analytical methods for the determination of residues. Dr. Geo. C. Decker, Entomologist and Head, Illinois Natural History

Survey, Urbana, Illinois, has fully discussed "The Significance of Pesticide Residues" in a paper presented at the meeting of the American Chemical Society held in Milwaukee, Wisconsin, April 3, 1952. Since this paper is to be published*, it will not be necessary to repeat here all the factors that enter into the matter of insecticide residues in foods.

Numerous factors, however, enter into the presence and magnitude of residues on food and forage crops. The time of application with respect to stage of plant growth and interval between last application and harvest is perhaps of greatest importance where insecticides must be applied directly to plants. The number of applications may be a factor associated with time of application but in the light of recent studies it is the interval between the last application and harvest that largely determines the magnitude of the residue. The rate of application has a bearing on the amount of residue present at any given time. The dangers attending the use of chemicals highly toxic to warm-blooded animals is mitigated by the fact that the more toxic chemicals are generally employed at dosages proportionately lower than the effective dosages of less toxic chemicals. We have previously shown that the inherent toxicity of a pesticidal chemical may not be a true indication of the final hazard on food.

Evaporation and decomposition as affected by temperature, moisture, sunlight, and foreign substances such as dust on the foliage have a bearing on the extent of residue on plants. Winds and rain tend to reduce residues or scatter sprays and dusts where they are not wanted. Residue dilution through expansion of treated surfaces due to plant growth materially reduces residues. Residues may also be reduced or eliminated by normal washing, scrubbing, or peeling before eating or processing.

All the foregoing factors have a bearing on the presence or absence of residues on food or forage at the time of harvest, eating, or processing. Recent developments in the use of insecticides in such ways as to preclude the presence of

residues are of utmost importance. I refer to the application of insecticidal chemicals to the soil before planting not only to control soil inhabiting insects but many species of plant feeders that spend a portion of their life cycle in the soil and are killed when they drop to the soil or enter the soil for pupation or hibernation. Significant strides have already been made in this direction.

Perhaps of equal or even greater importance is the development of new principles in formulations. Until very recently insecticides were applied as aqueous sprays derived from emulsifiable concentrates or wettable powders or as dusts. Various factors determine the amount of insecticide adhering to the foliage initially and the length of time residues remain as we have previously noted. Control measures designed to eliminate initial residues are being developed and practical applications are being made through the use of granular formulations. Granular formulations are prepared by impregnating or coating an inert carrier of granular consistency, usually 30-60 mesh with the insecticidal chemical to be employed. Such formulations are easily applied, will not drift with the wind, and will not remain on the foliage. Dr. M. D. Farrar has pioneered in this work and has shown that a rather wide range of insects can be controlled by the application of granular insecticide formulations (*Journal of Economic Entomology*, Vol. 46, No. 2, 1953). Insecticides employed in such a way as to avoid initial residues will not leave residues at harvest.

Thus far we have been discussing insecticidal residues on food and forage with the principal emphasis on food for human consumption. Residues on forage are of almost equal importance for they may result in residues in milk, milk products, and animal tissues. The same precautions must be exercised for forage that are necessary for crops intended for human food. Applications of insecticides that will avoid residues at any time are greatly to be desired. It is worthy of note here that granular formulations are proving very effective in controlling some of the major forage crop pests.

Nothing has been said concerning the determination or removal of

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THE NEW PLATE COUNT MEDIA IN ROUTINE PLATE COUNTS ON MILK*

FRANKLIN W. BARBER, HARVEY FRAM, AND ROBERT M. DEBAUN
National Dairy Research Laboratories, Inc., Oakdale, Long Island, N.Y.

A number of experiments were carried out to investigate the differences in bacteria counts on milk samples when the new "milk-free" plating media were compared with the old standard TGEN medium. Variations in type of milk, raw or pasteurized; grade of milk; high or low quality, incubation temperature and laboratory technique were included in these studies. The results obtained are similar to other reported comparative studies. It is likely that over an extended period the average counts with the new media will compare favorably with the old medium.

INTRODUCTION

During the past four or five years there has been much interest in the improvement of media for making standard plate counts on milk and other dairy products. It was desired to have a medium that did not contain or require the addition of skim milk. Preliminary studies and extensive collaborative studies conducted by the Committee on Applied Laboratory Methods of this Association¹ and by the Subcommittee on Methods for the Examination of Dairy Products of the American Public Health Association^{2, 3} resulted in the selection of two media which could take the place of the present Standard Tryptone Glucose Extract (Skim Milk) Agar (TGEN). In September 1952 a Committee Report published in the *American Journal of Public Health*⁴ concerning proposed changes for the Tenth Edition of *Standard Methods for the Examination of Dairy Products* stated that two milk-free plating media will be substituted for the present TGEN medium.

As is the case when changes in any standard procedure are proposed, there are always some workers who desire to investigate in their own laboratories the possible effects of the proposed changes. This desire resulted in a number of preliminary comparisons of the new medium with the standard TGEN medium in routine counts on milk samples by a few control laboratories. The results obtained were somewhat different from what had been expected even though it

had been stated that there might be a number of variations on individual samples where the results might be startling. This possibility of unexpected variations and the results of the preliminary routine plate counts prompted further comparisons of the new media and the standard TGEN medium at the National Dairy Research Laboratories. The purpose of this paper is to summarize the more interesting findings, resulting from this study with the thought that these comments may be of value in explaining and understanding some of the variations in counts which may occur when the new plating media are used.

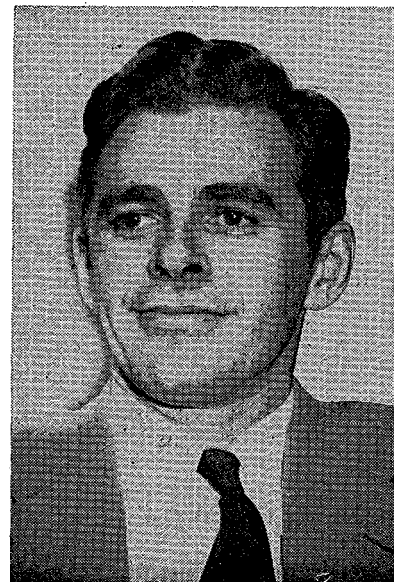
EXPERIMENTAL

In these studies it was desired to measure only differences between the various media being studied. Consequently a number of preliminary studies were conducted to investigate the effect of such conditions as type of transfer, number of dilutions, number of plates, etc. *Media*

For this study fresh batches of experimental media and standard media were supplied by the Baltimore Biological Laboratories (BBL) and the Difco Laboratories. The experimental BBL medium was their MPH medium which had been used in earlier collaborative studies. The standard medium was the BBL Trypticase Glucose Extract Agar. The experimental Difco medium was designated as Plate Count Agar (PCA). This medium was a modification of an earlier medium in which the yeast extract content was reduced to 0.25 percent. The standard medium was their regular Tryptone Glucose Extract Agar. These media were prepared according to the directions of the manufacturer and were used within 48 hours after preparation.

Milk Samples

The milk samples investigated were taken from the raw milk available at the laboratory which is shipped in from upper New York State and raw milk obtained from a local farm. Some of these raw milks were laboratory pasteurized while other pasteurized



Dr. Franklin W. Barber has been connected with the Research Laboratories of National Dairy Products Corporation since 1945 and is now Senior Scientist in charge of the Fundamental Laboratory at the company's research headquarters, Oakdale, Long Island, New York. He is a graduate of Aurora College, Aurora, Illinois, and received his M.S. and Ph.D. degrees from the University of Wisconsin. He has been active in the field of dairy bacteriology since 1937, and has numerous publications in this field.

milk samples were obtained on the open market from a local supplier.

Plating Procedures

Standard Methods⁵ were followed throughout the studies. To avoid any possible psychological bias in the reading of results the plates were extensively randomized in the following manner. When the plates had been prepared from a suitable dilution and poured with the various media, they were recoded by a disinterested operator and distributed in an incubator in such a manner as to minimize temperature differences within the incubator. After 48 hours incubation, the plates were read in random order so that any differences between plates made first and last, or read first and last would not affect the results. In some instances each milk sample was plated by three operators and all plates were read by each operator. Although the actual number of samples examined was small, the experimental design was such that the

* (Presented at the 40th Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., East Lansing, Michigan, on September 1, 1953.)

results are believed to be statistically valid.

Statistical Analysis

In this study the results were subjected to statistical analysis^{6, 7}. Samples were compared by the analysis of variance with suitable checks being made for constancy of error. Logarithms of the counts were used in order to obtain a normally distributed variate. Precision of the results is indicated by the 95 percent confidence interval which must be placed on a datum to give 95 percent confidence of insuring the inclusion of the long range average.

RESULTS

Preliminary studies were conducted to determine the most suitable experimental procedures to follow which would result in the most accurate measurement of differences between the standard media and the experimental media. The type of transfer from the dilution bottle to the plate was found to give the same precision whether one ml or one-tenth ml was used. The method of making the dilutions was found to be a source of variation in the results in that one or two dilutions produced the same precision but as the number of dilutions was increased to three and beyond, the precision decreased. This lack of precision was also evident in duplicate plates poured from the same dilution bottle when the number of dilutions was increased to three or beyond. For these studies then all plates for the different media were made from the same dilution bottle to increase the precision of the comparisons between the media. Although the operators did tend to show differences in counting levels, these differences did not affect the media comparisons.

Laboratory Differences

At the start of these investigations data obtained by a routine testing laboratory in which the experimental media were compared with the standard plating media were submitted for analysis. Later samples of raw and pasteurized milk were plated in our laboratory using the experimental media and the standard media. These results, shown in table 1, indicate that the routine testing laboratory obtained lower counts with the experimental media than with the standard

TABLE 1—COMPARISON OF PLATING MEDIA PRODUCTIVITY IN TWO LABORATORIES

Medium	Percent of TGEM count	
	Routine lab	Research lab
TGEM	100	100
PCA	81	114
MPH	89	123

TABLE 2—COMPARISON OF PLATING MEDIA PRODUCTIVITY AT SEVERAL INCUBATION TEMPERATURES

Medium	Percent of TGEM count at		
	37°C	35°C	32°C
TGEM	100	100	100
PCA	109	104	117
MPH	117	122	111

TABLE 3—COMPARISON OF PLATING MEDIA PRODUCTIVITY ON DIFFERENT MILK SAMPLES AT 35°C

Medium		Percent of TGEM count on milk.									Log avg.
		1	2	3	4	5	6	7	8	9	
PCA	R	83	83	95	117	107	78	90	.....	.....	92
	P	105	141	119	100	.....	.....	.....	101	143	118
MPH	R	89	106	100	158	77	94	81	.....	.....	93
	P	115	148	128	147	.....	.....	.....	112	116	114

R = Raw milk

P = Pasteurized milk

In all cases TGEM count = 100%

media. Our laboratory results showed that the experimental media counts were slightly higher than the standard media counts. These results were all obtained on raw milk samples.

Temperature of Incubation

Inasmuch as laboratories in some areas were using 37°C as the incubation temperature for their plate counts, a comparison was made in which duplicate plates of each medium were incubated at 37°C, 35°C and 32°C. The results summarized in table 2 show that the same media differences were obtained at each temperature. It was thought that perhaps lower temperatures might result in relatively higher media differences but this difference was not observed.

Media Differences

Following these preliminary experiments a limited number of media comparisons were made using the two experimental media (MPH and PCA), standard TGEM agar from BBL and Difco and raw and pasteurized milk samples.

Analysis of the standard media counts showed the standard media of both manufacturers produced counts which were not significantly different in that the counts were within 5 percent of each other.

The results obtained with the experimental media summarized in table 3 show that with both experimental media the raw milk counts were slightly lower than counts obtained with the standard media but the differences were not significant. However, the pasteurized milk counts were significantly higher with the experimental media than with the standard media. Stated in another way, the differences between the new media and the standard media are greater for pasteurized milk samples than for raw milk samples. It is interesting to note that these results compare favorably with those reported by Pessin and Robertson² and Buchbinder *et al.*³

Buchbinder *et al.*³, noted the fact that the new experimental medium appeared to be more productive (gave higher counts) for pasteuriz-

ed milk than for raw milk. These authors suggest that this difference may be due to the fact that pasteurized milk, unlike raw milk, contains bacteria which are injured but not destroyed during pasteurization and which grow in the presence of accessory food substances supplied by the yeast. This also may be a possible explanation of the results noted in our studies on pasteurized milk samples.

Milk Differences

In analyzing the results of this comparative study, it was observed that there also was considerable variation in the counts obtained with the various media with different milks on different days regardless of whether the milk was raw or pasteurized. It can be seen in table 3 that with some samples the differences between the experimental media and the standard media are greater in some instances than in others, for example, samples 8 and 9. In this instance sample 8 was a laboratory pasteurized sample checked immediately after pasteurization while sample 9 was a commercially pasteurized milk sample which had been refrigerated for several days after pasteurization and undoubtedly had an entirely different flora (probably psychrophiles) than the first sample. The same observation can be made on pasteurized milk samples 1 and 2 where the first was a laboratory pasteurized high quality milk from a local farm tested within 5 hours after milking and the second was a laboratory pasteurized poor quality milk sample from upper New York State which was anywhere from 24- to 48-hours old at the time of testing.

Note also milk sample 4, a fresh local raw milk in which the raw counts on the new media are significantly higher than those on TGEM. This difference is greater than any observed on all other raw milk samples and would indicate an entirely different flora in this milk. It should be remarked that this variation from the over-all trend significantly exceeds sampling error.

It would appear that the new experimental media contain better nutrients than the standard media for the growth of various milk bacteria. The increased colony size obtained with the new media

also indicates that there is this nutrient difference. These observations would indicate that there is need for further investigation concerning the ability of the new media to support growth of different types of bacteria which may be present in both raw and pasteurized milk.

SUMMARY

In summary, these brief preliminary studies in general substantiate the published results of the earlier collaborative studies on the comparison of new experimental media and the standard TGEM medium. It was found that for statistical analysis of results great care must be taken in the planning, operation, and interpretation of comparative studies so that only media differences are measured. The greatest variations encountered might be explained by differences in the milks investigated—whether the milk was raw or pasteurized, a good milk or poor milk—differences in the bacterial flora and their response to the nutrients available in the new media. It is likely that over an extended period the average of counts obtained with the new media will compare favorably with counts obtained with the present standard TGEM medium. In any case, the new media are an improvement over the present medium, especially from the point of view of ease in counting of plates.

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PROBLEMS OF INSECTICIDES IN FOODS

Continued from Page 175

residues when they are suspected in damaging or questionable amounts at harvest. Residue removal is to be avoided except as a means of last resort. Some studies in residue removal are in progress. There is some reason to believe, for example, that the toxic properties of certain insecticidal chemicals may be eliminated by the heat encountered during the canning process.

Important progress has been made in developing satisfactory analytical methods for determining residues. Chemical analyses, infrared spectrophotometry, and bioassays are available for most insecticidal chemicals. Each method has its strong points. Most satisfactory results are probably obtained where bioassays are run in conjunction with other methods. In many cases methods now in use are sensitive to 1 part or less in 10,000,000.

The many problems associated with residues resulting from the use of insecticides for the control of insects are by no means completely solved but tremendous progress has been made in the last few years. Education of farmers on the proper use of insecticides will greatly reduce those hazards remaining. With more efficient insecticidal chemicals now coming into use, applications for insect control can generally be made at a time and at a rate of application coupled with the use of proper formulations to preclude largely the possibility of trace residues at harvest.

BILL BRYANT HOSPITALIZED

Mr. C. B. A. (Bill) Bryant is hospitalized at the Community Health Center, Hillsdale, Michigan, suffering with a case of pneumonia. This situation necessitates the cancellation of his many speaking engagements for the next two months. Now is the chance for his many friends to drop him a line of greeting specifying "no answer expected."

A COMPARISON OF SIX METHODS OF PREPARING AND USING THE METHYLENE BLUE STAIN FOR BACTERIAL COUNTS BY THE DIRECT MICROSCOPIC METHOD*

NATHAN MANTEL

National Institutes of Health, Bethesda, Maryland
and

A. H. ROBERTSON

State Food Laboratory, Department of Agriculture and Markets,
Albany, New York

A cooperative study, involving 12 federal, state, local, and private laboratories throughout the country, was conducted to evaluate six methods of preparing and using the methylene blue stain for the direct microscopic count of bacteria in milk. Three of the six methods were found superior, yielding significantly higher bacteria counts, at the same time providing greater ease in counting. These three methods are: Levine and Black's acid-and-water-free stain; North's aniline oil stain; and Anderson's polychrome stain.

In 1948 Levine and Black^{1, 2} proposed a new method for preparing and using the methylene blue stain (methylene blue chloride, certified) when making bacterial counts by the direct microscopic method. By comparison with counts made with conventional methods³ of preparation and use of the stain, the counts by the new procedure were appreciably higher. Also in 1948 Anderson, Moehring, and Gunderson⁴ proposed a different method of preparing and using the stain and by similar comparisons demonstrated that the counts by this method were appreciably higher also. Levine and Black⁵ reported additional comparisons in 1949. Following collaborative studies on stains in 1951, Olson and Black⁶ showed that some of the newer methods of preparing and applying methylene blue stains were superior to certain modifications of the time-honored method. Later Levine⁷ presented an explanation of staining phenomena as it applied to the direct microscopic method. Because of these reported failures^{1, 2, 4, 5, 6, 7} to get as high counts by staining procedures prescribed in the eighth and ninth editions of *Standard Methods for the Examination of Dairy Products*⁸ as were obtained by the more recently proposed methods, the APHA* Committee organized a plan for comparing counts on stained milk and cream

films in order to discover the one or more most satisfactory among 6 staining procedures.

STAINS IDENTIFIED

The chief criterion for selecting a satisfactory stain was that it give the highest count with maximal uniformity when used by different operators. Recognizing certain assumptions, the study was organized so as to give at least 95 percent assurance that the best of the 6 stains would show up best if it were at least 5 percent superior (capable of giving 5 percent higher counts) to the next best stain. The study required obtaining counts on replicately prepared films from 25 raw milks, 25 pasteurized milks, 4 raw creams, and 4 pasteurized creams.

The comparison included the following stains:

Stain A A slight modification⁸ (23 percent alcoholic base) of the one used in 1911 by Breed⁸

Stain B The Newman-Lampert Type 2 stain⁹

Stain C North's aniline oil stain¹⁰

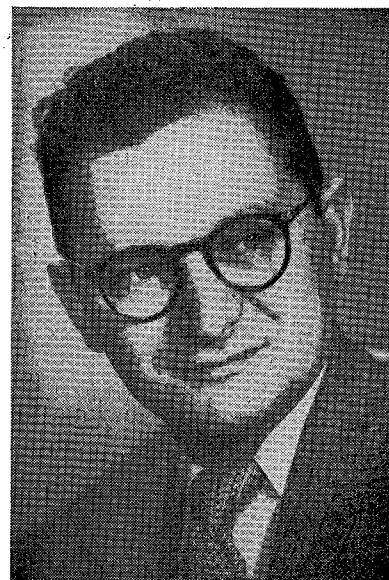
Stain D Levine and Black's acid-and-water-free stain^{1, 2, 5}

Stain E Borman's stain¹¹ (experimental, described below)

Stain F Anderson's polychrome stain⁴

The method for preparing the modified Stain A is described in paragraph 2.46, lines 4-7, of the ninth edition of *Standard Methods*. Because of confirmed observations that the carbolated methylene blue stain,^{1, 2, 4} also described in the same paragraph, was appreciably inferior to Stain A, the former was omitted from the study. In the absence of documental reference to Borman's stain, directions for its preparation and use follow:

To 970 ml of water, add 30 ml (3.5% aqueous) methylene blue chloride, certified, 8 g Na Cl, and 5 ml (2% aqueous) merthiolate. Store stock supply of prepared stain in cleaned, tightly closed container. Submerge slides with fixed, dried



Nathan Mantel graduated from the City College of New York in 1939. He has since been taking graduate work in advanced statistics at American University while employed in Washington. He is now in the Biometry Section of the National Cancer Institute, and has been with the Public Health Service since 1947. He has been principally concerned, at the Public Health Service, with the application of statistical methods to biological and medical research.

films in xylene for 1 minute. Drain and dry slides, optionally using forced air current. Submerge slides for 2 minutes in solution consisting of 1000 ml ethylene glycol monomethyl ether and 3 ml pyruvic acid, EK No. 498. Drain and dry slides completely, optionally using forced air current. Submerge in staining solution for exactly 1 minute. Remove and wash in gentle stream of tap water, stand on edge and dry, preferably using a forced air current.

For cream films proceed as for milk films, using 2 successive submersions in xylene with drying following each. Apply 2 successive submersions in conditioning solution with drying following each stain for exactly 1 minute.

The description and application of the Modified Polychrome Methylene Blue Stain used by Anderson in the current investigation follows. To prepare chloroform-alcohol, defatting-fixing reagent, completely dissolve 0.2 g gelatin, Eastman Kodak No. 5247, in 20 ml H₂O by heating gently at not over 70°C. Cool to 25°C. Slowly add gelatin solution with intermittent

*Submitted Oct. 20, 1953.

The American Public Health Association herewith acknowledges its indebtedness to all collaborators for their unselfish participation in this comprehensive undertaking.

TABLE 1.—ASSEMBLED REPORT FOR FILMS ON RAW MILK NO. 19.
Each Count Is the Total of Clumps Seen in 60 Fields, 30 for Each of Two Films.

Parti- cipant	Micro- scope factor	Stain											
		A		B		C		D		E		F	
		Count	Rank	Count	Rank	Count	Rank	Count	Rank	Count	Rank	Count	Rank
1	300,000	11	1½	12	3	14	5	13	4	11	1½	19	6
2	600,000	7	1	13	2½	15	4	416	6	13	2½	18	5
3	600,000	8	1	13	2	25	4	29	5	14	3	30	6
4	300,000	23	1	42	6	28	3	30	4	36	5	25	2
5	300,000	10	1	11	2	26	6	16	4	14	3	18	5
6	600,000	3	1	8	4½	8	4½	10	6	6	2½	6	2½
7 D*	300,000	7	1	24	2½	29	4	42	6	24	2½	30	5
8 C	500,000	7	1	8	2	23	5	11	3	15	4	24	6
9 A	300,000	2	1	4	2	16	5	13	4	19	6	6	3
10 E	300,000	2	1	6	2	13	5	10	4	7	3	15	6
11 F	300,000	11	1	18	2	44	5	36	3	38	4	47	6
Totals for parti- cipants, 1-6, non- stain sponsoring													
Counts		62	1	99	3	116	4½	514	6	94	2	116	4½
Ranks		6½	1	20	3	26½	4½	29	6	17½	2	26½	4½
Totals for parti- cipants, 7-11, stain sponsors													
Counts		29	1	60	2	125	6	124	5	103	3	122	4
Ranks		5	1	10½	2	24	5	20	4	19½	3	26	6

Counts = Number of bacterial clumps, without adjustment for microscope factor.

*Numbers identify participant; letters identify stain used.

shaking to flask holding 330 ml methyl alcohol, absolute, refined, Mereck, Baker, or Mallinckrodt (other brands tested were unsatisfactory). Add gelatin-methyl alcohol mixture to 650 ml chloroform in liter flask. Filter through rapid filter paper into stock reagent container fitted with tight closure. (Stock solution ordinarily is stable for at least 6 mo.) Replace solutions in current use monthly or after treating 75 slides or at shorter intervals if necessary. Optionally replenish reagent in current use with fresh stock reagent or filter used reagent to remove fat and other accumulations before returning filtrate to clean container.

Completely dissolve 1 g certified methylene blue chloride in 500 ml H₂O in liter flask. Add 6 ml (1% aqueous) H₂SO₄ and mix. Slowly add 20 ml (5% aqueous) potassium dichromate and mix. Add 375 ml H₂O and mix. Autoclave mixture at 121°C (15 lbs steam pressure) for 30 min. Cool to about 20°C and filter. Wash precipitate with 900 ml H₂O into graduated liter flask. Add 2 gm Na₂HPO₄, anhydrous. Heat to 95-98°C for 15 min, cool to 20°C, add 50 ml methyl alcohol, absolute, Merck, and make up volume with H₂O. Mix and filter into stock reagent container fitted with tight closure. Replace

stains in current use monthly or after treating 125 slides or at shorter intervals if necessary. Optionally replenish staining solution in current use with fresh stock reagent or filter, if precipitates or other accumulations collect, before returning filtrate to clean container.

To treat film, submerge slides in defatting-fixing reagent for 2 min. Drain and air dry (without aid of heat or fans) thoroughly for 3 min. Submerge in staining solution for 18-20 sec. Rinse in container of non-flowing, cold tap water for 2-3 sec. Stand slides on end on blotting or bibulous paper, drain and air dry films before examining microscopically.

Submerge cream films in defatting reagent for 2 min. Drain and air-dry films. Repeat above defatting operation *once* before proceeding as directed above for staining milk films.

The identities of (stain) sponsors and of (counting) participants follow in accompanying tabulation:

Lab. No.	Participants, but Non-stain Sponsors
1	Nicholas D. Duffett Department of Public Welfare Division of Health St. Louis, Missouri
2	Frost Claiborne Department of Health

3	State of West Virginia Charleston, West Virginia Betty Cunningham Beatrice Foods Company Decatur, Illinois
4	David Levowitz New Jersey Dairy Laboratories New Brunswick, N. J.
5	Harold J. Barnum Department of Health and Charity City and County of Denver Denver, Colorado
6	J. C. McCaffrey Department of Public Health Division of Laboratories Chicago, Illinois
Lab. No.	Participants and also Stain Sponsors
7	D Benjamin S. Levine Milk and Food Sani- tation Laboratory U. S. Public Health Service Cincinnati, Ohio
8	C M. T. Bartram Federal Security Agency Food and Drug Administration Washington, D. C.
9	A Charles Livak

*For complete identity, see previous description.

- 10 E Penn Dairies, Inc.
York, Pennsylvania
- Earle K. Borman
Bureau of
Laboratories
State Department
of Health
Hartford, Conn.
- 11 F C. W. Anderson
Department of
Public Health
Rockford, Illinois
- 12** B R. W. Newman
Division of Animal
Industry
Department of
Agriculture
Sacramento, Calif.

Although not responsible for originating the modified Stain A, Charles Livak, Laboratory Director at Penn Dairies, Inc., York, Pennsylvania, used it in this study and is referred to herein as its sponsor. Films of each milk and cream were prepared by B. Eugene Pellet and Richard Eglinton under the direction of E. K. Borman, in the Laboratories of Connecticut State Department of Health, Hartford.

Procedure

Exclusive of extra slides for replacement of lost or damaged ones, a total of 58 (milks and creams) x 6 (stains) x 12 (participants) x 2 (films in duplicate per slide), or 8,352 films, were prepared for counting. This was accomplished by taking 25 pairs of milks (1 raw, 1 pasteurized) and 4 pairs of creams, making a total of 29 pairs. For each pair, 98 slides with 4 films on each (2 raw, 2 pasteurized)

**No counts reported.

were prepared. Of each batch of 98 slides, 14 slides were sent to each of the 6 stain sponsoring laboratories for defatting and staining, and 14 slides were retained in reserve at Hartford. After defatting and staining 14 slides for each of the 29 pairs, each sponsoring laboratory shipped them in groups as completed to J. C. McCaffrey, Illinois Department of Public Health, Chicago. There coding on the stained slides was completed and the slides from the 6 sponsors were randomly regrouped before shipment to the 12 laboratories for counting. One stained slide from each set of 14 was sent to each of 12 laboratories and 2 were kept in reserve at Chicago.

Sponsoring laboratories were directed to use 4 staining solutions, each prepared from stain (powder) with a different lot identity. Batches of prepared stain could be replaced as needed, but 4 different solutions were maintained. A different solution was used for staining approximately $\frac{1}{4}$ of each set of 14 slides so as to reduce the possibility of finding that any one stain was either unusually good or unusually poor.

To avoid possible systematic biases resulting from orderly selection of slides, special care at each stage was taken to randomize the assignment of slides to stains, their reassignment to participating laboratories, and the order of counting slides. On each film 15 vertical and 15 horizontal fields were counted by starting about midway at one edge of each film. Fields were

selected by passing over the first 0.4 - 0.5 mm. and then counting each successive third field across the film, assuming that diameter of field is 0.206 mm.

A completed report form for each slide counted was sent by the participating laboratories to the writers where records were assembled for statistical analysis. Preparation of slides was begun in June 1951 and counting completed between December 1951 and May 1952. One laboratory failed to submit completed reports.

STATISTICAL CONSIDERATIONS

The original intent to use for reference the counts by Stain A was abandoned when it was found that the counts by different participants on the same sample varied so widely that mean counts partially lost their significance in comparisons. Contributing to irregularities in laboratories, 3 different microscope factors were used (table 1) instead of a fixed factor of 300,000. Still more important, the counts reported were much more erratic than had been anticipated. Initially when erratic results were discovered, the participant was asked to recount the film, but recounts never differed appreciably from original counts. Erratic counts were not confined to any particular milk, stain, or participating laboratory. Unusual counts could not be omitted from the comparison because there was no consistent way to identify them or to distinguish between them and many less erratic ones which were not completely out of line. Ac-

TABLE 2.—TOTAL BACTERIAL COUNTS FOR 58 MILKS AND CREAMS, BY PARTICIPANT AND STAIN.
Each Figure Represents a Total Count from 3,480 Fields.

Participant	Microscope Factor	Stain						Total
		A	B	C	D	E	F	
1	300,000	8,461	8,561	10,356	11,111	10,730	9,912	59,131
2	600,000	4,597	5,250	6,180	6,331	5,498	5,999	33,855
3	600,000	6,262	6,863	7,353	7,378	6,705	7,761	42,322
4	300,000	9,888	10,106	12,748	12,439	11,832	12,405	69,418
5	300,000	8,263	9,228	11,127	11,090	10,891	11,688	62,287
6	600,000	3,952	4,041	5,135	4,827	4,606	4,878	27,439
7 D ₂	300,000	8,470	9,789	11,993	14,223	11,314	12,258	68,047
8 C	500,000	6,295	7,066	8,999	8,465	8,613	8,556	47,994
9 A	300,000	5,526	6,417	8,175	8,247	7,213	7,828	43,406
10 E	300,000	8,803	8,820	11,147	11,441	12,355	11,772	64,338
11 F	300,000	9,930	10,630	13,103	12,926	12,548	15,699	74,836
Total for non-sponsoring participants, 1-6		41,423	44,049	52,899	53,176	50,262	52,643	294,452
Total for sponsoring participants, 7-11		39,024	42,722	53,417	55,302	52,043	56,113	298,621

cordingly the approach for statistical analysis was changed so as to circumspectly include the erratic counts.

This change required the simple ranking of counts in order of magnitude (lowest on each sample, 1; next higher, 2; etc.) and substituting in the statistical analysis the ranking numbers for actual counts, (table 1). Thus no more weight was given to an erratically high count than to a count only 1 higher than the next lower count. In case of identical values, the rank was split equally.

The resulting analysis was actually simpler than would otherwise have been required. Fortunately, the difference between counts obtained with certain stains was greater than anticipated, thereby making possible unmistakable distinctions. Table 1 illustrates the application to results on raw milk No. 19. Although by no means typical, this milk shows (1) the completely erratic count of 416 for participant 2 with Stain D, (2) the greater-than-anticipated variation for the remaining counts, and (3) an extreme example of the generally low counts on films treated with Stain A.

In a few cases extremely high counts were obtained where objects were counted which could not be unmistakably identified as bacterial clumps. Unfortunately the participants were not instructed to count only clumps which could be positively identified. It seems inappropriate to attempt herein to explain individual differences in counts possibly attributable to use in laboratories of different microscopic factors, to different ages of films before counting, to possible break-up of clumps, to presence of direct accidental contamination of films, to lack of familiarity with the stain, to staining failures of Stain A, etc.

STATISTICAL ANALYSIS

Totals of counts: Table 2 shows a summary total count for the 58 milks and creams for each participant with each stain. Noteworthy, each of the 11 participants obtained lowest totals with Stain A, and 10 of the 11 obtained next to lowest totals with Stain B. Typically, Stain E gave the third lowest total, being rated third by 7 of the 11 participants. Three participants obtained their highest totals with Stain C, 4 with Stain D, 1 with

TABLE 3.—AVERAGE RANK OF BACTERIAL COUNT FOR 58 MILKS AND CREAMS BY PARTICIPANT AND STAIN.

Participant	Stain					
	A	B	C	D	E	F
1	2.05	2.58	4.08	4.34	3.85	4.10
2	2.12	2.66	4.35	4.34	3.46	4.07
3	2.32	2.99	3.75	4.43	2.96	4.55
4	2.11	2.61	4.22	4.52	3.53	4.02
5	1.82	2.75	4.22	4.38	3.16	4.68
6	2.40	2.92	4.44	3.97	3.28	4.00
7 D	2.06	2.84	3.89	4.78	3.48	3.95
8 C	1.63	3.18	4.60	4.04	3.56	3.98
9 A	1.70	2.54	4.64	4.69	3.45	3.98
10 E	1.83	2.20	4.09	4.38	4.10	4.41
11 F	1.52	2.22	4.03	4.15	3.55	5.53
Average for non-sponsoring participants, 1-6	2.14	2.75	4.18	4.33	3.37	4.24
Average for sponsoring participants, 7-11	1.75	2.60	4.25	4.41	3.63	4.37

Stain E, and 3 with Stain F.

Of the 5 reporting sponsoring participants, 4 reported highest totals with the particular stain sponsored, suggesting that familiarity with a stain often leads to higher counts. The exception to this was Stain A, where similarity was insufficient to compensate for its markedly low staining properties.

Total counts obtained with Stains C, D and F agreed closely with each other. If the average total for these 3 stains is assumed to represent 100 percent, counts by Stain A would be 75 percent, Stain B, 80 percent, and Stain E, 95 percent.

Ranks of count: A summary of average rank for the 58 milks and creams for each participant with each stain is shown in table 3. These correspond to averages of the ranks illustrated in table 1. Judging from the ranks, the relations between the stains are much like those indicated in table 2. Each one of the 11 participants obtained the lowest average rank with Stain A, and 10 of the 11 obtained next to the lowest average rank with Stain B. Stain E received the third lowest average rank by 9 participants, being rated second lowest by 1 participant and fourth lowest by its sponsor. Stains C, D and F have ranks very close to each other and among themselves account for all of the highest individual participant average ranks. Three participants obtained their highest average ranks with Stain C, 4 with Stain D, and 4 with Stain F.

Statistical Significance: To the

extent that 11 participants could be considered a random sample of laboratories, the results found would be sufficient to establish statistical significance. The general systematic placing of Stain A lowest; Stain B second lowest; and Stain E third lowest is in itself significant. A procedure more sensitive to stain differences would be to consider the 58 milks and creams to be a random sample of all milks and creams.

With this viewpoint, it is necessary only to derive from the data some kind of score or rating value for each of the 6 stains from each of the 58 milks and creams, and then to determine if the average score over the 58 differs significantly from stain to stain. Two ranking scores have been considered and applied separately to sponsoring and non-sponsoring participants. The first score is the rank of each of the 6 stains in the order of the sum of the separate counts the participants obtain for each stain for the particular milk or cream. The second score assigns ranks to the stains for a particular milk or cream on the basis of the sum of the separate ranks each participant obtained for each stain. Both types of scores are illustrated for a single milk in the lower section of table 1. The average of such scores for all 58 milks and creams are in the first section of table 4.

For each of the 4 sets of averages shown in the first section of table 4, the set of differences between the 6 stains is highly significant. It is then proper to

TABLE 4.—AVERAGE SCORE FOR ALL 58 MILKS AND CREAMS, AND FOR RAW AND PASTEURIZED MILKS AND CREAMS SEPARATELY, BY STAIN.

Scores based on	Stain					
	A	B	C	D	E	F
Averages for All 58 Milks and Creams						
Sums of counts						
non-sponsoring participants	1.52	2.28	4.58	4.71	3.27	4.66
sponsoring participants	1.24	2.30	4.41	4.83	3.46	4.77
Sums of ranks						
non-sponsoring participants	1.55	2.33	4.59	4.73	3.23	4.57
sponsoring participants	1.24	2.20	4.52	4.76	3.62	4.66
Averages for 29 Raw Milks and Creams Only						
Sums of counts						
non-sponsoring participants	1.48	2.40	4.64	4.76	3.26	4.47
sponsoring participants	1.24	2.31	4.41	4.55	3.76	4.72
Sums of ranks						
non-sponsoring participants	1.57	2.38	4.60	4.90	3.34	4.21
sponsoring participants	1.21	2.14	4.59	4.45	4.00	4.57
Averages for 29 Pasteurized Milks and Creams Only						
Sums of counts						
non-sponsoring participants	1.55	2.16	4.52	4.66	3.28	4.84
sponsoring participants	1.24	2.29	4.40	5.10	3.16	4.81
Sums of ranks						
non-sponsoring participants	1.53	2.28	4.57	4.57	3.12	4.93
sponsoring participants	1.28	2.26	4.45	5.02	3.24	4.76

select the highest average and assert that it corresponds to the best of the stains. Each of the successively lower averages can then be compared with the highest average until a significant difference is obtained. This provides a demarcation between the possibly best and the presumably inferior stains. In all 4 sets of averages the possibly best stains consisted of C, D and F. In addition, in each case Stain E was significantly superior to Stain B, which in turn was significantly superior to Stain A.

In comparing any 2 stains with each other, the procedure was to total the number of milks and creams among the 58 with a higher score. A significant departure from a 29-29 split (a minor modification was necessary in the case of equal distribution) would indicate a significant difference between the stains.

It was not anticipated that the findings above would be altered appreciably if the sample was considered to consist of 29 pairs of milks and creams rather than 58 milks and creams. Since pairs instead of individual milks and creams were used for each set of slides, treating the sample as 29 pairs may be more appropriate.

The 58 milks and creams may

also be separated into 29 raw milks and creams and 29 pasteurized milks and creams, and a similar analysis performed separately on these 2 groups. The average scores for these 2 separate groups are shown in the lower 2 sections of table 4. The results for the 6 stains are substantially the same for both groups. Apparently, then, the stains which have been selected as superior are superior for both raw and pasteurized products.

SUPPLEMENTAL INFORMATION

In addition to bacterial counts on the report forms, participants were required to record their judgment about certain factors on each slide, generally relating to the ease of counting. This supplemental information served two purposes: first, a basis for rejecting a stain, based on film appearance alone, as difficult to work with even though it gave higher counts, and second, a reinforcement of the selection of a stain as superior, if the relative ease of counting supported such a choice. Conceivably, a stain could give high counts by virtue of a tendency to cause bacterial clumps to dissociate into smaller clumps or separate bacteria. If, as is true in the present study, the stains giving high counts were also easy to work with, the

presumption would be that the high counts were attributable to such ease. Therefore, the case for dissociation is weakened.

As implied above, the supplemental information furnished results which were very much in line with the bacterial count data. On each of the 4 supplemental factors considered, Stain A was poorest by far, Stain B very poor, and Stain E a little inferior to the remaining Stains C, D and F. The results for Stains C, D and F were all roughly comparable. Table 5 presents a summary tabulation of the data on supplemental information.

Care should be taken in interpreting the results of this supplemental information. If an operator has difficulty in making counts on a particular slide, he is very likely to downgrade the stain used on each of the factors considered instead of only the factors which caused the difficulty. The existence of this halo effect has been recognized in other judgment problems, i.e., taste testing. The halo effect makes more difficult the exact pinpointing of the weaknesses of the item being judged. In the present problem it may exist between the different factors considered in the supplemental information but not between these factors and the bacterial counts.

TABLE 5.—DISTRIBUTION OF RESPONSES TO SUPPLEMENTAL INFORMATION SECTION; TOTALS FOR ALL PARTICIPANTS.

Factor considered		Stain					
		A	B	C	D	E	F
Eyestrain and fatigue	Much	383	179	114	57	42	46
	Average	205	362	249	287	383	299
	Little	41	92	264	288	208	286
	No answer	9	5	11	6	5	7
Stained bacteria and protein contrast	Poor	285	100	23	30	44	27
	Fair	216	216	120	141	174	115
	Good	79	217	242	256	300	294
	Excellent	35	86	237	198	109	185
	No answer	23	19	16	13	11	17
Uniformity of background, absence of "cloud roll" effects	Poor	298	219	66	29	36	39
	Fair	238	240	127	119	190	171
	Good	72	159	205	275	277	315
	Excellent	22	15	213	202	128	104
	No answer	8	5	27	13	7	9
Refocusing of microscope z	Much	357	212	75	69	67	49
	Average	185	281	240	250	306	288
	Little	32	78	258	258	200	234
	No answer	64	67	65	61	65	67

SUMMARY AND CONCLUSIONS

A comparison of bacterial clump counts by the direct microscopic method discloses that Levine and Black's Acid-and-Water-Free Stain, North's Aniline Oil Stain, and Anderson's Polychrome Stain are equally satisfactory and appreciably superior to the stains prescribed in the ninth edition of *Standard Methods for the Examination of Dairy Products*. Borman's experimental stain proved slightly but significantly inferior to the stains identified above. The Newman-Lampert Type 2 Stain was superior to the other two conventional stains described in the ninth edition of *Standard Methods*, but all three of these stains were distinctively inferior to the three above mentioned appreciably superior stains.

For reasons given above, it was concluded that the superior stains should be recognized as soon as practicable by the American Public Health Association for official use for making bacterial counts in milk and cream by the direct microscopic method.

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STATE REVISES SANITATION RULES FOR MEAT MARKETS

New regulations governing sanitary conditions in Oregon's retail meat markets have been adopted and are now being enforced, announces the state department of agriculture.

They come partly as an outgrowth of the expanded inspection and sanitation program the depart-

ment got under way a few months ago when it brought Chester B. Liechty into the headquarters to direct work under the meat dealer's law. And they come partly as a result of needs voiced at the recent consumer conference on meats held by Oregon State College.

Under the new regulations, the department will insist that all fresh meats sold from self-service counters or display cabinets be wrapped if the cold box is open.

It is also required that all cut portions of bacon, hams, picnics or other smoked or prepared meats be covered with transparent paper or a glass container. This applies whether the product is cut in half or lesser size.

The department will make an effort to bring about a reasonable cleanliness of aprons and other clothing worn by meat handlers, and will encourage in every way it can a careful check on the health of meat handlers, says M. E. Knickerbocker, chief of the department's division of animal industry.

He says that 3,000 retail meat establishments—those with grade B state licenses—are now operating in Oregon, with 600 of these in the city of Portland. In Portland, the sanitation program is handled by the city inspection service; otherwise, the state department of agriculture is covering the field as thoroughly as it can with its limited personnel.

MILK and FOOD SANITATION

SIGNIFICANT ABNORMALITIES IN THE VIOLET RED BILE TECHNIQUE FOR COLIFORMS IN MILK*

R. L. MORRIS AND JOSEPHINE CERNY
State Hygienic Laboratory, Iowa City, Iowa

Criteria for recognition of inaccurate quantitative coliform counts are described. Under abnormal conditions of visual dye coloration, and/or appearance of minute speck-like colonies dispersed throughout the media, it is possible to demonstrate the presence of coliform colonies in the violet red bile agar without evidence of any typical colonies on the original plate.

It is recommended that plates under suspicion be confirmed by inoculating suspicious sections of agar into lactose and brilliant green bile broth or subjected to the completed test.

The routine use of the coliform count, using violet red bile medium, as a sanitation index of pasteurized milk, is widespread in state, municipal, and dairy industry laboratories. It has been our experience as one of the consulting agencies involved in the inspection of various laboratories that many analysts are unaware of significant analytical criteria which affect the accuracy of the coliform count.

*Standard Methods for the Examination of Dairy Products*¹ states that the presence of dark red colonies measuring 0.5 mm or greater in diameter constitutes a positive presumptive test and should be counted and recorded as "Coliform count /ml". The inference is made that selective agar media inhibit the formation of visible colonies of many of the milk and cream bacteria which are not of the coliform group, but that all of these organisms are not necessarily killed by the inhibitive materials. It is also possible in gross coliform contamination that toxic products are formed which inhibit the growth of coliform organisms to the visual criteria indicated by Standard Methods. This phenomenon has been recognized in our laboratory, and suitable detection procedures developed so that excessive coliform concentrations are not overlooked.

Laboratories performing routine coliform tests by violet red bile plate count methods usually plate

one milliliter quantities of pasteurized milk predicated on the theory that approximately 150 typical colonies may develop per plate². Inasmuch as the recently published *Milk Ordinance Code*³ specifies a maximum of 10 coliform organisms per ml, it is felt by many analysts that greater dilutions are uneconomical and serve no real sanitary interpretative purpose.

Examination of large numbers of routinely plated 1-ml dilutions in violet red bile agar gave evidence that the characteristic red color frequently deteriorated to a yellowish brown tinge, with or without the appearance of very small speck-like colonies dispersed throughout the medium. Other abnormal plates showed dark red peripheral coloration similar to the color of typical coliform colonies. Plates exhibiting the entire surface area of this coliform colony color were also observed. This red coloration phenomenon was noted both in the presence and absence of minute speck formation. Careful scrutiny under Quebec counter magnification and illumination was necessary to detect the colony formation in many cases. In others, only the deviation from normal dye color was grounds for suspicion of the presence of coliforms.

EXPERIMENTAL DATA

All routine coliform counts involved in this investigation were made using Difco dehydrated violet red bile agar, prepared according to Difco's directions just prior to use. One ml of milk was introduced into a sterile Petri dish, followed by 10-15 ml of the violet red bile agar cooled to 44° C. Contents were mixed thoroughly and allowed to solidify. After solidification, an additional 3-4 ml of violet red bile agar were added to each plate to provide a cover designed to prevent formation of a typical surface colonies of coliform organisms. Plates were inverted and incubated 24 hours at 35° C. Several different lots of media were involved in this investigation with reproducibility of the described phenomenon.



Robert L. Morris graduated from the State University of Iowa in 1940 with a B. S. in Chemistry and joined National Aluminate Corporation as Research Chemist. He received his M. S. in Chemistry from the State University of Iowa in 1950 and is now Chief Chemist of the State Hygienic Laboratory in Iowa City, Iowa. He also is an Instructor in Hygiene and Preventive Medicine at the State University of Iowa.

Miss Cerny holds a B. S. in Chemistry from the State University of Iowa, and is now Associate Chemist of the State Hygienic Laboratory in Iowa City, Iowa.

Plates exhibiting any of the above described deviations from standard criteria were investigated by inoculating portions of the pertinent sections of agar into lactose broth and brilliant green bile broth for confirmation of the presence of coliform organisms. The positive brilliant green bile tubes were then completed according to Standard Methods⁴ to show conformance with the accepted definition of coliform organisms.

A series of examples are presented here which demonstrate the validity of the suspected phenomenon. In table 1, a summary of observations made from a large number of normal and abnormal plates is presented.

DISCUSSION OF RESULTS

Large numbers of typical violet red bile plates having normal coliform colonies were examined.

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Completed tests indicated that coliform organisms were absent in sections of agar geographically separated from the discrete coliform colonies. Examples of the I and II series of table 1 show results found on these normal plates.

Under abnormal conditions of visual dye coloration, and/or ap-

pearance of minute speck-like colonies dispersed throughout the medium, it was possible to demonstrate the presence of coliform organisms in the agar without evidence of any typical colonies on the original plate. Examples of the III and IV series in table 1 set forth these facts. The vast

majority of plates exhibiting the above abnormal characteristics gave positive identification for coliform organisms by confirmed tests in brilliant green bile tubes. These confirmed tests invariably completed, using accepted Standard Methods technique⁴, showing presence of coliform organisms.

TABLE 1.—COMPLETED TEST OF VIOLET RED BILE AGAR PLATES

Example	Description of plate	Portion inoculated	Analytical results			Diagnosis of portions planted
			Lactose broth	BGB*	Completed	
I	Typically negative V.R.B. plate.	Picked portions of agar at random throughout surface area.	Negative	Negative		Coliform organisms absent.
II(a)	Typical coliform colonies surrounded by normally colored agar.	Picked portions of normally colored agar at random about $\frac{1}{2}$ " from nearest typical colony.	Negative	Negative		Coliform organisms absent.
II(b)	Typical coliform colonies surrounded by normally colored agar.	Picked inoculum from the typical colonies.	Positive	Positive	Positive	Coliform organisms present.
III	Entire surface of plate typical dark red of coliform colonies. Small specks evenly dispersed over entire plate. No typical coliform colonies.	Picked portions of agar and specks at random over entire plate.	Positive	Positive	Positive	Coliform organisms present.
IV(a)	Peripheral ring of dark red. Center section yellowish brown discoloration. Two typical coliform colonies. One in yellowish brown center portion and the other in dark red peripheral ring.	Coliform colonies from both stated locations.	Positive	Positive	Positive	Coliform organisms present.
IV(b)	Peripheral ring of dark red. Center section yellowish brown discoloration. Two typical coliform colonies. One in yellowish brown center portion and the other in dark red peripheral ring.	Picked portions of agar at random from yellowish brown center section $\frac{1}{2}$ " removed from nearest coliform colony.	Positive	Positive	Positive	Coliform organisms present.
IV(c)	Peripheral ring of dark red. Center section yellowish brown discoloration. Two typical coliform colonies. One in yellowish brown center portion and the other in dark red peripheral ring.	Picked portions of agar at random from dark red peripheral ring $\frac{1}{2}$ " removed from nearest coliform colony.	Positive	Positive	Positive	Coliform organisms present.

*Brilliant green bile broth

All examples shown in table 1 have arisen many times in the plating of routine 1-ml samples in this laboratory, and the record of positive completed results testifies to the accuracy of the diagnostic criteria as described.

A series of plates embracing dilutions up to 1/10,000 were made on subsequent samples of milk which had exhibited abnormal violet red bile characteristics. When several of these resampled milk specimens were plated, using a 1-ml quantity, the same abnormal results occurred. Such results occurred through successive dilutions, and in some instances plates did not appear normal until a dilution of 1 to 10,000 was reached. Normal plates showing typical, countable coliform colonies were obtained on these greater dilutions indicating that heavy coliform concentrations can inhibit colony development to the point where no typical colonies form and produce the abnormal dye changes and speck-like colonies described.

CONCLUSION

Milk analysts employing the violet red bile technique routinely using 1-ml portions of sample should be aware that significant errors in determination of coliform density can occur in the presence of heavy contamination of the milk by these organisms. Recognition of this condition is possible by visual changes in dye coloration and/or the appearance of speck-like colonies much too small to be considered typical coliform colonies. Plates under suspicion should always be confirmed by inoculating into lactose and brilliant green bile broth or subjected to the completed test.

Conformance to the above approach should markedly decrease inaccurate diagnosis of heavy coliform contaminations in pasteurized milk specimens.

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MILK CARTONS HIT NEW HIGH

A record-breaking volume of 9.7 billion paper milk containers—a ten-fold gain since 1940 — packaged nearly 50 per cent of all beverage milk sold to consumers in 1953, reports American Can Company.

"From the standpoint of mass-producing a special type of container for a single product, the paper milk carton is exceeded only by the standard food can," pointed out William F. May, general manager of Canco's fibre milk container department.

Since the 1930's when the container-manufacturing company introduced its paper milk container, the growing popularity of fibre milk cartons represents one of the industry's most spectacular packaging stories, commented Mr. May. During the last few years production volume of these containers has been increasing at the rate of more than one billion a year.

In addition to contributing to the science of distribution and merchandising of milk in America, Mr. May said, the paper container has substantially helped supplier industries. Last year's production, for example, required approximately 325,000 tons of paper and more than 125,000 tons of paraffin.

Anticipating the continuing trend in greater use of paper milk cartons—with expectation of substantial growth for the next five or possibly ten years—the can company has projected increased production facilities in 1954 at key locations across the country. "A new Canco plant is now being built at Needham, Mass., that will service the entire New England area. In addition, new milk container production lines are planned for installation during 1954 at existing Canco plants in Maywood, Ill., Stockton and Los Angeles, Calif., and Brooklyn, N. Y.

"Not only must container production facilities be stepped up to meet the demand," Mr. May stated, "but improved equipment for dairies constantly must be developed. There is now available a new

Canco-developed automatic casing machine which is capable of almost doubling the speed of present dairy packing methods. It is designed for use with the can company's rectangular-shaped containers. Soon Canco also will introduce the industry's first high-speed 200-per-minute milk filler—a major advance over the present 110-per-minute machines."

The increase in the use of paper milk containers, the company said, parallels the merchandising trend of other products in single-trip packages. Twenty years ago approximately 95 percent of all fluid milk sold as a beverage was delivered to the home. A recent study, however, revealed that in cities of 500,000 or over 41 percent of the families now buy all their milk in stores, 44 percent have it delivered to their homes and 15 percent buy it both in the stores and through home delivery.

With the modern transportation economies provided by paper containers, plus advanced dairy pasteurization and refrigeration techniques, it is not unusual to find dairies delivering milk to points as far as 100 miles away. The Canco executive pointed out that because of the efficiency of light-weight, single-trip paper containers, twice as much milk can be carried in a truck than can be handled in glass bottles without increasing the weight of the truck load.

SALES EXECUTIVE ELECTED OFFICER OF OHIO DAIRY PRODUCTS ASSOCIATION

D. E. "Cy" Scisinger, Le Roy, Ohio, is a dairy farmer who leads a complicated life, and likes it. He was recently elected Vice President of the Ohio Dairy Products Association and was also elected a Director of the Ohio Dairy Boosters Association for a three-year term. His principal job is that of Ohio-Michigan-West Virginia Sales Representative for Schwartz Mfg. Co., Two Rivers, Wis., makers of Perfection Milk Filter Discs and Cheese Bandages, and in his "spare time" Cy manages his Ohio farm, raising cattle, hogs and sheep, in addition to his association duties.

All examples shown in table 1 have arisen many times in the plating of routine 1-ml samples in this laboratory, and the record of positive completed results testifies to the accuracy of the diagnostic criteria as described.

A series of plates embracing dilutions up to 1/10,000 were made on subsequent samples of milk which had exhibited abnormal violet red bile characteristics. When several of these resampled milk specimens were plated, using a 1-ml quantity, the same abnormal results occurred. Such results occurred through successive dilutions, and in some instances plates did not appear normal until a dilution of 1 to 10,000 was reached. Normal plates showing typical, countable coliform colonies were obtained on these greater dilutions indicating that heavy coliform concentrations can inhibit colony development to the point where no typical colonies form and produce the abnormal dye changes and speck-like colonies described.

CONCLUSION

Milk analysts employing the violet red bile technique routinely using 1-ml portions of sample should be aware that significant errors in determination of coliform density can occur in the presence of heavy contamination of the milk by these organisms. Recognition of this condition is possible by visual changes in dye coloration and/or the appearance of speck-like colonies much too small to be considered typical coliform colonies. Plates under suspicion should always be confirmed by inoculating into lactose and brilliant green bile broth or subjected to the completed test.

Conformance to the above approach should markedly decrease inaccurate diagnosis of heavy coliform contaminations in pasteurized milk specimens.

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MILK CARTONS HIT NEW HIGH

A record-breaking volume of 9.7 billion paper milk containers—a ten-fold gain since 1940 — packaged nearly 50 per cent of all beverage milk sold to consumers in 1953, reports American Can Company.

“From the standpoint of mass-producing a special type of container for a single product, the paper milk carton is exceeded only by the standard food can,” pointed out William F. May, general manager of Canco's fibre milk container department.

Since the 1930's when the container-manufacturing company introduced its paper milk container, the growing popularity of fibre milk cartons represents one of the industry's most spectacular packaging stories, commented Mr. May. During the last few years production volume of these containers has been increasing at the rate of more than one billion a year.

In addition to contributing to the science of distribution and merchandising of milk in America, Mr. May said, the paper container has substantially helped supplier industries. Last year's production, for example, required approximately 325,000 tons of paper and more than 125,000 tons of paraffin.

Anticipating the continuing trend in greater use of paper milk cartons—with expectation of substantial growth for the next five or possibly ten years—the can company has projected increased production facilities in 1954 at key locations across the country. “A new Canco plant is now being built at Needham, Mass., that will service the entire New England area. In addition, new milk container production lines are planned for installation during 1954 at existing Canco plants in Maywood, Ill., Stockton and Los Angeles, Calif., and Brooklyn, N. Y.

“Not only must container production facilities be stepped up to meet the demand,” Mr. May stated, “but improved equipment for dairies constantly must be developed. There is now available a new

Canco-developed automatic casing machine which is capable of almost doubling the speed of present dairy packing methods. It is designed for use with the can company's rectangular-shaped containers. Soon Canco also will introduce the industry's first high-speed 200-per-minute milk filler—a major advance over the present 110-per-minute machines.”

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STUDENT PROFICIENCY IN JUDGING DAIRY PRODUCTS AS SHOWN BY AN ANALYSIS OF CONTESTANTS' SCORE CARDS

G. M. TROUT, E. O. ANDERSON, C. J. BABCOCK, P. A. DOWNS,
AND F. H. HERZER
*Committee on Judging Dairy Products, American Dairy
Science Association*

The Collegiate Students International Contest in the Judging of Dairy Products furnishes an opportunity for students enrolled in agriculture to try their skills in judging dairy products against standards established by experienced judges. The contest arouses competition among students within a school and/or between contestants from other colleges. Consequently, the training of potential contestants has been most effective in teaching quality in dairy products and in fixing mental standards for creamery butter, American cheddar cheese, pasteurized milk and vanilla ice cream.

The large number of teams participating in the annual dairy products judging event (19, 26, 18 and 26 teams for 1947, 1948, 1949, and 1950 respectively) indicates the value placed among dairy educators in the contest.

More extensive analyses of the contestant score cards than that previously reported¹ should furnish additional valuable information for teaching the judging of dairy products as well as student response to such training in actual contest judging. To this end data from the contestant cards of 267 student judges of butter, cheese, milk, and ice cream in the Collegiate Students International Contest in the Judging of Dairy Products from 1947 to 1950, inclusive, were analyzed. These data furnish the basis of a detailed report containing much tabular material, which may be had by writing to any one of the authors*. It seems sufficient to include herein only the salient observations of the study.

These observations were obtained from a study of the score cards of 57, 78, 54, and 78 contestants in the 1947, 1948, 1949, and 1950 contests respectively. Each contestant scored 10 samples of

creamery butter, pasteurized milk, cheddar cheese, and vanilla ice cream. One thousand and sixty-eight contestant cards were examined involving 10,680 individual contestant-sample judgments and 159,520 item judgments.

In making the analysis the contestants' score cards for each product were grouped at the start into quartiles. The first quartile consisted of the cards of the upper one-fourth in the judging of the specific product; the second quartile contained the cards of the second one-fourth next highest contestants, and so on.

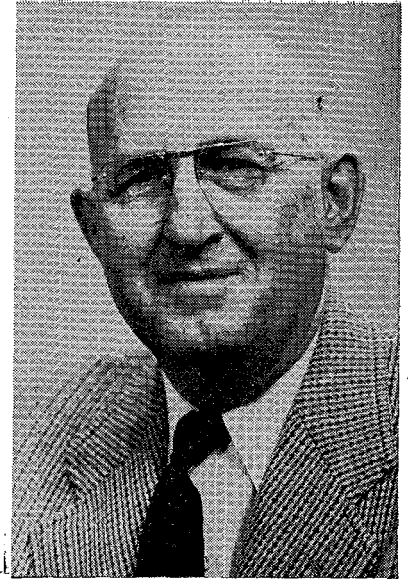
It must be recalled that in grading the contestant he is rated according to his ability to score the products in line with the scores of the official judge. Failing to do so he is given a "demerit" or grade equal to the difference between his score and that of the official judge. Also the contestant is graded on his ability to criticize the samples in light of the criticism of the official judges. Thus, the contestant with the least demerits or total grade shows superior judging ability.

An examination of the extensive data revealed again and emphasized that noted in previous studies^{1, 2, 3} namely that the high ranking contestants in each product attained superior rating because they knew how to score the flavor and the body texture more accurately than did their competitors.

As a result of the study of the contestant cards the following observations seem to be justified:

Butter. The highest ranking contestants in the judging of butter seemed to attain that position not only by superior judgment in scoring and criticizing flavor but also by recognizing that the body and texture of creamery butter today, in general, is above criticism. Those contestants in the lowest quartile each year were marked down in part because they were over-critical of the body and texture.

The average grade of the three highest individuals over the four-



Dr. G. M. Trout received his B.S. (1923) and M.S. (1924) from Iowa State College, and Ph.D. (1936) from Cornell University. He is a member of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, American Dairy Science Association, Dairy Industry Society, International and Institute of Food Technologists. He has been the author and co-author of many papers, articles, and bulletins in dairy technology. He has served at West Virginia University and is now Research Professor, Dairy Department, Michigan State College, East Lansing, Michigan.

year period from 1947 to 1950 inclusive, in scoring 10 samples of butter, was 10.7 points. This grade consisted of 6.1 points in flavor score and 3.6 points on flavor criticism. This grade represented, per sample, 0.61 point on flavor score and 0.36 point on flavor criticism, and is considered to be quite proficient scoring.

Students seemed to respond to training in judging flavor of butter more than in the judging of that of cheese, milk, and/or ice cream. This was shown (a) by the relatively low mean grade on butter flavor score of contestants in the first quartiles; (b) by the spread in mean flavor score grades between contestants in the first and 4th quartiles; (c) by a lower mean butter score grade of the three highest ranking contestants than for cheese, milk, or butter; and (d) by a lower mean grade on butter flavor criticism of the three highest individuals.

*A mimeographed compilation of the full data can be secured by writing to Professor G. M. Trout, Michigan State College, East Lansing, Michigan.

Cheese. Since the judging of cheese involves the scoring and criticizing of the body and texture and color as well as flavor, all of which are potentially scoreable by the official, the average total contestant grades were higher in cheese judging than in butter judging. Although the contestants as a group seemed to place a score on the flavor of cheese with about the same proficiency as they did that of butter, they showed slightly less skill in criticizing the flavor.

The contestants, in general, seemed to take a relatively high loss in scoring and criticizing body and texture of cheese. The three high ranking individuals in judging cheese appeared to secure that position in part by showing greater proficiency in judging this item than did their competitors.

Milk. Contestants appeared to obtain high rank in milk scoring in large part by superior ability in identifying the flavor and evaluating it in line with the official score. The higher ranking contestants also seemed to show slightly greater skill in scoring sediment and container and closure than did the lower ranking groups. Neither sediment nor container and closure scores in the 1950 contest affected proportionately the contestant's total milk score as they did previously.

Ice Cream. Ice cream flavor scoring and criticizing continues to yield relatively high contestant grades (poorer judging) as compared to butter, cheese, and milk even among the higher ranking contestants. Not only was the mean flavor score grade high but the flavor criticism grade as well. The relatively low difference in scores between the 1st and 4th quartiles, both on flavor score and on flavor criticism, indicates that no marked difference in proficiency exists between the better and poorer contestant judges of ice cream. This may indicate that the contestants have difficulty in sensing both the delicate, desirable, and slightly undesirable flavors when masked by sweeteners. The inhibitory effect of the sugar brings about "taste fatigue" and may play the major role in the inability of contestants to recognize flavor defects.

The over-all analysis of the study may be summarized as follows:

One thousand and sixty-eight contestant cards used in judging butter, cheese, milk, and ice cream in the Collegiate Students International Contest in the Judging of Dairy Products from 1947 to 1950 inclusive were studied. These involved 10,680 contestant-sample judgments and 159,250 item judgments.

An examination of the data seemed to indicate that the highest ranking contestants attained their high standing in judging dairy products because (a) they could detect the off flavors and evaluate them fairly accurately, and (b) because they showed an awareness of the body and texture defects of butter, cheese, and ice cream.

In general, all contestants were able to score such items as (a) color, (b) sediment, (c) container and closure, and (d) melting quality, about as well as those individuals who showed greater proficiency in scoring flavor and body and texture.

The mean grades per sample of each of the three high individuals in scoring flavor of butter, milk, cheese, and ice cream over a four-year period were 0.61, 0.76, 1.1 and 1.2 respectively. The mean grades on flavor criticism, per sample, of these same contestants were 0.36, 0.51, 0.46 and 0.59 for butter, cheese, milk, and ice cream.

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"DOCTOR JONES" SAYS:

BY PAUL B. BROOKS, M.D.

In Cincinnati, April 8, they dedicated an impressive, new six-story building: the Sanitary Engineering Center of the U. S. Public Health Service. The work, there, will be principally scientific research into new and changing aspects of environmental sanitation. Secretary Oveta Culp

Hobby, herself, was there—and the Surgeon General of the Public Health Service. Our Doctor Hilleboe was another speaker.

Well, that new building means more than appears at first sight. It stands for great advances in the science and practice of public health. But, more'n that: it's, you might say, a "mile-stone" marking a change—a turn in an important prevailing trend. It's something like what happened to the "trend" that general practitioners of medicine (family doctors) were "on the way out". They weren't. They were on the way up.

In the very early days public health was mostly environmental sanitation: getting sewage out of the street gutters and water supplies and all that. Then the development and application of bacteriology changed things. Some communicable diseases began to be controlled.

Now move up to our own time—mine, anyway. In 1900, in upstate New York, we had 718 deaths from typhoid; last year not one. By far the largest factor in that change was work done by environmental sanitarians on water supplies. In the later nineteen hundreds and nineteen thirties they recorded from five to ten milk-borne outbreaks every year—usually including some big ones. For several years now: almost none. Pasteurization (environmental sanitation) did that. Those're a few samples of the more apparent activities in the environmental sanitation field.

Recent years a trend developed that seemed to say: environmental sanitation, too, has had its best days; it should give right of way to activities in newer lines. But—still more recently has come increasing realization that our environment is always with us. Work in the old lines is unfinished. New factors, still not well understood (among 'em viruses and atomic energy) are affecting our environment.

To control 'em we must understand 'em. Since we can't escape our environment more power, they say, to our environmental sanitarians!

GETTING THE MOST OUT OF DAIRY EQUIPMENT* 1

CARL W. HALL

Department of Agricultural Engineering
Michigan State College, East Lansing, Michigan

To hold the cost of products sold at a competitive level in face of rising prices, it is necessary that production costs be held to a minimum. The first major field of reduction of production costs is in labor costs.

In order to get the most out of dairy equipment labor must be properly used. When the time requirements of a job are reduced by improving the method, the worker must be gainfully employed at some other assignment. There are beneficial changes which provide leisure, add to the comfort of the worker, and reduce the hazards of his work. Changes in plant equipment arrangement may be made even though they are not justified on a purely economical analysis.

The paper presents principles, with applications, which can be followed in each plant to improve the work method and decrease time requirements.

Today when labor costs are greater than ever before, it is important to investigate the possibilities of saving part of the cost of operation. With the high labor costs which exist, the first major field of reduction of production costs is in labor costs. It is also important to point out that if you are to save time by improving the method, the worker must be gainfully employed at some other assignment.

There are beneficial changes which provide leisure and add to the comfort of the worker and reduce the hazards of his work. Changes in plant equipment arrangement are often necessary even though not justified from a purely economical analysis. One of the popular items in the jargon of manufacturing concerns is "labor saving" but perhaps we should use the words "labor serving" instead because in many cases improvements can be made which would lighten the worker's job and help him to become more contented with his task.

What can the dairy plant operator do to meet these increased costs? To make preliminary savings, you do not need detailed time and

motion studies to locate bottlenecks in the operation. The principles involved in making time standards and an analysis of work simplification can be applied.

The following items should be investigated with the idea of improving the work method and decreasing the time requirements. In making equipment adjustments in the plant, all of us, including the workmen, resist change.

1. *Relieve hands* of work that can be done with the feet. An example of this type of motion economy can be found at the weigh can where the hands are normally used for filling. For closing or opening the valve in the weigh can, a foot-operated valve would relieve the hands for more valuable work. Another example is the control at the bottle filler which permits the cases of bottles to go into the refrigerated storage. This control should be foot-operated.

2. *Eliminate reaching* Several items of equipment have controls which are often located so that the worker has to step or walk to reach them from his work position. The valves at the can washer should be easily accessible by the man dumping the milk. If the valves are not close to the dumper, it might be possible to place an extension from the valves to the worker, so that it is not necessary for the worker to move in order to open and close the valves. See Figure 1.

3. *Tools and materials should be within easy reach* of the operator. At the can washer, the dumper should have the hammer or pipe for loosening the lids within easy reach. The pencil for recording the weights of the milk should be located where easily and quickly accessible. The water valve should be close to the point of use.

4. *Pre-position tools.* Not only should the tools and materials be within easy reach, but they should be pre-positioned so that by one grasp of the fingers, the tool is held in a position so that it may be used at the job. There is a right and a wrong way, for example, for picking up a pencil. The pencil should be pre-positioned so that



Carl W. Hall received his B.S. degree in 1948 at Ohio State University, M.S. degree in 1950 at the University of Delaware, and his Ph.D. degree at Michigan State College in 1952. He became associate professor of agricultural engineering in 1951, and is a registered professional engineer in the State of Michigan.

Before coming to M.S.C., he worked as a part time instructor at Ohio State University, and later was appointed assistant professor of agricultural engineering at the University of Delaware.

Dr. Hall is national chairman of the American Society of Agricultural Engineers' committee on agricultural processing, and a member of the Society of Automotive Engineers, Tau Beta Pi engineering honorary, Gamma Delta Sigma, American Association of University Professors, and the American Society of Mechanical Engineers.

it is not necessary for the operator to turn it in his hand before he is ready to write. If the preceding motion is carried out properly, additional work is not required to pre-position a tool properly.

5. *Motions should be balanced* and both hands should work simultaneously. The most obvious application of this practice is at the bottle filler and bottle washer. Both hands should work simultaneously.

6. *The hands should not be used as a holding device.* Equipment which is being washed should be held by jigs or fixtures so that the hands are relieved of the job of holding and can be used for more important tasks.

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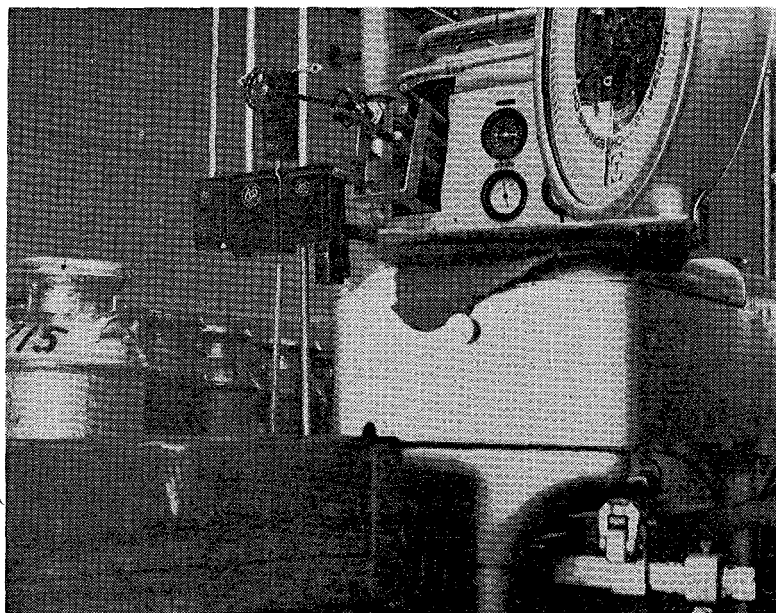


Figure 1.

7. *Use a drop delivery.* Cartons, washing powders, etc., could easily be dropped into the processing or adjoining room by means of a chute from a storage above, thus eliminating considerable work as far as handling is concerned.

8. *Can we combine operations?* The HTST pasteurizer is an example of a piece of equipment which accomplishes heating, pasteurizing, and cooling in one unit. Investigate the possibility of combining hammers, wrenches, screwdrivers, etc. where used at approximately the same time into one tool.

9. *Can we eliminate operations?* Question the necessity of each step followed in carrying out an operation. Milk can be separated without the customary heating. When hooding milk bottles, select a hood so that capping is eliminated. In the washing operation, eliminate excessive rinsing.

10. *Can we change the sequence of operations?* If one piece of equipment is slowing an operation, it might be possible to carry out the process at another time. The clarifier will often not take the milk as rapidly as it can be dumped in the receiving room. Clarifying after storage might be a solution.

11. *Can we simplify operations?* By properly applying all the principles listed, the operations will be simplified.

As a worker in the plant, you must obtain the approval of management before most changes

are made. Improving the operations in any part of the plant where the worker is actually idled while being envied by his co-workers may result in unsatisfactory labor relations. In such a case, changes should be planned, but not carried out until an appropriate time.

In conventional analysis, if the man is not kept busy at his job, the implication is that he is not doing his share. Some of the evils of time study could be eliminated if the lack of work by the employee is attributed to the machine which he is attending. The fault then lies with the engineer for improperly designing and arranging the equipment.

It is important to point out that equipment should be designed and arranged to permit utilization of labor, not to expedite labor. It is usually necessary to balance the cost of equipment by labor saving. On the basis of recent tests, the total cost of operation of many dairy plants could be reduced 5 percent to 8 percent by adopting more efficient plant operations.

Utilizing the above principles, a detailed time and motion study was made of each operation in the plant. Based on this study a method was proposed for selecting the proper size of equipment for various sizes of dairy plants. The material which follows is a summary of the results of the research work along that line.

(1) In the receiving room, it is possible to reduce the time for

weighing from 0.13 to 0.095 minute with a print-weigh device on a conventional scales. At 1952 prices with labor at \$1.75 per hour, 4.8 years would be required for a 40,000-lb per day dairy to pay for the added cost of a print-weigh device.

(2) It was found that the reasons for delays to the dumper were caused by:

(a) *Conveyor improperly designed.* The cans should be dumped at right angles to the incoming conveyor at the weigh can position. See Figure 2. It was found that there was a large variation in the length of the incoming and outgoing can conveyor in the receiving room. A chart was worked out on the basis of the time studies which illustrates the proper length of conveyor for the receiving room in order to dump and weigh the milk in the shortest possible time¹. It was found that in a few plants it would be more desirable to have a long incoming conveyor instead of a long outgoing conveyor.

(b) *Weigh can too small.* A small weigh can requires additional weighing time for large producers. A chart was developed to balance the added cost of a larger weigh can to the labor saving through the use of a larger weigh can². This information was based on a time study from which were evolved standard times for the dumping and weighing operations. From this chart it is possible to select a size of weigh can on the basis of the number of cans dumped. It was also found that the time the dumper allowed the weigh can to drain was far greater than necessary. A self-closing valve would permit a saving on the average of 0.02 minute for each weighing.

(c) *Can washer.* The can washer was often found to be either too small or too large. A can washer which was too large did not benefit the dairy in spite of the fact that the workmen were not held up at their job, but did require an additional investment for equipment and additional space for placing the equipment. A can washer which is too small does not permit the most efficient utilization of the labor because the dumper can empty the cans faster than the can washer operates. It was found that a 10-can per minute washer for a one-man receiving room was the most efficient size to utilize the

man's time. The major loss of time at the can washer was caused by the lids jamming in the lid rack at the top of the washer. The rotary can washer should be used for plants of 10,000 pounds per day capacity or less (1952). It was formerly recommended that a rotary can washer be used for 20,000 pounds per day or less, but that is an incorrect recommendation based on today's labor charge³.

(3) Processing room.

(a) Clarifier

The clarifier is usually too small to process the milk as fast as it is dumped at the weigh can. Some plant managers have overcome this small capacity by running the pump which feeds the clarifier at a speed above the rated capacity. This results in some decrease in efficiency of clarifying but increases the utilization of labor in the receiving area. The major loss from an economical standpoint to using a clarifier which is too small does not come from the loss of time at the dumping area but actually results from a loss of milk at the weigh can because the dumper does not wait for the milk to be clarified before he dumps in the next can into the receiving tank.

(b) Storage tank.

A study showed that the 84-inch diameter storage tank required less cleaning time than the 96-inch diameter tank of the same capacity. However, the tank with the smaller diameter requires more space in the plant. The saving in labor with the 84-inch diameter tank must be balanced against the additional building space required in comparison to the 96-inch diameter tank. The time saving amounted to about 5 minutes per day for cleaning. Based on the time study results of 1952 the 84-inch diameter storage tank would be more economical for the dairy plant in sizes up to and including 4000 gallons. At present, the largest tank of 84-inch diameter has a capacity of 3000 gallons. It should also be pointed out that it may not be necessary to change the design of the equipment, in this case, to utilize the labor more efficiently. *Improved work methods* might be carried out so that the cleaning requirements for the tanks of the two diameters would be the same. In one plant five people were delayed a total of seven hours during the day because of insufficient

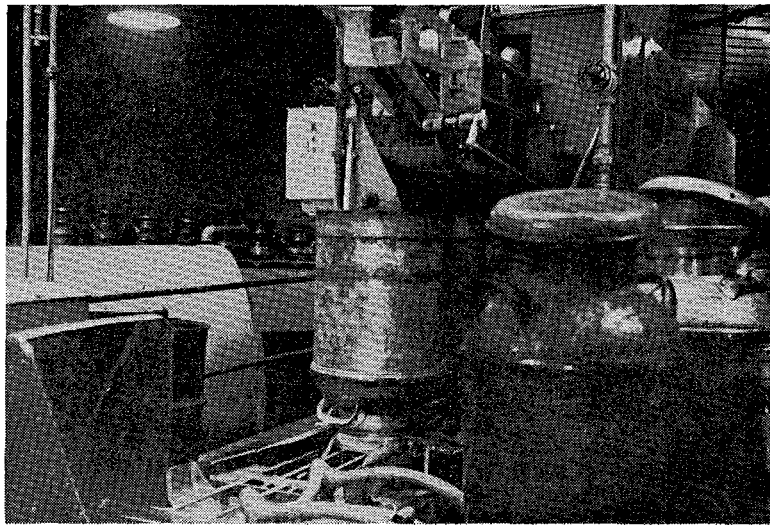


Figure 2.

storage for the raw milk.

(c) Cleaning

One of the major methods of time saving with cleaning equipment can be made by using parts racks, so that the equipment as it is washed on the rack is also prepositioned for the assembly, usually the following day. The major cause of excessive time requirements in cleaning dairy equipment is due to excessive rinsing. This would often amount to 50 percent of the total labor requirement for the cleaning operation. A water valve on the end of a hose would probably decrease the water requirements and also decrease the labor requirements in that it would not be necessary for the workman to go back to the mixing valve in order to turn the water on and off. The importance of the proper method of carrying out one operation and its relation on another operation is often overlooked. A water hose crossing an alley may not cause the cleaning operation to take much longer than it ordinarily would but would require excessive time for those operations which require the alley for moving materials. Possibly an extra cabinet for storage of cleaning agents would save considerable time.

CHECK LIST FOR RECEIVING ROOM⁴

1. Dumping

Cans should not pinch during dumping.

Water on the floor should drain away from the operator.

To secure a rapid dumping rate, the trucker should loosen the can lids; two truckers may work together in unloading the cans and

loosening lids.

If the trucker does not loosen the lids, the person doing the dumping should loosen several lids at a time, not just one.

An automatic can lid loosener should be used for receiving at rates faster than 7 cans per minute.

Cans should be permitted to drain before going into the can washer; an extension should be provided on the can washer to catch the drippings from the cans.

2. Weigh Can, Scales, Weighing, Sampling

A self-closing valve on the weigh can should be given consideration. There is justification for a self-closing valve on the weigh can, particularly for a multiple man-operation.

An air-operated valve should be used to lighten the work of the weigher.

The correct size of scales and weigh can should be selected according to the size of dairy and the size of the producers.

Scales installed in a dairy should have a capacity of either 750 or 1000 pounds.

A permanent table should be placed near the sampling position for recording weights.

A foot-operated weigh can valve control should receive consideration.

The receiving tank need not be more than three times as large as the weigh can; a receiving tank twice as large as the weigh can is usually sufficient.

There is little justification for a 1000-pound weigh can unless the plant has a capacity of 60,000

pounds or more per day with fifty percent of the producers shipping more than 500 pound lots.

The use of a print-weigh device on the scales should be considered to speed up the receiving operation.

The dial of the scales should be positioned so that it is easy to read.

A permanent place should be provided for the weigh sheets where they can be kept in order.

In a two-man operation, the weigher should be able to see can numbers easily without the dumper rotating the can.

Dumper should be able to see receiving tank so that he can avoid running it over.

Make sure that there are no obstacles to encounter when obtaining the sample.

Man dumping the cans should be able to see if cans are removed from the can washer.

Sample bottles should be easy to obtain, clearly marked, and fitted with a lid which is easy to manipulate.

Both hands should be used simultaneously when sampling.

3. Can Washer

Can washer should operate as rapidly as worker's normal dumping speed.

The water and steam valves should be within easy reach of the operator.

The can washer should be checked regularly to see if lids are feeding through properly.

The speed of the receiving operation may be affected by direction in which the lids are taken into the washer. The cap (flat side) of the lid may be fed into the can washer to the right or left.

The lid rack from the can washer should be extended so that it is within easy reach of the dumper.

The safety devices on the can washer should be checked periodically to prevent breakage in case of an obstruction.

4. Conveyor

The connections between the gravity conveyor and roller conveyor should be carefully designed and periodically inspected to prevent lodging of the cans.

The possibility of including a cross-over between conveyor loops to facilitate handling small truck

loads should be investigated.

The incoming conveyor should be level with or slightly higher than the bed of the truck.

The outgoing conveyor should be close to the incoming conveyor, but there should be sufficient area for one truck to be unloading and one truck to be loading at the same time. In large operations, the possibility of having two incoming conveyors so that the trucks could unload simultaneously should be investigated.

Conveyors should not "box in" the workmen.

Conveyors should be arranged so that a short reject line is required.

The incoming and outgoing conveyor lengths should be selected so that the dumping will not be delayed.

Conveyors should be lubricated regularly.

The pinching of the cans at the dump can be eliminated by dumping at right angles to the conveyor.

If the dumper must remove the lids, the incoming conveyor should be arranged so that he can easily travel around it.

There should be a conveyor control for the truck driver near the unloading platform.

Minimize cost of conveyor system by utilizing a single chain whenever possible.

If conveyor goes to the outside of the building, a method of locking the can pass doors must be provided. The doors should be easy to open and close.

Conveyor should be placed about 30 to 32 inches above the floor.

5. General receiving room

A truck door should be provided which can be either opened or closed or both from the cab of the truck, to eliminate need for the trucker to get in and out of the truck at the loading and unloading platform.

The handling of two grades of milk should be considered when designing the receiving room.

A wash basin should be in the receiving room for the dumper.

The washing of ten-gallon cans from processing room which may have been used in other operations should be considered.

The total and unit costs of the operation should be used as a guide to equipment selection.

The receiving operations should

be balanced with the processing operations.

The trucks bringing in the milk from the farms should not interfere with the milk route loading and return positions.

The receiving room should be planned so that it can be easily adapted to bulk handling.

If a storage tank is placed in the receiving room, a door should be provided with adequate size to move the tank through.

Adequate ventilation should be provided—a minimum of 300 cubic feet per minute of air movement for each can per minute capacity of the washer.

Window should be placed by the unloading platform so that the trucker can see into the receiving room.

The receiving room should be well-lighted — natural and artificial light.

SUMMARY

The use of time and motion study methods can improve the operations in practically every part of the dairy plant. In order for the saving in time to benefit the plant, the worker must be utilized in a productive operation during the time salvaged from the work improvement. Evaluate each operation in the entire plant on the basis of the time and motion principles presented. Everyone resists change. We must try to:

1. Combine operations.
 2. Eliminate operations.
 3. Simplify operations.
 4. Change the sequence of operations.
 5. Place tools close to work.
- Often by following one or more of these items we can get the most out of dairy equipment.

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Association News

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**MICHIGAN ASSOCIATION OF
SANITARIANS**

On the 5-6-7 of this month the Annual Meeting of the Michigan Association and Sanitarians School was held at Kellogg Center at Michigan State College. About 100 persons attended and we were all pretty well agreed that it was one of the most successful meetings we have ever had.

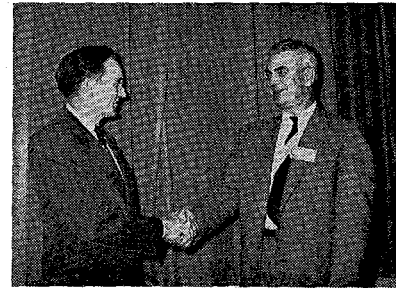
This is the first year that our Association has permitted membership to laboratorians, sanitarians, and quality control personnel employed outside of official agencies. This change in policy was marked by the election to the board of directors of the Association three men who are employed by commercial food or milk processing companies. They were Mr. Emerson Teal of the Michigan Milk Producers Co., Mr. Don Foster of Sani Seal Dairy at Saginaw and Mr. William Wade of McDonald Coop Dairy at Flint. The association is looking forward to increasing interest on the part of the many quality control personnel in the commercial field who are not yet members of a professional group such as the M.A.S.



Winfred Ettesvold, past president of Michigan Association, congratulating Russell Palmer of Detroit Health Department, winner of this year's Service Award of this Association.

This year marked also the first annual Service Award to a member who has contributed the most toward the advancement and development of the organization. A suitably inscribed scroll and a life membership to the M.A.S. were presented to Russell Palmer of Detroit, winner of this year's award. The presentation was made at the Annual banquet held at Kellogg Center the evening of April 6.

This year's banquet speaker was Dr. Malcolm Trout who showed motion pictures taken in Europe on



Winfred Ettesvold (left), retiring president of Michigan Association, congratulating Clifford Bracy (right) newly elected president.

his recent visit there as a delegate to the Thirteenth World's Dairy Congress, The Hague 1953.

(We are indebted to Grey Turney for the pictures. His interest and helpfulness are appreciated.)

**FLORIDA ASSOCIATION OF
MILK SANITARIANS**

The Tenth Annual Conference of the Florida Association of Milk Sanitarians was held on the University of Florida campus in Gainesville, on April 13 to 16, 1954. Highlighting the program was the awarding of Ten-Year Service Citation Certificates. Ten outstanding members of the Florida Association received this award (see cut). The citation, jointly awarded by three organizations, read "In recognition of outstanding service in Florida Association of Milk Sanitarians, active membership in the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, regular participation in the annual conferences conducted by the Department of Dairy Science, University of Florida Agricultural Experiment Station, and for contributing to the improvement and protection of public health through the sanitary control of production, processing, and distribution of dairy products." Signing of the certificates of the three above organizations respectively, were L. L. Chaffee, President of the Florida Association, H. H. Wilkowske, Secretary-Treasurer of INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS and E. L. Fouts, Head of the Department of Dairy Science, University of Florida.

The meeting got off to a good start with the Laboratory Section featuring a thorough discussion and practice period dealing with all

10-YEAR AWARDS RECIPIENTS—1954



Left to Right
 1. C. O. Stoy, Dade County Dairy Supervisor, Miami.
 2. H. H. Rothe, State Dairy Supervisor, Gainesville.
 3. W. Howard Brown, Director of Food and Laboratory Division, Jacksonville Health Department, Jacksonville.
 4. H. F. Cameron, Sanitation Officer, Clay County Health Department, Green Cove Springs.
 5. L. A. Scribner, Milk and Food Sanitarian, Orlando.
 6. E. L. Fouts, Head, Department of Dairy Science, University of Florida, Gainesville.
 7. A. G. Shaw, State Dairy Supervisor, Tallahassee.
 8. B. J. Northrup, Bacteriologist, Pinellas County Health Department, St. Petersburg.
 9. L. T. Smith, State Dairy Supervisor, Jacksonville.
 Not Shown, J. M. Scott, Chief Dairy Supervisor, Gainesville.

phases of the Cryoscope. No doubt this subject was of more than usual interest in view of the fact that five court cases are pending at the present time in the Dade County (Miami) area based upon alleged watered milk detected by cryoscopic examination.

Several outstanding speakers from out-of-state were on hand to make the program of interest to the 125 people who attended. Mr. W. R. McLean, Senior Sanitarian of the U.S. Public Health Service from Atlanta, presented and demonstrated the operation and testing of a HTST system. A portable (about 750 pound?) unit has been fabricated for this purpose which can be used very effectively in presenting a better understanding of this subject. Mr. G. M. Wilkins, of Ingersoll-Rand, New York City, presented an interesting talk, with slide illustrations on air agitation of milk. He pointed out that such system meets all sanitary regulations and is being installed in numerous large dairies in several states. Our friend, Dr. G. H. Hopson, DeLaval Separator Company, Poughkeepsie, New York, again appeared on the program after several years absence to bring us up to date on the many aspects of pipe line milkers. In addition to his usual excellent

discussions, he had an actual-size equipment set-up to show cleaning of milkers and pipe lines by vacuum circulation.

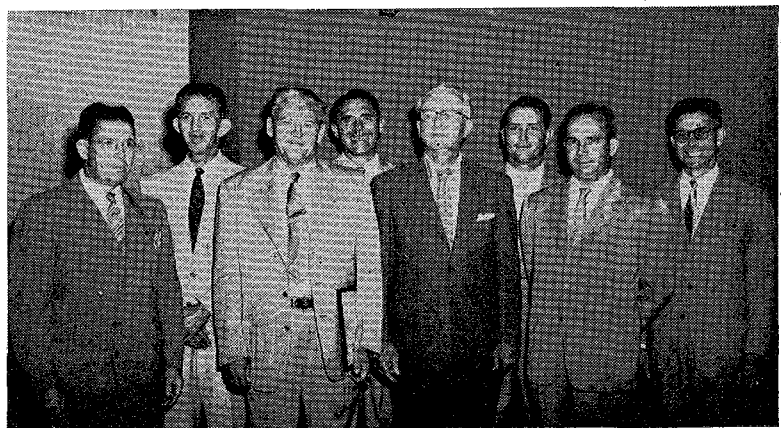
Mr. William A. Hadfield, Pennsylvania Salt Manufacturing Company, Philadelphia, gave an interesting discussion of water problems related to sanitation, and noted

that Florida is one of numerous states that have many different types of water with which to contend. Mr. N. A. Mason, Pittsburgh Plate Glass Company, Pittsburgh, Pennsylvania, pointed out that new chemical compounds are now available which, when added to paint, increase the cost about one dollar per gallon, but which are extremely successful in solving the mold and mildew paint problems around many dairy and food establishments throughout the entire country.

Space does not permit reviewing the many important points brought out in the discussions by some twenty members of the Florida Association, other than to point out the following subjects were currently popular: control of filth in foods, coliforms, bulk milk dispensers (discussed by our new member, Dr. W. H. Haskell, we are proud to say); latest information on plastics and rubber; the state and national cattle disease program; and, a round table discussion of the procedures for sampling milk from cold wall tanks.

H. H. WILKOWSKE, *Secretary*
 Florida Association Milk
 Sanitarians

FLORIDA ASSOCIATION OF MILK SANITARIANS OFFICERS AND DIRECTORS — 1954-1955



Left to Right—
 1. Past-President: L. L. Chaffee, Milk Sanitarian, Pinellas County Health Department, St. Petersburg.
 2. Director: J. S. Massey, Milk Sanitarian, Escambia County Health Department, Pensacola.
 3. President: C. O. Stoy, Dairy Supervisor, Dade County Health Unit, Miami.
 4. Director: S. O. Noles, Milk Consultant, State Board of Health, Jacksonville.
 5. Vice-President: H. H. Rothe, State Dairy Supervisor, Gainesville.
 6. Director: R. D. Lundy, Milk Sanitarian, Glades-Hendry County Health Departments, Moore Haven.
 7. Director: J. D. Robinson, State Dairy Supervisor, Plant City.
 8. Sect.-Treas.: H. H. Wilkowske, University of Florida, Gainesville.
 Not Shown. Director: W. R. Thompson, Milk Sanitarian, City Board of Health, Jacksonville.



Joined in open discussion of sanitation problems are, left to right, Earl Wright of the University of Wisconsin; A. P. Welsh of the Pet Milk Co., New Glarus, Wisconsin; Dr. H. E. Calbert, Associate Professor of dairy industry at the University of Wisconsin, and Howard Miller, PMA fieldman, Janesville, Wisconsin. Along with other prominent men in various branches of the dairy industry, they attended a milk sanitation meeting in Madison, Wisconsin on April 26, sponsored by Babson Bros. Co., Chicago, Illinois.

BABSON BROS. COMPANY HOLDS SANITATION MEETING

A need for better understanding and cooperation between men of the diverse yet related branches of the dairy industry, and an opportunity to introduce the newest systems of cleaning and sanitizing milk pipe lines on the farms has motivated Babson Bros. Co. of Chicago, manufacturers of Surge Dairy Farm Equipment, to organize a series of milk sanitation meetings throughout the midwest.

At Madison, Wisconsin on April 26, Robert Mather of Babson Bros. Co. urged the assembly of milk plantmen, fieldmen, City Health Department inspectors and others in the dairy world to give up the "let George do it" attitude and combine their energies in open discussion, constructive criticism and the use of ingenuity in coping with present sanitation problems involved in the advanced system of pipe line milking.

The inabilities of "the human equation" could lead the industry down the road to mediocrity, Mather suggested; therefore, it is imperative that in this day of the pipe line system of milking all men in the dairy field strive to replace group bickering and isolation with a workable rapport.

The advent of the pipe line has introduced new and complex problems in bulk holding, cleaning and sanitizing. The washing and sanitizing of long pipe lines of either

stainless steel or glass often involve a water softening problem for in-place cleaning. No two waters are alike. It is still necessary, Mather pointed out, to test the water at each individual pipe line installation, adding to the water an additive which will be increased in exact relation to the grains of hardness.

The speaker said that his company is instituting a planned cleaning and sanitizing program for every farm pipe line installation where the Surge equipment is in use. After the water on the farm has been tested to determine its total hardness and mineral content, the cleaning and sanitizing program is established with the particular cleaning products being used depending on the kind of water.

Pipe line and pipe line cleaning and sanitizing equipment were displayed at the meeting where the assembly were encouraged to ask any questions on sanitation concerning them. These were either answered or presented for open discussion by Mather.

P. L. MUSICK, APRIL 10, 1954

Mr. Porter L. Musick, 49, died unexpectedly at his home at 50 East West Lake Drive, Athens, Georgia, Saturday, April 10, 1954. Mr. Musick was mowing his lawn

when he received a fatal heart attack.

Mr. Musick was born in Alabama and after a long career in the fields of Milk and Food Sanitation was employed by the Georgia State Health Department in 1949. He was assigned to the State Regional Health Office as Milk Sanitarian in the Athens Region in 1950, which position he held at the time of his death.

He was president of the Georgia Chapter of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS. He was also a member of the Georgia Public Health Association and the American Public Health Association.

Mr. Musick was a member of the First Methodist Church in Athens. Funeral services were conducted at the church, Sunday, April 11th.

Mr. Musick is survived by his wife and one son who reside at the home in Athens.

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FOOD TECHNOLOGY AT SUMMER M. I. T.

To consider important recent scientific advancements in the food industry, the Massachusetts Institute of Technology again presents a three-week Special Summer Program in FOOD TECHNOLOGY, from Monday, July 12, to Friday, July 30, inclusive, during Summer Session 1954.

This Special Summer Program is planned to enable those in the food industry to study recent developments in food manufacture and control. It is also planned for advanced engineering and chemistry students who may desire to investigate opportunities open to them in the field. Food origin and composition will be discussed, as well as food processing, handling, transportation, storage, and control. Emphasis will be placed on related chemical, microbiological, and engineering factors.

Since enrollment in the Special Summer Program will be definitely limited, early application is advisable. Preference will be given to applicants having a background of technical, production, or executive experience in food industries, to faculty members of other schools, to government workers in food control or nutrition, and to advanced students in chemistry and engineering. Tuition is \$150, due and payable upon Notification of Admission. Academic credit will not be offered.

The program will include lectures, demonstrations, conferences, and visits to food plants, and fundamental food technology subjects, such as the following:

FOOD CHEMISTRY AND NUTRITION
EFFECTS OF MICROORGANISMS ON
FOODS AND FOOD PRODUCTS
CONTROL OF CHEMICAL CHANGES
IN FOODS
FLAVOR AND FOOD ACCEPTANCE
UNIT OPERATIONS IN FOOD ENGI-
NEERING
EQUIPMENT USED IN FOOD PROCESS-
ING
FOOD PACKAGING
FERMENTATION
MATERIALS HANDLING
NEW ANALYTICAL TOOLS AND
TECHNIQUES
BAKING TECHNOLOGY

During the third week of the program, opportunity will be provided for participation in any one of four different fields of specialization, including sanitation, nutritional evaluation of food processing, food acceptance and flavor evaluation, and radiation sterilization.

1. *Sanitation*, a subject of fundamental importance in the production of quality food products, will be presented by Professors Dunn and Nickerson and will include discussions relating to the following:

DETERGENTS
FOOD AND THE LAW
CLEANING
SIGNIFICANCE OF BACTERIAL AND
MOLD COUNTS
SANITIZERS
INSECT CONTROL
SANITARY CONSTRUCTION
RODENT CONTROL
WATER SUPPLIES

There will also be plant trips.

2. *Nutritional Evaluation of Food Processing* will be presented by Professors Harris and Sherman. The problem of feeding increasing numbers of persons focuses attention sharply on this important phase of food technology. Topics considered will include:

METHODS OF FOOD ANALYSIS
FACTORS AFFECTING THE COM-
POSITION OF FOODS
LOSSES IN NUTRIENTS DURING TRANS-
PORT AND STORAGE OF UNPRO-
CESSED FOODSTUFFS
CHANGES IN NUTRIENT CONTENT
DURING PROCESSING AND SUB-
SEQUENT STORAGE
NUTRIENT LOSSES IN FOODS DURING
LARGE-SCALE AND HOME PRE-
PARATION
FACTORS INCREASING OR DECREAS-
ING NUTRITIVE VALUE OF FOODS
EFFECTS OF CHEMICALS AND NEWER
PROCESSING PROCEDURES ON COM-
POSITION OF PROCESSED FOODS
USE OF ISOTOPES IN NUTRITIONAL
BIOCHEMISTRY RESEARCH

3. *Food Acceptance and Flavor Evaluation*, a subject of particular interest to those concerned with quality food production and food service, will be presented by Professor Lockhart. There will be

laboratory demonstrations. Topics considered will include:

FOOD HABITS AND PREFERENCES
PRODUCT FACTORS ASSOCIATED
WITH ACCEPTABILITY
SENSORY METHODS FOR DETERMIN-
ING DIFFERENCES
ANALYSIS OF VARIABLES AND
ATTRIBUTES
CONSUMER ACCEPTANCE TESTING
PANEL APPROACHES
SIMPLE STATISTICS

4. *Radiation Sterilization* will be presented by Professors Proctor and Goldblith. This subject is of special significance at this time, the beginning of the atomic age. The program will include lectures, supplemented by demonstrations and by visits to sources of ionizing radiations, and will cover the following basic topics:

PROPERTIES OF MATTER
RADIOACTIVITY
COMPARATIVE PROPERTIES OF BETA
AND GAMMA RADIATIONS
SOURCES OF IONIZING RADIATIONS:
MACHINE AND ISOTOPIC
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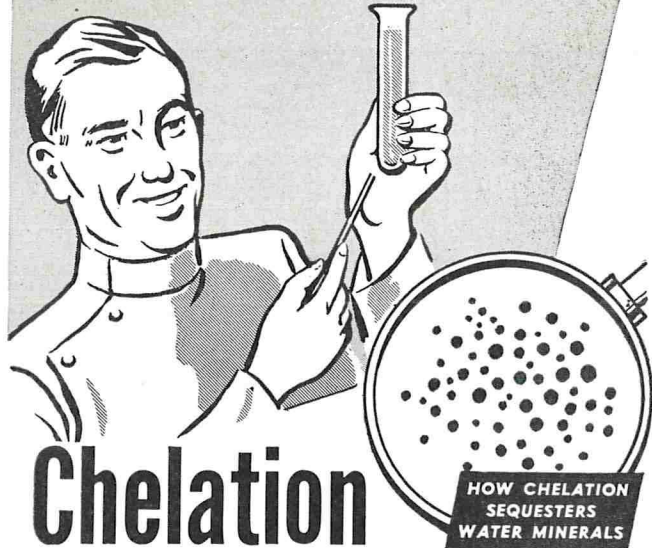
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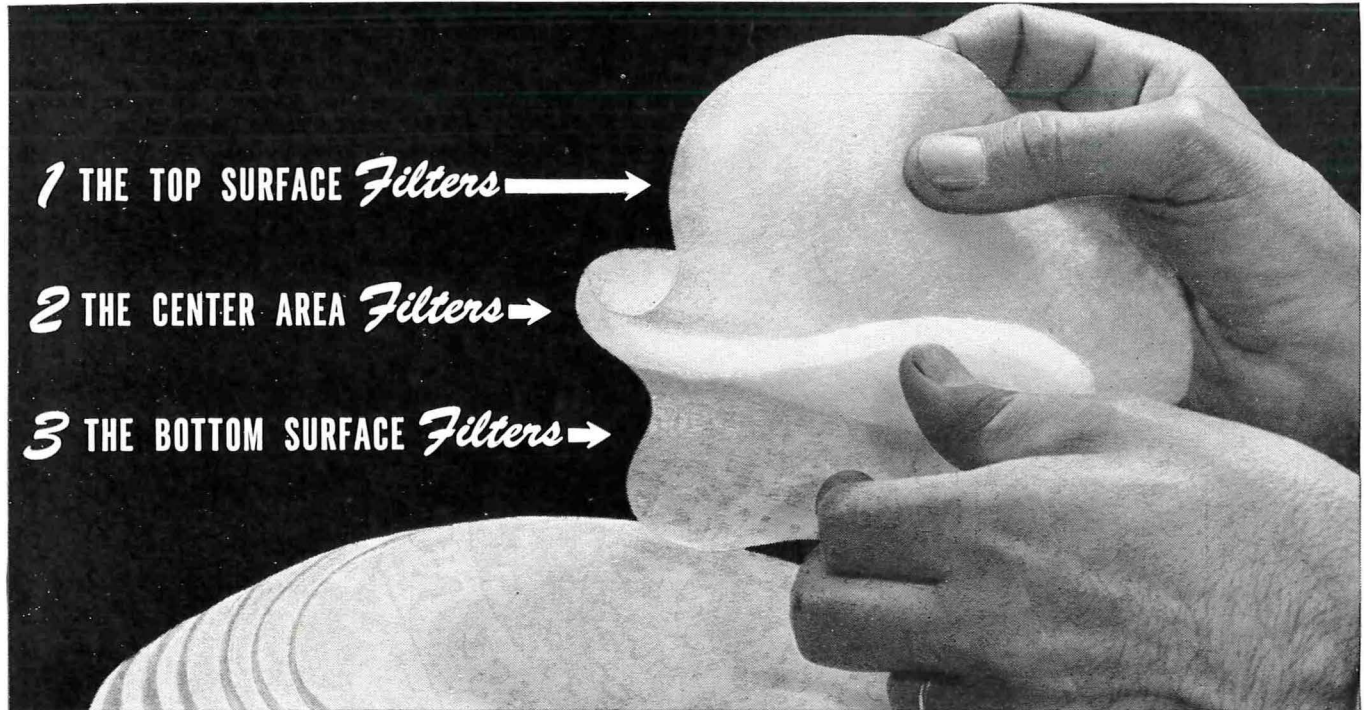
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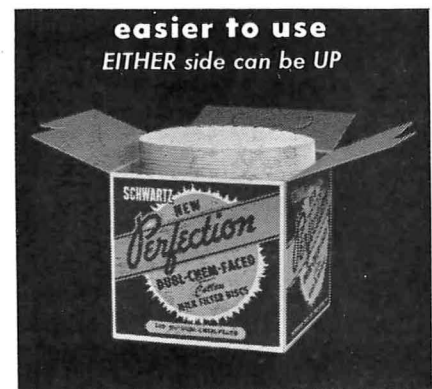
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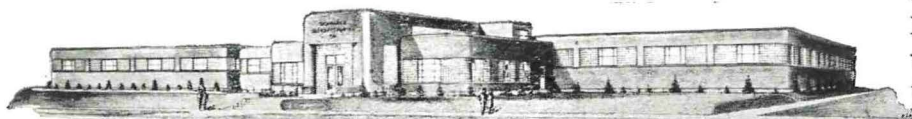
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