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MILK and FOOD TECHNOLOGY

Official Publication

International Association of Milk and Food Sanitarians, Inc.

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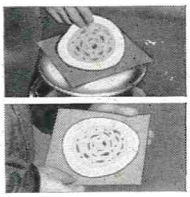

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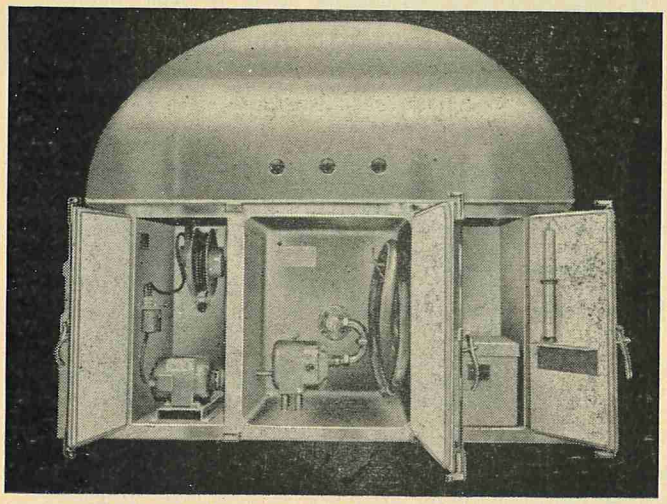

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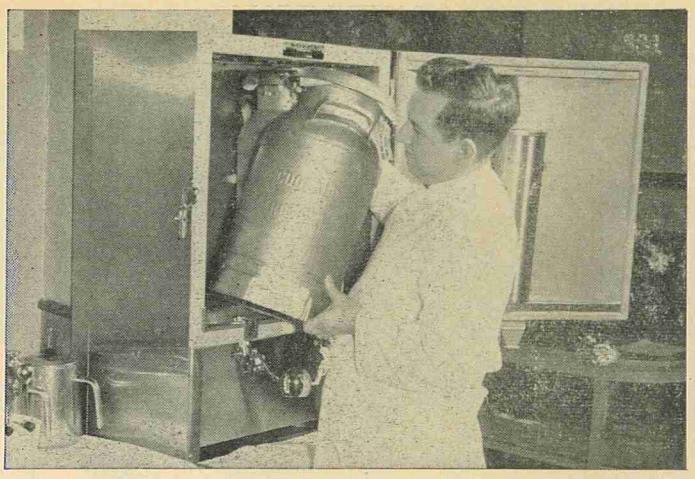

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THE ETIOLOGY AND EPIDEMIOLOGY PARALYTIC SHELLFISH POISONING[1] [2]

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Outbreaks of paralytic poisoning following the consumption of toxic shellfish have resulted in more than forty deaths in coastal areas of North America since 1927. The toxic agent exists preformed in members of the plankton species, Gonyaulax, which frequently occur in the food supply of edible shellfish. The establishment of quarantine measures based upon periodic sampling and assay of shellfish from dangerous areas, has greatly reduced the hazard to public health.

Until comparatively recent times, the utilization of shellfish foods was largely confined to maritime communities. Within the past twenty years, however, as a result of improved methods of processing, storage, and transportation their use as food on this continent by coastal and inland dwellers alike, has increased to an extent scarcely realized by many persons. The shellfish industry is now one of major economic importance to both Canada and the United States, the combined output of the two countries amounting to approximately 600 million pounds annually.

Shellfish, unfortunately, in common with many other desirable foods, are occasionally responsible for human illness, and even death. For that reason, the origin and consequences of their toxic properties has presented a problem of considerable magnitude to those agencies entrusted with the protection of public health. In consequence, many investigations into the nature and distribution of toxicity in shellfish have been conducted over the past thirty years in efforts to ensure their safety as food.

Outbreaks of food-poisoning in which shellfish have been incriminated, are of two distinct types. The first of these is characterized primarily by gastro-intestinal disorders and is considered due to contamination either with specific organisms pathogenic to man, or to massive non-specific bacterial growth arising from improper processing or storage. It may originate in varieties of food other than shellfish. The second or paralytic form of poisoning, to which the present discussion is limited, is associated with the presence of a unique toxin whose principal action is upon the central nervous system. It may be readily extracted from bacteriologically clean shellfish, and has been reported only in conjunction with species such as clams, mussels, and scallops.

[1]Contribution from the Department of National Health and Welfare, Laboratory Services, Food and Drug Directorate, Vancouver, B. C.

[2]Presented at the 43rd Annual Meeting of the INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC., at Seattle, Washington, September 5-7, 1956.

Mr. Howard I. Edwards received the M. A. degree from the University of British Columbia in 1934. He was later employed in biochemical research at the Laboratory of Plant Pathology, Saanichton, B. C. In 1939, he was appointed to his present position on the staff of the government Food and Drug Laboratory, Vancouver, B. C., and is currently investigating methods for the isolation of shellfish toxin and its assay.

During the past fifty years, many hypotheses have been advanced as to the origin of the paralytic toxin in shellfish. Some investigators considered it to be elaborated as the result of actual disease in the mollusc. Others believed it to be a post-mortem decomposition product of the tissue, or to originate in bacterial contamination from polluted or stagnant waters.

These theories, however, were eventually abandoned following the isolation of a highly toxic substance from the dinoflagellate plankton *Gonyaulax catenella,* by the late Dr. Hermann Sommer and his associates of the Hooper Foundation (*13*). Evidence then presented demonstrated a close relationship between the toxicity of the mussel, *Mytilus californianus,* and the plankton concentration of the waters of their habitat. Extracts of the dinoflagellate moreover, when injected into mice, caused death with paralytic symptoms identical to those observed when toxic mussel preparations were employed. Further large-scale collections of marine plankton rich in the suspect organism were pro-

cessed by Riegel *et al,* (8), and yielded paralytic toxin of extremely high potency. These observations definitely established *Gonyaulax catenella* as the major primary source of poison in Pacific Coast shellfish.

A similar relationship between plankton concentration and the degree of toxicity in several species of Atlantic Coast bivalves has been reported by Medcof and others (5), and later confirmed by Needler (6). In both studies evidence was presented to show that a related dinoflagellate, *Gonyaulax tamarensis,* occurring in the planktonic food of Eastern Canadian shellfish was the major cause of their periodic toxicity. Although extraction of the toxic agent from the latter plankton has not been reported, it is generally believed to be physiologically, if not chemically, similar to that occurring in *G. catenella.*

Both plankton organisms exhibit a fairly well-defined seasonal pattern in growth, occurring in greatest number during the summer months. In general, therefore, the occurrence of toxicity in both Atlantic and California shellfish is also seasonal in nature, although reaching its maximum slightly later than that of the plankton count. Toxicity apparently tends to accumulate as the shellfish feed on toxic plankton, and to diminish slowly after the cause is removed. Needler (6) has shown that toxicity in the Fundy mussel, *Mytilus,* first appears in the early summer, more or less rapidly reaches a maximum which may persist for three or four weeks, and gradually disappears. Toxicity during the winter months is seldom observed, except in a few locations where it exists to a moderate degree throughout the year.

No such clearly defined seasonal fluctuations in toxicity have been found in the butter clam, *Saxidomus giganteus,* however. This species, common to the British Columbia and Alaska coasts, is equally toxic in winter as in summer, exhibiting only minor variations over long periods of time. Although little information is available concerning seasonal variations in the plankton count of western waters, this characteristic of the butter clam would suggest that *G. catenella* is present to some extent in the North Pacific throughout the year.

A second factor which exerts a definite effect upon the incidence of shellfish toxicity is that of coastal topography. Examination of those locations in both Atlantic and Pacific waters where toxic bivalves occur, reveals considerable physical similarity between such areas on the respective coasts. Toxicity is almost entirely confined to locations in which the shellfish beds are exposed in part to the open sea, or to large bays or inlets where active tidal currents bring ocean conditions close to shore. Shellfish from beaches protected by reefs and islands, or from enclosed inlets, on the contrary, exhibit little or no toxicity.

As might be expected, therefore, shellfish display marked variations in toxicity according to species. Shellfish whose normal habitat is within protected waters are rarely toxic; species capable of withstanding exposure to open waters may become highly toxic because of the greater availability of toxic plankton under those conditions. Individual species show a similar variation with respect to location. The butter clam, *Saxidomus giganteus,* on the lower British Columbia coast where it is protected from ocean conditions by Vancouver Island, is seldom toxic. However, on the western coast, and on the northern tip of that island, the species is invariably toxic to some degree.

On the Pacific coast, the shellfish species most commonly involved in outbreaks of paralytic poisoning is the large sea mussel, *Mytilus californianus.* Although of little economic importance, the mussel is frequently consumed by local inhabitants, and consequently has been responsible for a number of fatalities, in areas ranging from California to Alaska. Second in importance are the clams, *Saxidomus nutalli,* and *S. giganteus,* the former being native to Washington and Oregon, and the latter to British Columbia and Alaska. Both are of commercial value, and at times exhibit dangerous toxicity. The little neck clam, *Paphia staminea,* and the razor slam although occasionally reported as toxic on the California coast, are rarely so in more northerly waters.

Six species of shellfish on the Atlantic Coast have been reported by Medcof *et al.* (5) as showing varying degrees of toxicity. Of these, the most highly toxic were the horse mussel, *Modiola modiolus,* and the black mussel, *Mytilus edulis,* followed by the bar clam and the razor clam. The commercially important species, the soft shell clam, *Mya arenaria,* and the scallop, *Pecten grandis,* although of lesser toxicity, frequently attain dangerous levels, and on occasion have caused death.

Sommer and Meyer (9) concluded that most of the poison in the large sea mussels was concentrated in the digestive glands or 'livers'. This was also noted in Atlantic shellfish, with the exception of the bar and soft shell clams. In these species, the gills were found to be an equally important center of concentration. Pugsley (7), however, demonstrated that the bulk of the toxin in the Pacific Coast butter clam, occurred in the siphon. Data later presented by Chambers and Magnusson (2) indicated that up to 70 per cent of all toxic material was located in that region. The toxicity of the siphon, moreover, exhibited marked fluctuations from month to month, but that of the body remained relatively constant. In commercially processed shellfish, however, removal of the viscera, gills, and siphons, reduces considerably the hazard to the consumer.

Paralytic shellfish toxin, whose chemical properties have been fully described by Sommer and co-authors (*11*) is considered to be an alkaloid, and one of the most potent known to man. It is heat stable in neutral and acid solution, but readily destroyed under alkaline conditions. The poison is freely soluble in water, acids, and the lower alcohols, but insoluble in immiscible solvents such as ether and chloroform.

Isolation of the poison in relatively pure form has been accomplished by the use of chromatographic procedures developed by Sommer *et al.* (*11*) and (*12*). By this method, toxic material has been prepared of such potency that as little as 0.25 microgram is sufficient to kill a mouse (*3*). Investigations by the author, now in progress, have shown the synthetic ion-exchange resin, Amberlite IRC-50 to be a particularly efficient adsorbant for the removal of toxin from shellfish extracts of low potency. The poison from crude extracts is rapidly and completely adsorbed by the resin, and readily eluted by small volumes of 1.0 N. HCl. Further adsorption from the acid solution on Norite and subsequent elution with alcohol, yields preparations in which the toxin concentration is increased nearly two hundred–fold in relation to that of extraneous materials.[3] The ultimate purification of the toxin and its chemical structure, however, have not yet been reported.

Up to the present, no satisfactory chemical procedure for the detection and estimation of the toxic agent has been devised. Measurements of shellfish toxicity therefore, can only be determined by means of a suitable biological assay. The procedure currently employed by most investigators for the routine assay of shellfish extracts is a modification of the "field test" originally proposed by Sommer and Meyer (*9*). In this method, acid-aqueous extracts of shellfish are prepared according to standard procedures elsewhere described (*5*). 1.0 ml. volumes of the extract are injected intraperitoneally into each of three albino mice weighing approximately 20 gm., and the time from injection until death is noted. The death times are referred to a standard curve from which the toxicity of the extract is determined in terms of "mouse units" per 100 gm. of shellfish tissue. The "mouse unit" is defined as that quantity of toxin which will cause the death of a 20-gm. mouse in 15 minutes, with paralytic symptoms.

[3]Unpublished data. Western Regional Laboratory, Food and Drug Directorate, Vancouver, B. C.

Graded response assays of this type, however, neglect the variations in susceptibility of individual mice and are, therefore, subject to considerable error when only small numbers of animals are employed. For that reason, many workers prefer assays of the quantal response design in which the median lethal dose or LD_{50} of the extract is established. This value occurs at the mid-point of the dosage-response curve, and can be determined with greater precision than a dose which produces 100 per cent mortality.

Because of many variables inherent to the biological assay which are difficult to control, toxicity data from different sources can be satisfactorily evaluated only when expressed in terms of a single reference standard. With the object of developing a toxic preparation with characteristics suitable for this purpose, a study of the stability of the paralytic toxin from two species of shellfish was initiated by Stephenson *et al.* (*14*). These authors showed that a crude acid-aqueous extract, dried by lyophilization, retained its potency over long periods of time, and suggested its applicability as a biological standard.

In conjunction with this investigation, a comparison was made of both the quantal and graded response assays. When equal numbers of mice were used, the two methods appeared to measure toxicity equally well. The quantal response assays, however, possessed the added advantage that the experimental data could be more readily assessed by standard statistical procedures. It was found by these workers that female mice were considerably more susceptible to shellfish toxin than were males, and that the estimated toxicity in terms of the LD_{50} was dependent upon the body weight of the test animals. It was further noted that the slopes of the dosage-response lines determined for the butter clams, *Saxidomus giganteus*, and the Atlantic scallop, respectively, did not differ significantly. This observation suggested that the physiological action of the toxin derived from *G. catenella* is identical to that occurring in *G. tamarensis*. If this assumption can be verified, the toxicity of shellfish from different sources may then be determined in terms of a single reference standard.

Historically, one of the earliest recorded outbreaks of shellfish poisoning occurred in British Columbia waters in 1793, and is described by Captain George Vancouver in the journal of his Pacific voyages. On this occasion, four members of Vancouver's crew having eaten mussels, became seriously ill. Of these men, one died within a few hours; the others slowly recovered. The symptoms as described in the journal were typical of the paralytic form of poisoning.

At irregular intervals during the following hundred years similar cases of poisoning were reported from a number of localities in Europe. One such outbreak in 1885, in Germany, claimed four lives, and marked the first serious attempt to isolate the toxic agent. In this study, Brieger (*1*) obtained a substance he called "Mytilotoxine" from mussels, which when injected

into animals produced the characteristic paralytic symptoms.

Paralytic poisoning, due to the consumption of toxic shellfish has therefore been recognized as a distinct clinical entity for more than a century. Its significance as a potential public health hazard on the North America continent however, was not fully realized until the publication in 1937 of the results of an epidemiological survey by Sommer and Meyer (*9*). A later report by these authors (*10*)recorded a total of 346 cases of shellfish poisoning, accompanied by 24 deaths, on the Pacific coast from Mexico to Alaska during the years 1927 to 1941. Since that time, 12 additional deaths have been reported in western waters.

Included in the latter outbreaks, are the first modern cases of shellfish poisoning in British Columbia, when in May, 1942, three persons died after eating clams and mussels near Bamfield on the West coast of Vancouver Island. During the same week, three fatalities also occurred in the vicinity of Port Angeles, Washington, the toxicity on both occasions presumably being due to the same widely spread body of plankton.

As recently as June, 1954, seven cases of severe illness resulting in one death were reported from False Pass, Alaska, following consumption of the mussel, *Mytilus edulis*. In this instance, the victim exhibited symptoms of paralytic poisoning, accompanied by abdominal pain, nausea, and vomiting, and succumbed within three hours of ingesting the shellfish. The others recovered without incident within two days.

Although information is not available as to the quantity of shellfish eaten, and their toxicity at the time, samples of mussels collected three weeks later were found to contain on the average, 86,000 mouse units per 100 gms. of tissue. Microscopic examination of sea water samples taken then, indicated that *G. catenella* was present, but not in large numbers, suggesting that the plankton had disappeared in the time that had elapsed between the poisonings and collection of specimens.

On the Atlantic coast of Canada, a comparable situation was found to exist, following the occurrence of two deaths from the use of toxic mussels at Digby, Nova Scotia. This was confirmed by Gibbard and co-authors (*4*), who demonstrated the presence of paralytic toxin in several species of shellfish from the Bay of Fundy.

As a result of the increased war-time demand for shellfish products of all kinds, and because of the apparent risk, further studies of Atlantic coast conditions were instituted in 1943 by the Department of National Health and Welfare in co-operation with the Department of Fisheries, and the Fisheries Research Board of Canada. Epidemiological data obtained in the course of this survey have been reported by Medcof and others (*5*). These authors described in detail, the symptoms, their sequence, and the probable quantity of toxin ingested by 21 victims of shellfish poisoning in New Brunswick in August, 1945. The shellfish concerned in these cases was the soft shell clam, whose toxicity in the raw state amounted to 18,000 mouse units per 100 gm. of meat. Depending upon the quantity of food consumed, the dosage of ingested toxin was estimated to vary from 1000 to 36,000 mouse units in the individual cases. No fatalities occurred, and the symptoms were arbitrarily classed as mild, severe, and extreme.

In this study, wide variations in human susceptibility to the toxin were noted. Some victims who consumed at little as 4,000 mouse units were seriously ill, while others ingesting 11,000 presented only mild symptoms. Still others received dosages estimated at 17,000 mouse units without harmful effects. Data also presented by these authors suggested that certain persons possess a natural tolerance to paralytic toxin; others, resident in coastal areas whose diet normally includes shellfish, may acquire a tolerance to quantities of poison that would produce severe symptoms in susceptible individuals.

From the information available, many investigators have concluded that the minimum lethal dose of shellfish toxin for man, is probably between 30,000 and 40,000 mouse units. The minimum amounts of poison producing mild, severe, and extreme symptoms have been estimated at approximately 2,000, 10,000 and 20,000 mouse units respectively. Somewhat lower values than these, however, were evident from an outbreak of poisoning at Metis Beach, Quebec, in July 1954. On this occasion, the consumption of toxic clams resulted in illness and two deaths in the seven members of one family. Death in one instance was caused by less than 12,000 mouse units, and severe illness in four others by less than 5,000 mouse units.

The symptoms of paralytic poisoning in man, as indicated earlier, are of nervous origin and may appear within less than an hour of ingesting the shellfish. A prickly sensation of the lips, tongue, and face, followed by numbness of the extremities are early signs of intoxication. In severe cases, these symptoms are succeeded by dizziness, convulsions, lack of muscular co-ordination, and varying degrees of paralysis. Lethal doses of the toxin result in death from respiratory failure. Although nausea and abdominal pain are common, other gastro-intestinal symptoms are infrequent.

No specific antidote to the toxin is known and treatment usually consists of the use of emetics and the control of shock. In the event of respiratory difficulty, artificial respiration or oxygen should be em-

ployed. Since the toxin is largely excreted through the kidneys, diuretics may be of value.

In the course of investigations into shellfish toxicity conducted over the past twenty-five years, it became apparent to public health authorities in both Canada and the United States that some degree of control over shellfish producing areas was necessary. Regulatory measures accordingly, were introduced by many states and provinces in order to prevent the sale and use of dangerously toxic shellfish. Since 1929, California has imposed a quarantine on mussels from May to October annually, similar action later being taken by Oregon and Washington with respect to clams as well.

On both the Atlantic and Pacific coasts of Canada, however, quarantine is based upon a continuing sampling program which has been in effect since 1942, and is applied only when toxicity levels exceed a specific amount. Under this plan as conducted in the British Columbia region, sampling areas have been selected that were considered representative of the variable conditions along the coast, and with due regard to commercial use and proximity to centres of population. Since toxicity in this region exhibits no decrease during the winter months, sampling is continued throughout the year.

On the Atlantic coast, and particularly in the Bay of Fundy, however, there is a consistent order in the time of appearance of toxicity in different locations. Mussels in areas exposed to the open bay, regularly show poison about ten days prior to its presence in tributary inlets. For this reason, regular sampling from a few selected "key stations" provides sufficient warning for the imposition of quarantine measures.

Information gained from early studies indicated that commercial processing and domestic cooking usually destroyed up to 90 per cent of the toxin initially present. In spite of this reduction, however, persons who consume large quantities of shellfish may still ingest sufficient poison when original toxicity is high, to induce severe illness. In order to provide a wide margin of safety in such cases and to allow for sampling variation and assay errors, quarantine levels have been established at the relatively low value of 400 mouse units per 100 gms. of tissue. When toxicities exceed this amount, removal of shellfish from the beaches concerned is prohibited.

Surveys on the Atlantic coast have shown that shellfish toxicity in dangerous years may attain values of 36,000 mouse units or more. In the British Columbia butter clam, toxicities greater than 5,000 mouse units have been the exception. Values of 1500 units commonly occur in the vicinity of Prince Rupert, and occasionally on the West coast of Vancouver Island. These values, although not as extreme as those of the Fundy area, are still capable of causing illness or death in susceptible persons. The efficiency of the quarantine system is thus evident from the fact that no cases of poisoning attributable to commercially produced shellfish have occurred since its inception.

Paralytic shellfish poisoning is therefore a problem of mutual concern to health and fisheries agencies of both the United States and Canada. Parallel regulatory measures in the two countries, and the free exchange of information, have greatly reduced this hazard to public health.

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THE RELATIONSHIP OF AVERAGE STANDARD PLATE COUNT RATIOS TO EMPLOYEE PROFICIENCY IN PLATING DAIRY PRODUCTS

J. L. COURTNEY

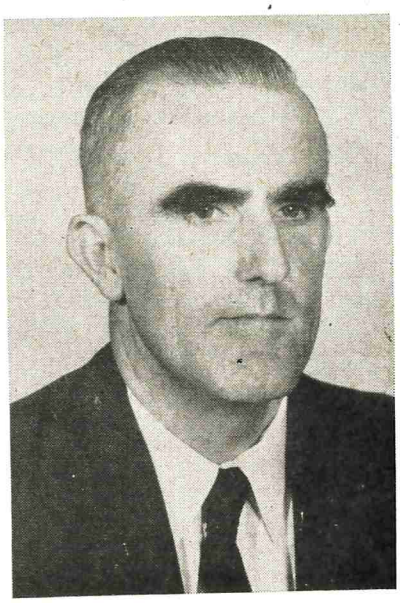
Public Health Laboratory, Oak Ridge, Tennessee

(Received for publication August 8, 1956)

A study of the conditions under which 32,546 samples of dairy products were plated and 2,264 ratios occurred emphasizes the role of the individual worker and effective supervision in attaining maximum accuracy when making standard plate counts. It appears that the average ratio varies directly with the accuracy with which the procedure, particularly pipetting, is performed. Consequently, the average is an index to the quality of work being done.

The average standard plate count ratio in its present form seems to have evolved from the work of Conn (*4, 5*) in 1915 and of Frank, Abele, and Havens (*5*) in 1925. The current edition of Standard Methods (*1*) defines count ratio as "the ratio of the greater to the lesser plate count, as applied to plates from consecutive dilutions having between 30 and 300 colonies". In addition, examples of ratios are listed. One of the rules given for counting colonies is that when the higher computed plate count, from two plates of consecutive decimal dilutions having between 30 and 300 colonies, is more than twice the lower, the lower computed count is reported. In other words, the rule applies when the count ratio is greater than 2.0. For about 30 years, editions preceding the current edition (*10*) of the Milk Ordinance and Code contained essentially the same definition and rule as given above. The definition, examples, and rule first appeared in Standard Methods in the Ninth Edition (*2*) and, as indicated above, now appears in the present edition of this manual. Upon being incorporated into Standard Methods, all reference to count ratios was dropped from the Milk Ordinance and Code beginning with the 1953 Edition (*10*). These are desirable changes since the subject pertains strictly to laboratory procedure. Editions of the Milk Ordinance and Code prior to that of 1953 also contained a recommendation that the average plate count ratio should not be more than 2.0 and the average was described as a measure "with which to judge the work of the laboratory" (*5, 11*). This recommendation and description has not yet appeared in Standard Methods.

In conformance with the definition above, the term "ratio" is restricted throughout this study to include only those ratios occurring between two computed counts on one sample when the number of colonies on each of the two plates of different dilutions falls between 30 and 300.



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The participation of individual workers in making plate counts, the levels of training and experience of these individuals, personal characteristsics having a bearing on job performance, and the circumstances under which the work was done are considered in relation to the magnitude of the average ratio. The objective is to show any relationship between the average ratio and accurate technique in making standard plate counts. Perhaps, thereby, some insight may be gained into discrepancies in results within and between laboratories.

A recent study (*8*) indicates that the standard plate count is superior to other methods for the examination of raw milk. The need for improvement in the routine application of the plate count (*6, 7*) is intensified by the probability that this method will be used even more in the future than it has been in the past.

METHODS

The data reported have been compiled on the basis of 24 six-month periods[1] beginning on January 1 and July 1 and designated as Periods 1-24.

The samples examined consisted of raw milk, pasteurized milk, cream, chocolate beverage, frozen desserts, and a relatively small number of samples of pasteurized skim milk, condensed skim milk, and goat milk. Samples were usually received before noon and were held in a refrigerator maintained at approximately 4° C. until plated in the early part of the afternoon. The only exception was frozen desserts samples which were often received so late in the afternoon that it was necessary to hold them in frozen condition overnight.

Dilution bottles containing 99 ml. (tolerance 2 ml.) of diluent were used. Toxicity tests on the distilled dilution water, recommended by Standard Methods, showed no significant reduction in bacteria. Buffered dilution water was not used until after the close of this study. Retail packaged fluid products were mixed by shaking the original container. One plate of each dilution was made. Pipettes calibrated at both 1 ml. and 0.1 ml., and 11-ml. pipettes, were used. In the case of milk, a dilution of 1:100 was made by transferring 1 ml. of the sample to 99 ml. of diluent and plating 1 ml. of this dilution. A dilution of 1:1,000 was made by plating 0.1 ml. of the same dilution. Dilutions of 1:10,000 and 1:100,000 were made by transferring 1 ml. of the 1:100 dilution to 99 ml. of diluent and plating 1 ml. and 0.1 ml. of the resulting dilution. In addition, when a 1:10 dilution of milk was plated, an 11 ml. portion of the sample was transferred to 99 ml. of diluent and 1 ml. was plated. Before January 1, 1948, all test portions were measured with pipettes. After this date, undiluted portions of cream, frozen desserts, and condensed products were weighed aseptically into dilution bottles. When cream, frozen desserts, and condensed products were plated, 11 ml. or 11 grams of sample were added to 99 ml. of diluent. For the 1:10 dilution, 1 ml. was plated. Dilutions of 1:100 and higher were made by transferring 11 ml. of the 1:10 dilution to 99 ml. of diluent and continuing as with milk.

There was considerable variation in the use of dilutions. During Periods 1 and 2, dilutions of 1:100 and 1:1,000 were run on suspected low count products and dilutions of 1:1,000 and 1:10,000 on suspected high count products; otherwise, all three dilutions were used. Practically all cream was plated using these three dilutions. Occasional samples of various products were plated with dilutions as high as 1:100,000; and sometimes a dilution of 1:10 was used. There were many high count raw and pasteurized samples. Beginning with Period 3, dilutions of 1:100, 1:1,000, and 1:10,000 were made on raw milk and dilutions of 1:10, 1:100, and 1:1,000 on pasteurized products. This practice continued until the end of Period 2. At this time, the number of dilutions was reduced from three to two – 1:100 and 1:1,000 on all products except chocolate beverage which was plated in dilutions of 1:10 and 1:100.

Until March 15, 1954, during Period 21, dehydrated tryptone glucose agar was used. Sterile skim milk, prepared from skim milk powder, was aseptically added to the agar just before pouring the plates. The pH was determined colorimetrically and maintained within the recommended range of 6.6–7.0. It was usually 6.6–6.7 until the end of Period 10. Beginning at this time, the reaction of the culture media was adjusted, according to the procedure of Standard Methods, to pH 6.9–7.0. After the above date, dehydrated tryptone glucose yeast agar was used at a pH of 6.9–7.1.

Prior to March 1, 1946, during Period 5, it is probable that 30-40 minutes elapsed between pipetting the first sample and pouring the agar when plating raw milk. The plating of other samples often extended beyond 20 minutes. After this date, all samples were plated in small groups to reduce plating time to 20 minutes or less. This was usually achieved.

In compliance with the recommendation of the 1948 Edition of Standard Methods, incubation temperature was changed from 37° C. to 35° C. effective January 1, 1949 which was the beginning of Period 2.

A gravity convection incubator (Elconap B-3) equipped with a water reservoir and a mechanical convection incubator (Precision Iso-Tropic Air Jacketed) with built-in cooling coils were used for the incubation of agar plates. Temperature readings were made from thermometers held in stoppered test tubes of water. The averages of 202 readings made when 37° C. incubation was being used were 36.6° C. for the top shelf and 36.2° C. for the bottom shelf. After the change to 35° C. incubation, the averages of 204 readings taken on the gravity convection incubator were 35.3° C. for the top shelf and 34.8° C. for the bottom shelf, and the averages of 240 readings on the mechanical convection incubator were 35.0° C. for the top shelf and 35.1° C. for the bottom shelf. There was no apparent relationship between the incubator used and the average ratio. A small gravity convection incubator was used to hold media at pouring temperature and was maintained at an average of 43.6° C.

Copies of the editions of Standard Methods current during this study were always available to laboratory employees.

[1]The first period covers only 15 weeks due to the first plate counts having been made on March 18, 1944.

TABLE 1 — SUMMARY TABULATION OF STANDARD PLATE COUNT RATIOS[a]
(ARRANGED BY SIX-MONTH PERIODS)

Period	Number of samples plated	Number of samples producing ratios	Percentage of samples producing ratios	Average ratio	Frequency distribution of ratios					
					1.0 to 2.0	2.1 to 4.0	4.1 to 7.0	7.1 to 12.0	12.1 to 20.0	Over 20.0
1	449	36	8.0	2.23	29	5		2		
2	2,207	210	9.5	2.30	138	59	7	4	2	
3	2,149	240	11.2	2.65	121	93	17	6	2	1
4	1,363	134	9.8	1.99	93	36	5			
5	1,337	101	7.6	1.77	80	18	3			
6	1,467	69	4.7	1.97	56	12			1	
7	1,896	52	2.7	1.64	49	1	2			
8	1,990	67	3.4	1.89	52	12	3			
9	2,470	199	8.1	1.97	146	43	8	2		
10	2,131	235	11.0	2.09	159	62	12	2		
11	2,131	257	12.1	1.81	222	27	5	3		
12	1,418	111	7.8	1.64	99	12				
13	1,911	92	4.8	1.57	87	4	1			
14	2,030	98	4.9	1.55	93	4	1			
15	1,580	125	7.9	1.66	115	9	1			
16	1,271	68	5.3	1.49	64	4				
17	767	38	4.9	1.48	35	3				
18	665	28	4.2	1.46	27	1				
19	609	29	4.8	1.47	28	1				
20	616	25	4.1	1.88	14	11				
21	485	10	2.1	1.44	10					
22	442	7	1.6	1.57	7					
23	568	8	1.4	1.45	8					
24	594	25	4.2	1.46	24	1				
1-24	32,546	2,264	7.0	1.94	1,756	418	65	19	5	1

[a]Count ratio is the ratio of the greater to the lesser plate count, as applied to plates from consecutive dilutions having between 30 and 300 colonies (*1*).

Table 1 shows the number of samples examined, the number of ratios produced, the percentage of samples producing ratios, the average ratio, and a frequency distribution of ratios arranged by six-month periods.

Figure 1 shows the average plate count ratio for each six-month period and the horizontal portion of the graph depicts periods of employment and the time during which each employee made standard plate counts. The averages, derived from ratios recorded to one decimal place, were plotted to two decimal places to avoid possible trend distortions. A brief listing of the training and experience of employees appears below Figure 1. Employees are designated by the letters A through H. There were times, when in the absence of employees designated as making plate counts, other employees not so designated carried out the procedure. However, these occasions were infrequent and it is throught that they do not seriously impair the value of the data.

EMPLOYEES, CONDITIONS, AND RESULTS

The average ratio for the first period was 2.23. It then rose to 2.30 and to 2.65. The conditions under which this work was done are of interest. Oak Ridge, with a population of 30,000 at the close of this study, was first planned on a basis of about 13,000 population (*9*). Site preparation began in October 1942 and the first family occupied a house on July 27, 1943. The laboratory was planned and organized by Employee A beginning in the latter part of October 1943. Equipment was so scarce that it took more than four months to get the bacteriological work started. The first plate counts by this laboratory were made on March 18, 1944. By this time Oak Ridge had a population of approximately 45,000 and was growing so fast that 16 months later the peak population of 75,000 was reached. Building was being pushed faster and faster but was not keeping pace with the influx of workers. Two employees were hired during Period 1; B on May 24 and C on June 19. Neither had any experience. Empoyee C worked only half time from September 13, 1944 until June 4, 1945 in order to complete a degree in bacteriology. Employee A, in addition to directing the laboratory work, collected all samples of retail milk, cream, and chocolate beverage during Periods 1, 2, and 3. As a result, supervision of Employees B and C was necessarily limited. The volume of samples was increasing fast. Bacteriological

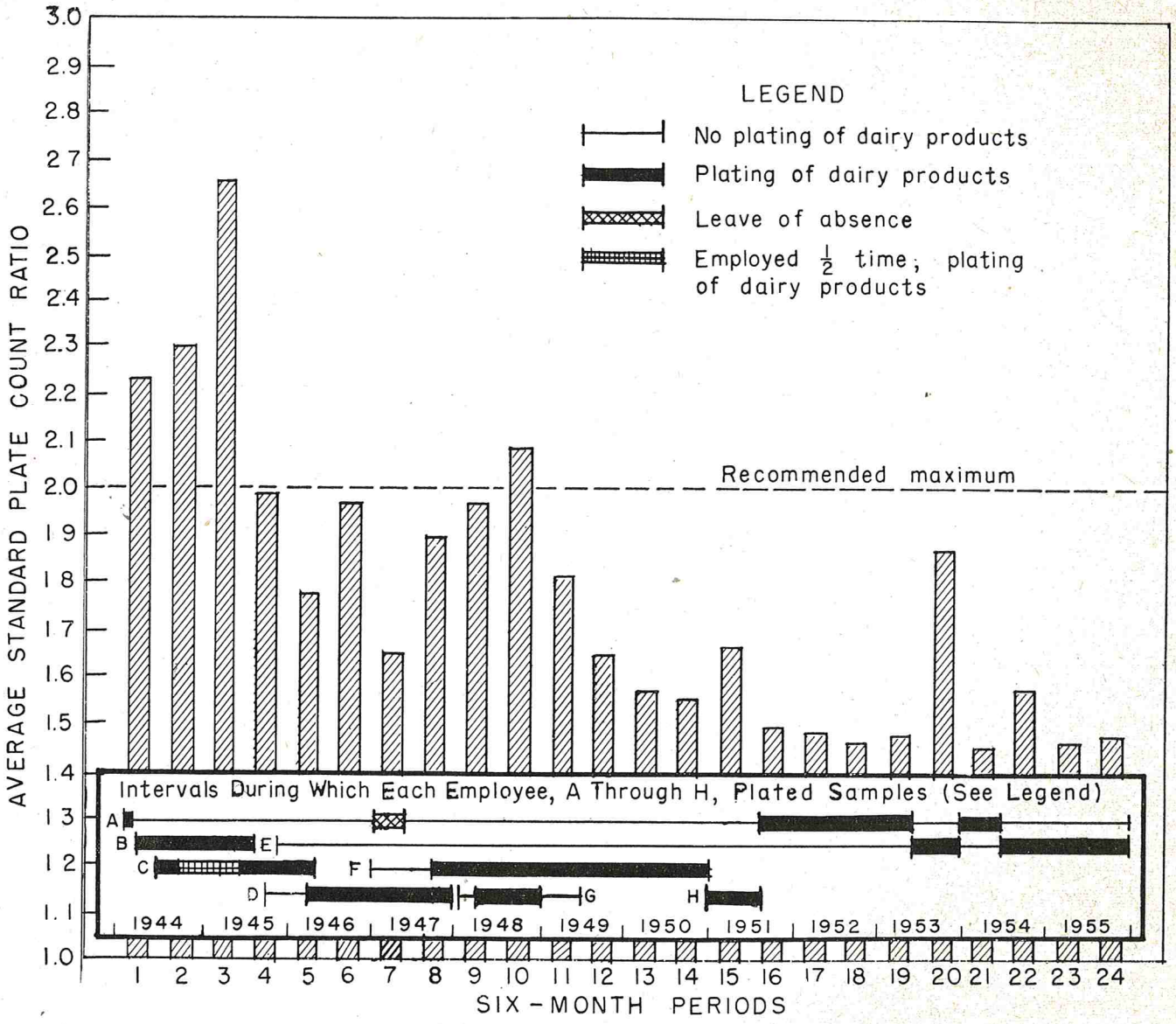

Figure 1. Average standard plate count ratios by six-month periods with intervals indicated during which different employees plated the samples. A list of the training and experience of employees is given below.

Employee A. Five years and four months of experience in public health laboratory work. Nine months of plant experience in quality control of dairy products; B. S. degree in chemistry; one year of graduate study in laboratory control of dairy products and control of water and sewage; graduate study completed during Period 7; M. S. degree in dairy husbandry received during Period 10.

Employee B. No experience; B. S. degree in home economics including 4 quarter hours in bacteriology.

Employee C. No experience; B. A. degree in bacteriology received during Period 3; major in bacteriology; major in chemistry.

Employee D. No experience; B. A. degree in bacteriology.

Employee E. No experience; grammar school education.

Employee F. Sixteen months of experience in record keeping and assisting with hospital laboratory work; high school education.

Employee G. Four years of experience in public health laboratory work; eighteen months of experience in the bacteriological examination of water in stream pollution control; B. A. degree in bacteriology.

Employee H. No experience; B. S. degree in bacteriology including 15 quarter hours in dairying.

water examinations were transferred to this laboratory on June 20, 1944. The examination of frozen desserts was begun about the first of July 1944 and raw, producers' milk on July 31, 1944 (the sale of retail raw milk was not permitted). Water, frozen desserts, and raw milk samples were not collected by the laboratory staff. Clinical laboratory examinations were not a part of the laboratory program at this time. In addition to making the laboratory examinations and collecting part of the samples, the laboratory staff of three prepared and issued daily reports to producers and processors and weekly summary reports to various Army personnel. These details are recounted to show the circumstances under which the average ratios for the first three periods were obtained.

The average ratio for Periods 4 and 5 dropped to 1.99 and 1.77 respectively. During Period 4, Employee A began putting increased emphasis on conforming with Standard Methods. The survey form for milk laboratories developed by the U. S. Public Health Service was used. About February 1, 1946, during Period 5, it was found that the average ratio was higher than the maximum recommended by the U. S. Public Health Service. Previously no attention had been paid to average ratios. Since the chief cause of high ratios was reported (3) to be the carrying over of clinging drops on the tips of pipettes during the making of transfers, instructions intended to prevent, insofar as possible, these occurrences were given to employees at this time. All subsequent employees were given similar instructions except in two instances when the information was purposefully withheld (see Periods 15 and 20).

Supervision by Employee A increased due to more time being available for strictly laboratory activities. Samples were not collected by the laboratory staff after September 19, 1945, during Period 4. About the same time, the weekly report was discontinued and the reporting of results to processors and producers was turned over to another office; however, the gain was partially offset by the continuing increase in number of samples. The average ratio for the portion of Period 4 preceding the discontinuing of sample collection by Employee A was 2.06. With Employee A devoting full time to the laboratory, the average for the remainder of the period dropped to 1.89. Employee B permanently left the laboratory during Period 4 and Employee C left during Period 5.

The average ratio for Period 6 increased to 1.97. The staff, which had been increased to four during Period 4 with the hiring of Employee D, consisted of only three during this period. Throughout her employment, Employee D pipetted very rapidly.

During Period 7, Employee A was away from the laboratory from February 3 to June 9, 1947 on leave of absence. Employee D took charge and applied herself very conscientiously to maintaining good technique. The average dropped to 1.64 for Period 7. Employee F was added to the staff at the beginning of this period but did no pipetting of dairy products.

Employee F, who had no academic training, learned to use pipettes during her employment with this laboratory. She frequently took part in pipetting during the latter part of Period 8 as a result of plans on the part of Employee D to leave the laboratory. The average ratio for Period 8 rose to 1.89. Employee D left on January 2, 1948 at the beginning of Period 9.

Clinical examinations were added to the laboratory program near the end of Period 8. Employee G, a bacteriologist with four years of experience in public health laboratory work, was employed on February 2, 1948 during Period 9. She had made standard plate counts of dairy products in two other laboratories where she was previously employed. This employee, whose results in clinical bacteriology were very dependable, regarded as superfluous the precise care taken with plate counts in this laboratory and apparently never took very seriously the instructions and admonitions intended to improve the quality of work being done. In addition, she seemed to enjoy subtly inciting Employee F to fear infection from clinical specimens. There seems to be no doubt that the association with Employee G adversely affected Employee F's work. During the last 3-4 months of Period 9 and during Period 10 Empoyee G shared quite regularly in pipetting of raw milk samples, usually did tests other than the plate count when pasteurized products were being examined, and very seldom pipetted dairy products during Period 2. Her chief assignment was the clinical work. The average ratio, which was 1.89 for the period before Employee G was hired, rose to 1.97 for Period 9, to 2.09 for Period 10, and dropped to 1.81 for Period 11. The employment of G was terminated at the end of Period 11.

It is of interest to note that, after the departure of Employee G, Employee F continued to work during Periods 12, 13, and 14 and that the average ratio descended to 1.64, 1.57, and 1.55 respectively for these periods.

Employee H was hired shortly after the beginning of Period 15. It was expected that she would work approximately six months. Employee F did no pipetting after Employee H reported for work and left the laboratory about three weeks later. At the time Employee H was hired, 24 weeks remained of this period. It was planned to let her pipette all samples during the first 12 weeks without instructions such as had been given to preceding employees. Instructions

would be given at the beginning of the second 12 weeks and she would be asked to try to do the most accurate work possible during the remainder of Period 15. A comparison would then be made of the two 12-week periods. The first 12 weeks went according to plan. Unfortunately, circumstances beyond the control of the laboratory resulted in only one dairy product sample being received during 10 of the remaining 12 weeks. So few samples were received that a comparison was of no value.

The average ratio for Period 15 rose to 1.66. It had been thought that the average would probably be higher than this since a new, inexperienced worker plated 90 percent of the samples and, of this portion of the samples, 87 percent were plated before instructions were given. That the average was not higher is at least partially accounted for by the fact that Employee H turned out to be unusually precise and accurate. She had a keen interest in the control of dairy products and had deviated from the standard curriculum in bacteriology to include laboratory and other courses in dairying. College records indicate that no other employee, except Employee A, had training of this type.

After the first month of Period 16, Employee H left and Employee A took over all the laboratory work with the assistance of Employee E. Employee A did all the plating of dairy products and maintained averages of 1.49, 1.48, 1.46, and 1.47 for Periods 16, 17, 18, and 19. Raw, producers' milk was not examined by this laboratory after February 27, 1952 which was during Period 17. This change exerted no observable effect upon the average plate count ratio.

The pipetting of all dairy products during Period 20 was assigned to Employee E to determine the effect upon the average ratio. Employee E had only a grammar school education and had long worked as a maid. During her employment with the laboratory, which began in 1945, this employee had cleaned the laboratory, washed and sterilized equipment, assembled and numbered equipment for use, assisted with procedures by shaking samples and dilution bottles, etc., but had never pipetted dairy products. However, since about the middle of Period 17, she had routinely pipetted water samples into lactose tubes and petri dishes for the Presumptive Test and plate count and had poured the agar. In this, her accuracy was satisfactory. She did not understand what was meant by standard plate count ratios and had no appreciation of their causes. There was, of course, much carry over of accuracy from the pipetting of water samples to the pipetting of dairy products but she was given no additional instructions. The average increased from 1.47 for the previous period to 1.88 for Period 20.

To determine if the average would return to the proximate level maintained for Periods 16-19, Employee A plated all samples during Period 21. The average ratio for Period 21 was 1.44.

Employee E was again assigned to this work during Period 22. First, however, she was given thorough instructions calculated to increase her accuracy in pipetting and other phases of the procedure. The average for Period 22 rose to 1.57; thus, efforts to improve the technique of Employee E resulted in a lower average ratio than the average of 1.88 for Period 20 during which she had received no supervision. Employee E continued to do the pipetting during Periods 23 and 24 and, with the additional experience, the averages were 1.45 and 1.46.

DISCUSSION

Figure 1 shows that the peak fluctuations of the average ratio are the averages of Periods 3, 6, 10, 15, 20, and 22. Since this study had its inception during Periods 10-12, the relation of employees and circumstances to the average ratios of approximately the first half of the study has been viewed only in retrospect. Consequently, the causes of the increases of Periods 2 and 3 and the fluctuations of Periods 4-8 cannot be specifically pinpointed. In general, however, the high level averages of Periods 1-3 as compared to the much lower level averages of the following five periods appear to be adequately explained by the lack of supervision, inexperience of workers, the abnormal growth of volume of work, and the frequent absences of Employee C which resulted in a more hurried performance on the part of other workers. Conversely, closer supervision and emphasis on complying with Standard Methods explain the lower level averages which follow.

The personal attitude of Employee G and its adverse effect upon Employee F appears to account for the increases in the average ratios of Periods 9 and 10.

Inexperience and the withholding of supervision and instructions from trained Employee H, partially offset by training and interest, adequately explains the increased average of Period 15. The repetition of this experiment with untrained Employee E during Period 20 produced a similar but more pronounced increase. When adequate instructions and supervision were given to Employee E during Period 22, the average was significantly lower and, with continued experience, was further reduced during Periods 23 and 24.

Table 1 shows how individual ratios were distributed according to magnitude during the periods studied. All ratios greater than 12.0 (13.8, 14.3, 17.0, 28.6, 16.4, 18.0) occurred during Periods 1-6. All ratios greater than 7.0 were produced during the same periods (10.0,

8.8, 7.7, 9.2, 7.6, 8.4, 10.2, 8.4, 8.7, 7.1, 9.1, 9.8) and during Periods 9-11 (8.9, 8.5, 10.7, 7.8, 7.5, 8.4, 11.1). The maximum ratios of Periods 7, 8, and 12-15 were 5.6, 6.3, 3.9, 6.4, 5.6, and 4.6 respectively. The highest ratio for the last 9 periods was 3.1 for Period 20, but this period was planned with the expectation of high ratios; the highest ratio for the other 8 periods was 2.6.

Since the increasing attention given to accuracy in making standard plate counts was accompanied by a decline in magnitude of ratios produced, it appears that the high individual ratios which occurred during the early periods were due, in most part, to gross errors in technique. Had extreme variations in bacterial growth been responsible, high individual ratios should have occurred at random throughout the periods reported.

Clinging drops on the tips of pipettes seem to be the most common cause of ratios not greater than 1.5 and are often a contributing factor to those greater than 1.5. Comparison of the desired volume with the maximum that can be introduced as a clinging drop shows that this error would not, if colonies grew on consecutive decimal dilutions strictly in multiples of 10, produce ratios higher than 1.5 when the usual procedure of plating 1 ml. and 0.1 ml. portions is used. Since such accuracy is not characteristic of bacterial growth, other coinciding variations, large or small, are undoubtedly increased in the same manner by clinging drops and result in ratios being as great as 2.0 or greater. Also, ratios may occur wholly from causes other than clinging drops. It seems that a ratio is often the end result of several causative factors.

The greatest increase in ratios appears to be caused by gross errors in technique, by which is meant such violations of the standard procedure as will cause much greater deviations than is produced by clinging drops. Among these are large inaccuracies in conforming to pipette calibrations, pipetting the same volumes of a dilution into plates designated as different dilutions, reversing portions of diluted sample in plates designated as different dilutions, inaccurate counting of colonies, and deviations in amount of medium poured varying greatly from the standard tolerance. There are undoubtedly others. Such errors should not occur but the writer believes that they occur more frequently than we suspect. Usually these errors remain hidden but an instance follows in which it was possible to determine the nature of an error which had occurred.

During Period 21, two plates of a sample of chocolate beverage, one designated as a dilution of 1:10 and the other as a dilution of 1:100, were found to have 98 and 94 colonies respectively. The resulting ratio was 9.6. Magnification showed that the concentration of chocolate particles was the same in the two plates. A mistake had been in making the transfers from the dilution bottles to the petri dishes. The plates were duplicate dilutions and, consequently, the result did not come within the difinition of those plate counts from which ratios are calculated. If this error had not been discovered, the average ratio for Period 21 would have been 2.18 instead of 1.44.

In view of the small number of ratios produced during Periods 16-24, and excluding Periods 20 and 22 because they were pre-arranged situations, the uniformity of the average ratio for the rest of these periods is remarkable. Evidently errors of large magnitude were avoided.

The reduced number of samples during the last 8 periods (see Table 1) may have resulted in a more careful performance of the procedure despite the accompanying reduction in personnel (see Figure 1). If great enough, such an influence would be expected to contribute to the low averages of these periods. However, nothing was observed to indicate that this occurred and no way has been found to show that it did or did not occur.

Since, as shown under Methods, the same dilutions were not used throughout the periods studied, the effect of these variations upon the average ratio was investigated. Dilutions of 1:100 and 1:1,000 were the most frequently used dilutions and were used during each period. Averages of only those ratios derived from dilutions of 1:100 and 1:1,000 (1,518 of the total of 2,264 originated in this manner) were calculated. Thus a uniform basis for the study of ratios was established. Although they tended to be slightly lower, comparison of these averages with those based on all the dilutions used showed no significant differences. When it was found that either basis resulted in the same conclusions, the ratios from all the dilutions used were retained throughout the study.

Deviations in the amount of medium poured per plate could not be evaluated. Occasional checks indicated a tendency for variations to be slightly above the prescribed range rather than below it.

As noted under Methods, incubation temperature was reduced from 37° C. to 35° C. at the beginning of Period 11. Since the average ratio was predominantly high before this change and predominantly low afterward, the possibiity that this change was responsible for the lowered averages was investigated. Periods 6, 9, and 10 (temperature records were not kept during Periods 1-5) were selected as a basis for the following comparison. Temperatures for each period were assembled into three groups and averaged. These groups were (a) days during which samples were

incubated on which one or more ratios greater than 2.0 occurred, (b) days on which there was one or more ratios within the range of 1.0-2.0, and (c) days when no ratios occurred. The presumption was that, if incubation temperature is the controlling factor, the average temperature for each group would vary in direct relation to the magnitude of ratios and would be lowest in the absence of ratios. The results showed no pattern or trend and the differences were so small as to be of no significance. There was no indication that the change in incubation temperature had any effect upon the average ratio.

The counting of colonies was probably the best supervised part of the procedure and occasional checks showed that workers usually duplicated their own counts within 5 percent and those of others within 10 percent. This was true of the average of a day's counts but not of each individual count.

Employee A counted 50.8 percent of the samples plated during the 24 periods. It seems that there was occcasion for little change in Employee A's technique of colony counting during this time. A comparison was made between the results from samples counted by Employee A and those counted by other workers. The average of 1,154 ratios from counts made by Employee A was 1.93 and that of 1,110 ratios from counts made by other workers was 1.95. In addition, various other comparisons failed to show any recognizable relationship between the counting of colonies and the fluctuations of the average ratio.

SUMMARY AND CONCLUSIONS

The average standard plate count ratio responded to closer supervision of the Standard Methods procedure, and the specific attempt to improve the accuracy of pipetting, by declining in magnitude. Average ratios for only four periods exceeded the recommended maximum of 2.0. The averages of three other periods closely approached this maximum. All of these seven averages occurred during Periods 1-10. Excluding the planned Periods 15 and 20, the averages leveled off to approximately 1.5 during the last half of the periods reported. Lack of supervision, failure to respond to supervision, intentional withholding of supervision and instructions, inexperience, lack of training, and hurried performance coincided with the high average ratios.

Fluctuations of the average ratio, considered in relation to the influences and conditions under which the samples were plated, indicate that the average ratio varies directly with the accuracy with which the procedure is performed. Although other causes may enter into determining the average ratio, the factor of greatest importance seems to be the accuracy with which pipetting is carried out. Extreme variations in bacterial growth, to the extent that they could be distinguished from the effects of technique, were at no time a significant factor in the occurrence of ratios.

This study does not purport to prove or disprove the desirability of 2.0 as a maximum average ratio. Any such evaluation should be based on additional data from additional laboratories in different geographical locations. Until such a determination is made, the maximum of 2.0 can be used to advantage.

Changes from time to time in the dilutions used, the change from tryptone glucose skim milk agar to tryptone glucose yeast agar, lowering the temperature of incubation from 37° C. to 35° C., the use of two different kinds of incubators, and the counting of colonies by different individuals, conditions coincidental to this study, did not significantly affect the average ratio.

Academic training, all but indispensible for supervisory personnel, is secondary to employee interest and effective supervision in the case of non-supervisory workers. This is no indictment of academic training but rather a relegating of factors to their proper perspective. Such training should be an asset to any worker.

It appears from the data reported that there is justification for describing the average standard plate count ratio as a measure "with which to judge the work of the laboratory". A low average ratio indicates that accurate pipetting is being done. Since this is hardly accomplished without over-all improvement in technique, such an average also indicates the probability that the entire procedure is being accurately carried out.

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REPORT OF THE COMMITTEE ON EDUCATION AND PROFESSIONAL DEVELOPMENT[1] — 1956

Objectives. First, to develop plans and devise methods whereby the Sanitarian can more fully gain recognition as a professional worker in public health; and secondly, to recommend standards of education, training and experience designed to establish desirable professional qualifications to the end that the title Sanitarian will denote adequate preparation for professional work and attainment. The members of the Committee on Education and Professional Development accomplished their tasks through the use of sub-committees. Four sub-committees functioned as follows:

Sub-committee on Scholarships. The objectives of this sub-committee were to plan the administrative details concerning the publicizing, administering and awarding of the I.A.M.F.S. Scholarship Program. The committee members were Howard Brown, *Chairman,* Florida; James White, New York; and B. G. Tennant, Florida.

The sub-committee prepared and mailed announcements of the scholarship award and application blanks to all schools that were qualified to offer majors in sanitary science and public health. Four applications for the scholarship were received and surveyed. Recommendations were forwarded to the Executive Board for final approval before a scholarship was awarded.

The sub-committee recommends that the following procedures should be used in handling the administrative details of the scholarship program:

a. Announcements of the scholarship and application blanks shall be mailed by the Executive Secretary to all eligible schools prior to May 1st of each year.
b. The Executive Secretary shall forward all applications to the Chairman of the Committee on Education and Professional Development. Three members of the committee will study the application and send their recommendations to the Chairman. The Chairman will forward the recommendations, with any comments, to the Executive Secretary.
c. The Executive Secretary will submit the recommendations of the Committee on Education and Professional Development to the Executive Board for final selection of the scholarship winner.
d. The Executive Secretary will inform the scholarship applicants of the final results of the recommendations and applications. The scholarship stipend will be mailed to the college or university where the student is majoring. The funds will be specifically ear-marked for the purpose assigned.

Sub-committee for Studying Public Health Education in Secondary Schools. The objectives of this sub-committee were: (a) to ascertain the extent of public health education presently in secondary schools; and (b) to explore means of increasing health education in secondary schools if such appears desirable. Canada; Richard Mansfield, Tennessee; and L. D. The committee members were E. J. Rigby, *Chairman,* Searing, Washington.

The sub-committee found that there is general agreement among public health workers that public health education in secondary schools is desirable. Further, it was determined that education was primarily a responsibility of local authorities and that the problems and methods used varied from district to district in a state or province and between states.

The sub-committee found that various methods, including public health surveys by students, demonstrations of bacteriological methods and the importance of personal hygiene were being used effectively in some schools for educational purposes.

The sub-committee recommended that further studies should be made concerning methods whereby public health education could be improved in the secondary schools.

Sub-committee on Curricula and Facilities Available for Training Sanitarians. The members of this sub-committee were Harry Lindquist, Chairman, Massachusetts; William Miller, Washington, D. C.; and Tom Gable, Nebraska.

Due to the death of the Chairman, Dr. Harry Lindquist, this sub-committee did not function.

A Study of the Professional, Educational and Marital Status of Sanitarians. This study was accomplished by J. J. Sheuring with the cooperation of the members of the I.A.M.F.S. and the Executive Secretary.

The objectives of the study were to determine the educational, financial, marital and professional status of sanitarians. One major objective was to determine the attitudes of the sanitarians concerning the desire to obtain professional status for sanitarians.

Questionnaires were sent to all members of the I.A.M.F.S. The results are given in Tables 1-6. Al-

[1]Presented at the 43rd Annual Meeting of International Association of Milk and Food Sanitarians, Inc. at Seattle, Washington, September 5-7, 1956

TABLE 1 — AGE AND FAMILY STATUS OF SANITARIANS

	Age Group							Physical defects		Average number of children
	20 — 30	30 — 40	40 — 50	50 — 60	Over 60	Males	Females	Yes	No	
State employees supervising more than 5 people	7	23	26	12	18	74	2	5	71	2.0
State employees supervising less than 5 people	16	45	43	25	8	137	0	3	134	1.6
USPHS employees	3	14	12	6	1	36	1	0	37	1.6
Engineers	1	9	13	5	0	28	0	0	28	2.0
Veterinarians	1	7	10	9	11	38	0	3	35	2.0
Educators	10	23	16	9	13	72	0	8	64	1.6
County and city sanitarians supervising more than 5 people	17	27	29	21	7	98	0	5	93	1.4
County and city sanitarians supervising less than 5 people	18	35	25	14	5	83	1	4	80	1.9
Industrial employees	18	71	72	57	16	220	8	7	213	2.0
Fieldmen	9	22	14	5	3	53	0	2	51	1.7
Miscellaneous	6	9	8	10	2	34	1	1	34	1.5
No job listed	2	6	7	3	2	31	0	0	31	1.1

TABLE 2 — REMUNERATION AND PERSONAL FEELINGS CONCERNING PUBLIC HEALTH WORK AS A CAREER

	Annual salary range				Would you recommend public health work as a career?		
	Number reporting	Minimum	Maximum	Average	Yes	No	No answer
State employees supervising more than 5 people	71	$2,750	$10,200	$5,629	63	9	4
State employees supervising less than 5 people	116	2,856	7,800	4,660	89	25	23
USPHS employees	28	3,720	10,000	6,116	33	3	1
Engineers	29	5,040	18,000	8,482	26	1	2
Veterinarians	21	2,400	13,000	6,768	31	5	2
Educators	58	2,400	15,000	8,363	64	3	5
County and city sanitarians supervising more than 5 people	85	2,392	13,800	5,559	75	17	9
County and city sanitarians supervising less than 5 people	77	1,560	12,000	4,553	60	12	12
Industrial employees	166	1,800	17,000	6,791	167	43	24
Fieldmen	45	3,000	7,320	5,045	35	16	2
Miscellaneous	24	2,660	15,000	5,998	26	5	4
No job listed	—	———	———	———	16	1	14

TABLE 3 — ATTITUDE CONCERNING PROFESSIONAL STATUS FOR SANITARIANS

	Do you believe in trying to establish professional status for sanitarians?		
	Yes	No	No answer
State employees supervising more than 5 people	69	3	4
State employees supervising less than 5 people	131	1	5
USPHS employees	37	0	0
Engineers	24	2	3
Veterinarians	31	4	3
Educators	62	6	4
County and city sanitarians supervising more than 5 people	90	5	6
County and city sanitarians supervising less than 5 people	78	1	5
Industrial employees	194	19	21
Fieldmen	41	10	2
Miscellaneous	21	0	14
No job listed	25	3	3

though some questionnaires were completely answered, portions of others were left void. Therefore, consideration should be given in analyzing the data to the fact that all sums are not exact. The personal comments of the various members are not included in the data.

Conclusions.

a. Most of the sanitarians in the country are well trained.

b. The financial status of sanitarians in the country needs improving.

c. Most sanitarians want professional status.

d. Sanitarians, in general, recommend the fields of public health and sanitation, as a career.

The Committee on Education and Professional Development recommends that further studies should be made to improve the educational and professional status of sanitarians. The Committee recommends that every effort should be made to help the sanitarians gain professional status as quickly as feasible.

TABLE 4 — EDUCATIONAL TRAINING OF SANITARIANS

	Only the following number of years of high school				Number of years of college							Degrees obtained						Dairy majors	Special schools
	1	2	3	4	1	2	3	4	5	6	7	A.B.	B.S.	L.L.B.	M.A.	M.S.	D.V.M.	Ph.D.	
State employees supervising more than 5 people				3	1	6	5	31	29	0	5	5	30	0	0	30	0	4	29	35
State employees supervising less than 5 people				7	7	8	4	79	14	11	1	12	65	2	4	5		1	40	84
USPHS employees				5	0	3	1	15	10	0	3	4	9			10	1	2	7	23
Engineers					0	0	0	13	14	0	2	11	9	1	6	9			0	18
Veterinarians											38						38		0	18
Educators					0	1	0	16	18	0	37	3	13	0	4	13	3	34	35	37
County and city sanitarians supervising more than 5 people				3	1	6	5	36	30	0	5	5	30			30		4	32	37
County and city sanitarians supervising less than 5 people				4	6	3	9	49	6	2	1	6	43			6		0	20	55
Industrial employees		15		28	14	19	8	96	29	3	18	12	96			24		15	91	100
Fieldmen		6		8	3	3	0	28	4			1	24			4			17	23
Miscellaneous				3	3	2	0	16	4	0	8	3	14			3		6	6	21
No job listed				3	3	1	1	8	1	0	3	2	6			2		2	4	12

TABLE 5 — STATUS OF PROFESSIONAL STANDING OF SANITARIANS

	Registered sanitarians	Sanitarian	Registered pharmacist	Chemist	Bacteriologist	Registered engineer	D.V.M.	No rating
State employees supervising more than 5 people	2	43	1	2	4			22
State employees supervising less than 5 people	31	88			1	5		11
USPHS employees	7	23			1			5
Engineers						28		
Veterinarians	7	7					38	
Educators	5	17						50
County and city sanitarians supervising more than 5 people	20	55		1		6		16
County and city sanitarians supervising less than 5 people	28	40						16
Industrial employees	22	58		5	8	1		134
Fieldmen	5	21		1				26
Miscellaneous	10	10		4	1			7
No job listed	3	6		2				19

TABLE 6 — ORGANIZATION MEMBERSHIP OF SANITARIANS

	A.D.S.A.	A.P.H.A.	N.A.S.	American Chemical Society	Society of Amer. Bact.	American Vet. Ass'n.	Institute of Food Technol.	American Soc. of Refrig. Engineers	American Soc. of Prof. Engineers
State employees supervising more than 5 people	6	18	6	4	4		4		
State employees supervising less than 5 people	4	14	13		1		1		
USPHS employees	2	17	6	1	1		1		
Engineers	0	15		1					9
Veterinarians		5	1			13			
Educators	33	18	2	3	19				
County and city sanitarians supervising more than 5 people	5	17	3	2	3		3		
County and city sanitarians supervising less than 5 people	1	5	9		1	1	2		
Industrial employees	50	21		15	11		16	3	
Fieldmen	3		5						
Miscellaneous	4	8		3	2		2		
No job listed	3			1			2		

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NEWS AND EVENTS

GENERAL PROCEEDINGS OF THE 43rd ANNUAL MEETING

The INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC. held its 43rd annual meeting in the Olympia Hotel, Seattle, Washington, September 5-7, 1956.

The first general business session was called to order by President-elect Paul Corash, followed by an invocation and welcome address from the Mayor of Seattle who was introduced by Cameron Adams, capable chairman of the local arrangements committee.

The presidential address was given by H. S. Adams on the theme "Professional Growth and Development". This address was stimulating, thought-provoking and offered a definite challenge to the membership.

President Adams outlined the responsibilities of the nominating committee and then appointed the following to that committee: H. J. Barnum (Chairman), Colorado; H. C. Goslee, Connecticut; Karl Jones, Indiana; Louis Arrigoni, Washington; C. H. Holcombe, Minnesota; Fred Baselt, New York; and C. J. Leonard, South Carolina.

The nominating committee nominated for First Vice-president, Frank Barber (New York) and Harold Wainess (Illinois); for Second Vice-president, W. V. Hickey (Utah) and Harold Froilland (South Dakota); and for Secretary-Treasurer, H. H. Wilkowske (Florida). No additional nominations were made from the floor. The tellers appointed by the President were B. W. Hartman (Missouri), Lyall Searing (Washington), and L. E. Nisson (California). Frank Barber was elected First Vice-president, William V. Hickey Second Vice-president and H. H. Wilkowske Secretary-Treasurer.

Numerous committee and special reports were made by committee chairmen, alternates or others as indicated below. All reports listed below were formally adopted. These reports will be published in greater detail in subsequent issues of the *Journal of*

Milk and Food Technology. They are listed briefly here.

The Report of the Committee on Applied Laboratory Methods, "Laboratory Problems of Importance to Milk and Food Sanitarians" was presented by Dr. F. W. Barber.

The Report of the Committee on Food Equipment was presented by W. V. Hickey.

The Report of the Committee on Sanitary Procedure and report on the 3-A Symbol Council was presented by C. A. Abele.

The Report of the Committee on Frozen Food Sanitation, "Public Health Aspects of Frozen Foods" was presented by J. C. McCaffrey in absence of Frank Fisher.

The Report of Committee on Dairy Farm Methods, "Problems Related to the Bulk Handling of Milk and Other Labor-Saving Devices" was presented by Chester Bletch.

The Report of Committee on Communicable Diseases Affecting Man, "The Development of a Suggested Procedure for the Investigation of Foodborne Disease Outbreaks" was presented by R. J. Helvig.

The Report of Committee on Education and Professional Development was presented by John J. Sheuring. The chairman and the committee were especially commended for their outstanding work during the past year.

The Report of the Committee on Membership was presented by L. O. Tucker in absence of H. L. Templeton.

The Report of the Committee on Baking Industry Equipment was presented by John Fritz in absence of V. T. Foley.

The Report of the Committee on Ordinances and Regulations "Need for Suggested Requirements for the Production of Milk and Cream for Manufacturing Purposes" was presented by C. G. Leonard.

The Report of the Committee on Recognitions and Awards was made by J. D. Faulkner. A citation award was presented to K. G. Weckel and the recipient of the Sanitarians award was John Fritz.

The report of the Committee on Resolutions was given by J. D. Faulkner. The resolutions adopted were: (a) acknowledgement of the splendid work of the Washington Association; (b) an expression of appreciation to the Washington Industries for their excellent support; (c) endorsement of Senate Resolution 2936 for a Samuel J. Crumbine commemorative stamp; (d) request the National Health Council to give in the future more consideration to recommendations by the Association of Sanitarians and that such recommendations be followed in revisions of the booklet "Health Career Horizons"; (e) study of the possibility of using the mail ballot; and (f) a memorial to deceased members.

The report of the Executive Secretary was given by H. L. Thomasson. He also presented a detailed budget for the coming year.

The Financial Report was given by H. H. Wilkowske, Secretary-Treasurer.

No old business was pending, but under new business there was a discussion regarding the disposal of recommendations contained in the various committee reports. It was agreed that when committee reports are accepted by the general assembly, appropriate action insofar as possible was required on all recommendations as directed in the committee report.

Regarding the question of affiliation with the National Health Council, it was moved, seconded and carried that such action be deferred until IAMFS obtains the reaction of NHC regarding Resolution (d) above.

President Adams discussed the matter of and was authorized to continue joint deliberations with NAS and APHA officials regarding the establishment of a National Registry for Sanitarians.

At the close of the meeting President Adams turned the gavel over to the new President, Paul Corash. The newly elected officers were installed and the meeting adjourned. The next annual meeting will be held October 8-10, 1957, in Louisville, Kentucky.

H. H. WILKOWSKE,
Secretary-Treasurer

INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS

MINUTES OF EXECUTIVE BOARD MEETING AT THE ANNUAL MEETING, SEATTLE, WASHINGTON, 1956

1. President H. S. Adams called the meeting to order at 7:00 P.M. September 2, 1956 in the Olympic Hotel, Seattle, Washington. The meetings continued during the next several days.

2. Cameron Adams, Chairman of the local arrangements committee reviewed the details of local arrangements, registration, meetings and entertainment. He reported the Washington Association had raised about two thousand dollars from allied industries to help finance the meeting. He requested that one dollar more of the registration fee be set aside for additional expenses, if needed, which otherwise would be returned to IAMFS. After discussion the registration fee for this meeting was set at $3.00. A vote of thanks was given Cameron Adams, the local committee Chairman, and all local members who worked on the local arrangements committees.

3. The duties and responsibilities of the various members of the Executive Board were reviewed for purposes of coordination and correlation. It was agreed that hereafter the Junior (Immediate) Past President, in addition to presiding at the meeting of the Council as defined in the Constitution, shall also act as chairman of the Resolutions Committee. The Senior Past President shall be chairman of the Committee on Recognitions and Awards. The Secretary was requested to prepare

a new list of duties for the First and Second Vice-Presidents, and prepare lists for all officers for use at the annual meeting next year, providing all members of the Executive Board will bring their respective lists of duties up to date and forward them to the Secretary.

4. Regarding the matter of providing money for expenses for the Committee on Sanitary Procedures, Mr. Abele was reported to have worked out an interim plan of financing expenses for 3A meetings without the need of financial aid from IAMFS.

5. The Secretary-Treasurer, H. H. Wilkowske, reported the need for a new and redesigned recruitment brochure. Mr. H. L. Thomasson, Executive Secretary, reported the present supply exhausted. The Committee on Membership and the Publicity Committee (Tom Jones) were requested to undertake immediate revision of the present brochure, bring up to date, improve where necessary, redesign and submit to the President by November first.

6. A progress report was made concerning the newly created Committee on Research Needs and Applications. The newly appointed committee membership and its objectives will be listed along with other continuing committees in the January issue of the Journal and a formal report will be included at the next annual meeting.

7. Mr. Thomasson read the proposed contract agreement to be entered into with Harold Wainess regarding advertising commissions to be paid for assistance in securing new advertising in the Journal. He was directed to rewrite the contract to clarify the periods of time involved and the percentages to be paid.

8. Mr. Thomasson made a progress report of the Executive Secretary's duties. He pointed out membership is now over 4200 for an increase of about 200 over the past year. Turnover of membership averages about 10 per cent. Journal average circulation is now 5,300. He also presented the budget which was approved. Prospective State Associations now giving consideration toward affiliation include Alabama, Ohio, North Dakota, Nebraska, Montana and Toronto (Canada). Persons in these states holding direct membership in IAMFS were urged to help promote affiliation of their respective State Associations with this progressive organization.

9. After discussion a motion carried to increase direct Journal subscription rates from $5.50 to $6.00 for Agencies and from $3.00 to $4.00 for Libraries, as proposed to the Executive Board by the Committee on Publications.

10. The Secretary-Treasurer was directed to obtain bond for $5,000.00.

11. After discussion it was the concensus of the Executive Board that the fire and extended coverage insurance of Association property be increased from three to five thousand dollars.

12. Mr. Paul Corash reviewed the details concerned with the program.

13. Affiliate Council problems were reviewed, which were later discussed at the Council meeting and appear in greater detail in the minutes of that meeting. It was agreed the budget be presented at the Council and at the general business sessions.

14. Affiliation with the National Health Council was discussed. Mr. Adams read a letter of invitation to affiliate from Phillip E. Ryan, Executive Director. This matter was referred to the Committee on Education and Professional Development for study and recommendation. Mr. Faulkner also discussed a resolution regarding the matter of the Career Booklet of the National Health Council and the question of educational requirements of Sanitarians.

15. After discussion a motion passed to accept the invitation to help sponsor the Dairy Remembrance Fund.

16. A progress report was made regarding Scholarships. The first recipient selected is Thaddeus F. Midura, who is a senior in Sanitary Science and Public Health at the University of Massachusetts. Upon motion duly seconded and carried the minutes of the Augusta meeting are to be amended to show the Scholarship money is to be paid from the reserve fund.

17. Dr. Joe C. Olson, Jr., Associate Editor, reported on the Journal for the past year through the July 1956 issue. He summarized the types of articles carried, which totaled 42 technical articles, as follows: Milk technology 18, Dairy plant sanitation 1, Dairy plant waste disposal 2, Farm sanitation 5, Food sanitation 4, Food in general 4, General sanitation 2, and General interest 5. Manuscripts at the printer at the present time numbered 16, manuscripts in process 5, manuscripts ready for editing 3, and a symposium on extraneous matter 5. In addition to the technical papers during the past year there were published 5 editorials, 10 committee reports, 6 3A standards, 3 book reports, 6 helpful information columns, and 15 affiliated association programs. Dr. Olson reported no major problems existed relative to the Journal. He emphasized the need for constant watch by the printers to avoid typographical errors. Following his report Dr. Olson was especially commended for his work as Associate Editor.

18. The bulletin on the Procedure for Investigation of Food-Borne Outbreaks developed by the Committee on Communicable Diseases Affecting Man was discussed. It was agreed the present printed version was of unsatisfactory quality and that a new one be prepared by Dr. Olson with the help of the Committee. Dr. Ray Helvig, Chairman of the Committee on Communicable Diseases Affecting Man, further reported the committee's work for the coming year will be to develop a recommended ordinance governing the reporting of foodborne and gastrointestinal diseases.

19. After discussion a motion carried directing Dr. Olson and Mr. Thomasson to investigate the possibility of publishing a 20-year index and report the estimated cost of such project.

20. Dr. Olson was approved as ex officio member of the Resolutions Committee. It was emphasized other committee chairmen should be aware of the fact that the Editor of the Journal should be given all information of newsworthy value and that he be kept informed during the course of the year on the committee's work and progress. All members are urged to send in "grass-roots" news items and articles to the Editor.

21. Regarding the next annual meeting to be held in Louisville, Kentucky, October 8-10, 1957, the Executive Secretary was directed to prepare a write-up of details needed for information of the local arrangements committee for conducting a meeting and make an advance trip to Louisville to help organize the plans.

22. President Adams reported he attended the annual meeting of the National Association of Sanitarians in Chicago in July. He reported on informal discussions with Harry Bliss on matters of mutual cooperation and amalgamation. After lengthy discussion by the Executive Board it was agreed to further explore the possibilities of a Joint Council of Sanitarians as one of the best areas toward greater mutual cooperation.

23. Mr. C. A. Abele brought up the matter of appointments on the 3-A Symbol Council. President Adams reappointed Paul Corash and Mark Howlett for two-year terms beginning in April 1957. Mr. Abele reported the 3A Symbol Council up to the present time had 89 requests for applications, 18 authorizations had been issued, and the Council had established a nominal operating fund.

24. It was recommended that the membership of the Committee on Sanitary Procedure should be reviewed with respect

to committee size and activity of members and new appointments made accordingly.

25. A discussion took place regarding overlapping interest by the National Sanitation Foundation and 3A on ice cream freezers and counter freezers. It was pointed out a need for close liason is needed with representatives from both IAMFS and the Industry task committee. Regarding food equipment, certain problems remain in obtaining unanimous agreement.

26. Regarding the CIP procedures developed by the Farm Equipment Institute, independent of 3A, and which was rejected for publication, it was agreed that publication in the Journal cannot be permitted without joint approval of the appropriate 3A committee. Close liason also is needed with the Committee on Farm Methods. To avoid any future occurrence, it was pointed out the Editorial Board should be cognizant of such possible developments and if standards and procedures are related to any work of any IAMFS committees, such matters should be referred to such committees for review and approval before publication.

27. The Executive Board met with Journal Associate Editors Joe Olson, Frank Barber, Ken Weckel, John Flake, Fred Baselt and C. A. Abele. Dr. Olson reviewed the past year's editorial work. He reported on the number of manuscripts published and in process. The number of papers available is favorable and future prospects look good. Errors in the Journal were discussed. It was agreed that improvements be made or additional or better secretarial help be employed in the Executive Secretary's office to get the job done right. It was agreed a twentieth anniversary issue of the Journal be planned. The President was directed to appoint a committee to help Dr. Olson plan the issue.

28. Following the annual association business meetings and election of officers the newly elected Executive Board members Frank Barber and Bill Hickey were welcomed by and met with the Executive Board, President Paul Corash presiding.

29. The 1958 meeting site was discussed, and it was decided to accept a bid to go to New York City.

30. In the discussion of Awards, it was agreed the Awards Committee should be sole administrators of the Citation Award and was directed to review and recommend a more suitable type award (plaque) for the Sanitarians Award.

31. Regarding eligibility for the Sanitarians Award, it was agreed eligibility of local sanitarians for the Sanitarians Award shall not be jeopardized by method of payment of salary provided the Sanitarian is in fact full time local Sanitarian and not subject to State and Federal direction.

There being no further business, the Executive Board adjourned at 5:00 P.M. September 7, 1956.

H. H. Wilkowske, *Secretary-Treasurer*

FINANCIAL REPORT (1956)

INTERNATIONAL ASSOCIATION OF MILK AND FOOD SANITARIANS, INC.

For the last fiscal year ending July 15, 1956 the International Association of Milk and Food Sanitarians had a total gross income of $40,546.97. This includes all forms of income including that derived form membership dues from 4,207 members, advertising and reprint income from the *Journal of Milk and Food Technology*. The *Journal* has a circulation of 5,300 issues monthly.

All financial transactions are handled in the office of the Executive Secretary and Managing Editor Mr. H. L. Thomassson at Shelbyville, Indiana. All receipts are deposited in a General Fund from which withdrawals can be made only upon co-signature of the Executive Secretary and the Secretary-Treasurer. Withdrawals are made to an Operating Fund maintained at a level of approximately $10,000. This amount is necessary for convenient and efficient financial operation of the Association business.

The firm of Robert E. Eck, Certified Public Accountants, of Shelbyville, Indiana, is retained to maintain accurate and reliable accounting of all finances of the Association. The services of this firm consist of monthly audits, quarterly reports to the Executive Board and an annual complete audit and report. The Executive Board has carefully and thoroughly reviewed the annual report and has found the finances of the Association in proper order.

The Balance Sheet shows the present financial condition of the Association.

BALANCE SHEET

ASSETS

Current Assets	
Cash in operating and general funds	$12,972.99
Accounts receivable	1,052.78
Savings Account (Building and Loan)	2,053.70
U. S. Bonds and interest	2,009.30
Inventory of Supplies	2,008.96
Prepaid Expenses	71.22
Total Current Assets	$20,168.95
Fixed Assets	
Office, addressing and mailing equipment, at cost, less accumulated depreciation	$ 2,004.42
TOTAL ASSETS	$22,173.37

LIABILITIES AND RESERVES

Current Liabilities	
Accounts payable	$ 1,515.09
Accrued salaries and bonus	676.92
Payroll Taxes withheld from employees	501.00
Reserve for Special Award	1,163.90
Reserve for Scholarship Grants	95.00
Total current Liabilities	$ 3,951.91
Reserve for Contingencies	$18,221.46
TOTAL LIABILITIES AND RESERVES	$22,173.37

A financial analysis can be made by dividing the

Total Current Assets by the Total Current Liabilities, which results in a working capital figure of 5.1. A figure of 2.0 usually is considered satisfactory.

Since the Association agrees to render certain services for a definite future period (such as sending Journals to members which have been paid for in advance), this deferred income liability should be recognized; it is estimated at seven thousand five hundred dollars.

The net addition to the Reserve for Contingencies for the year was $4,067.24.

At the present time the financial position of the Association is excellent, but it should be pointed out that increasing needs for additional funds in the future may require additional income to conduct the overall activities of the Association.

Howard H. Wilkowske, *Secretary-Treasurer*

MACON AND TULSA HEALTH DEPARTMENTS RECEIVE AWARDS FOR OUTSTANDING WORK IN PUBLIC HEALTH

NEW CONTEST ANNOUNCED

The only nation-wide honors for local health units, the Samuel J. Crumbine Awards, sponsored by the Public Health Committee of the Paper Cup and Container Institute, have been won for 1955 by the Macon-Bibb-Jones Department of Health (Georgia) and the Tulsa City-County Health Department (Oklahoma). Presentations of the awards in memory of the great pioneer Kansas public health officer were made at the luncheon of the Health Officers Section at the annual meeting of the American Public Health Association in Atlantic City on November 14, by Dr. Granville Larimore on behalf of the jury.

Nearly 1,150 local health units were eligible to submit entries based on their work in 1955.

The Macon Department was honored for "outstanding achievement in the development of a comprehensive program of environmental sanitation." Under the rules of the contest, the jury in making this award gave special consideration to newly developed activities of a pioneering nature which supplemented a well-rounded municipal program.

First place for "outstanding achievement in the development of a program of eating and drinking sanitation" was awarded to the Tulsa unit.

The winning departments received plaques bearing a bronze medal and an inscribed plate, and members of the departments instrumental in carrying out the winning programs received individual medallions, reproducing the medal on the plaque.

Dr. R. J. Walker, Commissioner of the Macon-Bibb-Jones Department of Health, and Dr. T. Paul Haney, head of the Tulsa City-County Department, received the department plaques. Dr. R. Frank Carey, now retired, was given a medallion for his work in instituting the Macon program, as was Dr. Haney in connection with the Tulsa program.

Medallions were also awarded to the directors of the divisions of sanitation of the two winning departments, Joel C. Beall and Clyde B. Eller, and to Richard W. Hume, Tulsa's Director of Food Service Education.

In making the presentations, Dr. Larimore pointed out that local health units everywhere could consider themselves as contenders for the award for development of a comprehensive program of environmental sanitation won by the Macon department this year. Almost every department sets such a program as one of its goals, and entries for this award are judged by the Awards Jury with the resources of the various departments in mind. The test lies in the fact that the contest requires that entries be judged with special consideration to "newly developed activities of a pioneering nature" as part of a well-rounded program.

Macon's program was exceptionally good from every point of view as attested by the results cited:

1. Passage of a bond issue for the construction of a sewage treatment plant.
2. Formation of a minimum housing standards committee by realtors and other interested parties which resulted in a legally supported 5-point environmental improvement program.
3. Creation of a county planning and zoning commission.
4. Formation of a nursing home committee of operators and other interested parties.
5. Participation of local garden clubs in a drive to eliminate open garbage dumps.

The jury was impressed not only with the wide range of results achieved in the year but with the fact that a large part of the achievement came from the initiative of the staff as a whole through an unusual system of encouragement set up by the Director of the Sanitation Division.

All ten professional members of the division were given actual experience in leading its work through a rotation of the chairmanship of the weekly two-hour staff meeting. Each month a different member had the responsibility of preparing the business, educational and social topics to be covered, and the person to be chairman in the following month prepared for the job by acting as vice chairman and secretary.

Members were given further leadership training and additional opportunities to participate in developing policies, operational procedures and work allocation through assignment to standing committees. These

studied specific areas of activity and made recommendations. Members were thus drawn into individual study and to consultations with others on common problems. When work was completed, committee recommendations were presented to the entire staff for decision. The Division Director retained the right to veto decisions thus arrived at, but it was agreed that he would explain and justify any veto he exercised.

Tulsa won the award for "outstanding achievement in the development of a program of eating and drinking sanitation" with a program of quite another kind but with equally striking results —

1. Establishment of facilities for training food industry personnel in correct working procedures in 5 new health centers.
2. Adoption of a proposal by the restaurant association to employ a training director and to require all food service personnel to pass an examination in proper food handling.
3. Development and publication of a monthly sanitation news letter for all eating and drinking establishments.
4. Adoption of swab testing of eating and drinking utensils as a routine procedure.
5. Developments of in-service training for new staff members and semi-monthly staff meetings to keep departmental inspection procedures uniform.

The five new health centers in the Tulsa district each feature an ample auditorium with a completely equipped kitchen for cafeteria style service adjoining it behind folding doors. Thus practical demonstrations can be given with approved equipment during the training courses regularly conducted for food workers.

The department also states that further impact on the community has been achieved by making these facilities available to organizations whose interests are allied to public health with the result that each group using the kitchen "sees and uses facilities that show proper design and built-in sanitation."

The department's marked progress in establishing the principle of operator responsibility for sanitation was achieved through an educational campaign. A committee of the local restaurant association, concurring with what the Department was seeking to do, recommended that association fees be raised to provide for the employment of a training director and that all food handling personnel in eating and drinking establishments be required to qualify themselves by passing an examination on sanitary procedures. The association subsequently approved the committee report, hired a director of training and set up a system of examinations and education. In the first 9 months of its operation (to June, 1956), 4,400 people took the industry-sponsored tests. A total of 3,500 secured a passing rating.

With this solid progress behind it, Tulsa does not plan any let-up in its activities. The department has these projects now in various stages of development:

1. Establishment of a food service advisory council.
2. Review of the food service training program and establishment of an advanced training course.
3. Revision of inspection reports to make them more meaningful and helpful to operators.
4. Presentation of awards each year by the Junior Chamber of Commerce to operators who have maintained a high level of sanitation, service and quality.
5. Preparation of a manual for the use of sanitarians when in the field.

The jury for this year's awards were Dr. Daniel Bergsma (Chairman), Commissioner of Health, New Jersey State Health Department; Mr. Harold S. Adams, Department of Health, University of Indiana; Dr. Mayhew Derryberry, Chief, Public Health Education Section, U. S. Public Health Service; Mr. Frank B. Elder, Engineering Associate, American Public Health Association; Dr. Granville Larimore, Deputy Commissioner of Health, New York State Health Department; Mrs. Robert F. Leyden, Director of Women's Activities, American Cancer Society, Inc.

On October 15, the Public Health Committee of the Paper Cup and Container Institute announced the opening of the 1957 third annual Samuel J. Crumbine Award Contest for programs conducted in 1956. Requirements are the same as in previous years, and no department that has won an award may compete for the same award again. Previous winners may, however, try for the award which they have not won.

Entry blanks may be obtained from Crumbine Awards Jury, Room 1025, 250 Park Avenue, New York 17, New York.

All entries must be in by March 1, 1957.

NEW PRODUCTS, PROCESSES UNVEILED AT 20th DAIRY SHOW IN ATLANTIC CITY

"Automation — automation — more automation."

This was the answer of a dairy supplier-equipper to the question, "What's new in the dairy industry — as seen at the 20th Dairy Industries Exposition?"

New developments at the Exposition, in Atlantic City's Convention Hall, October 29 — November 3, seemed indeed to center frequently on automation — automatic control of mechanical processes.

But these were only one of many aspects of the 20th

Dairy Industries Exposition – conceded by dairy industries Old Timers as the most comprehensive display of dairy industrial supplies and equipment ever assembled.

Automation was evident in "packaging" operations. An almost completely automatic set-up for washing, filling, sealing and crating milk bottles, and stacking the crates and unstacking them, was demonstrated, simulating the automato-mechanical perfection reported of the Express Dairy of London. Only one person was required to handle the entire operation.

Ice cream novelty manufacture also came in for its share of automatic innovations. Several machines handled up to 600 or 700 stick confections per hour, without human intervention. A completely automatic cone filler made its appearance at the show.

Automatic in-place cleaning remained an important continuing trend, with additional refinements in evidence. In-place spray cleaning took the place of conventional hand-brush methods in cleaning of transportation tanks and processor pasteurizers and tanks. Also receiving new attention was farm equipment, with the appearance of refinements on automatic cleaning of pipeline milkers.

Automatic merchandising was not neglected. Venders of milk and ice cream, in various size and type containers, for both outdoor and indoor distribution, were in evidence.

Basic to the automation of all machinery at the Show were the automatic controls, often small and unpretentious. Exhibits showed controls for temperature, pressure, timing.

Important to the dairy processor who may wish to automate his equipment is the fact that the general principle of "interchangeable parts" is being observed in new equipment for in-place cleaning, for materials handling and milk bottling operations. In these and other operations, manufacturers of equipment are producing single automated units that may be fitted one at a time into a conventional type operation, for slow or *only* partial development of automatic operation.

Of perhaps equally history-making qualities to the industry are new methods of processing indicated by higher temperature, shorter time pasteurizers, usable for processing of ice cream mix and butter cream as fresh milk. (Some of these, although very new, have already gone abroad). New high temperatures were said to make it possible to process ice cream mix without use of a stabilizer, and eliminate superheating of raw products. For milk, they have led to development of a new concentrated milk (3-to-1), which can be used for whipping cream, coffee cream and baby formulas, and can be trucked as far as 900 miles in ordinary paper cartons, and kept fresh as long as three weeks at normal refrigeration temperatures. The makers of the new pasteurizers claim an almost sterile milk at the temperature used – 275°. Pasteurized by the new equipment at lower temperatures of 218° to 220° for 3 seconds, milk has good keeping quality, no cooked flavor, the makers of the pasteurizer claim.

Also conspicuous were variations on the vacuum processor for removal of off-flavors in milk. This processing equipment was planned either as auxiliary to or part of a normal pasteurization process.

Other important trends were observable, but none more so than adaptability, and emphasis on the fitting of new machinery and equipment into standard systems, or development of multiple-use equipment. As an instance, new bottle and capping equipment is adaptable to the filling of all sizes of bottles from half-pint to gallon. New small-size ice cream cabinets and soda-fountain units can be combined in any numbers desired to give all the services of a conventional fountain. Small, they can be fitted into a window space for serving customers outside the window. Versatile, similar units can form an "island" for service to customers on both sides of the fountain.

In certain fields of equipment and supplies, individual developments seemed to attract unusual attention.

In addition to new high temperatures for pasteurization, and vacuum processing innovations, other types of processing equipment making history at the Show included:

- "Instantizers" to render nonfat dry milk instantly soluble, in either cold or hot water.
- Fully automated systems for production of ice cream stick novelties, filled cones.
- Three-tube continuous freezer for ice cream, which can be so used that each tube is for a different flavor. All can be operated separately, or together.

In the special field of filling, capping, washing, and crating equipment, automation remained one of the biggest answers to what's new with, bottle crating and decrating, crate stacking and destacking equipment offered by several manufacturers. One almost completely automated system was capable of handling the multiple operations of bottle washing, filling, capping and crating, crate stacking and crate unstacking, without attendance by workers.

Equipment to handle new large sizes of containers were in evidence. Bottle and carton fillers for half-gallon and gallon-size containers, and bottle washers for half-gallon and gallon-size, were offered widely. An ingenious machine placed handles in a pair of quart cartons, to create a half-gallon container.

Changes in materials were evident. Visitors of past

Shows have commented that a much larger proportion of stainless steel was being used in dairy equipment and supplies than seen at recent Shows.

Large and small capacity machines were appearing widely in the filling-sealing field, for use in smallest operations as well as largest.

In the container field, advances in old materials and use of new materials were seen. Changes in treatment of containers to obtain maximum visibility of product, or in other ways advance "silent salesman" features, were prominent. Large size containers for milk — half-gallon and gallon — and for other dariy products were common. New developments included —

- a new process for strengthening returnable glass bottles, with microthin coating protecting the bottle from most abrasions and scratches that normally lead to breakage.
- a new single service milk container with plastic liner, adapted to consumer retail use in half-gallon and gallon size, and made in 3 gallon size for the home milk dispenser, 6 gallon for the commercial dispenser. Made with polyethylene liner and cardboard carrying carton, it is claimed non breakable, leakproof, light weight, space saving, and economical. A pour spout makes it easy for the housewife to use.
- appearance of large numbers of gallon jug and half-gallon jug fillers, cappers and washers, indicating new emphasis on large sizes.
- "see-through" features, like all-plastic combinations, plastic lids.
- attractive color printing to increase impulse buying.
- appearance of packages attractive enough to be used on the table or even at parties.

Dominating the transportation scene were reduction of empty weight, on the one hand, to provide larger capacity travelling longer distances and on the other hand increased emphasis on insulation and refrigeration qualities. Some of the weight reduction was being accomplished by use of new materials. Prominent too was the appearance of the dual purpose delivery truck, handling combinations of milk, ice cream, cream cheese, and fancy goods. Important to new delivery truck models were innovations for "driver convenience," making it possible for the driver to sit or stand, and to gain access easily to his product for handling.

Other developments include —

- aluminum body in panels, lightweight and easy to repair.
- vapor-proof roof for ice cream and frozen foods truck bodies.
- plastic doors and jams to prevent "sweating".
- use of magnesium alloy for weight and modeling advantages.
- squared-up body design to gain increased capacity.
- continuous refrigeration, effected by "plug-in" or through motors, or by combination of both (effected without opening the trucks.)
- fast pull-down and automatic frost prevention in refrigeration systems.
- condenser units that "pull out" for repair.
- "small-package" refrigeration units, light weight taking up little "milk bottle" space.

In addition to the commercial displays of the Show, a non-commercial exhibit representing an economical method of disposing of dairy wastes was an example of scientific advance by Government and industry working together.

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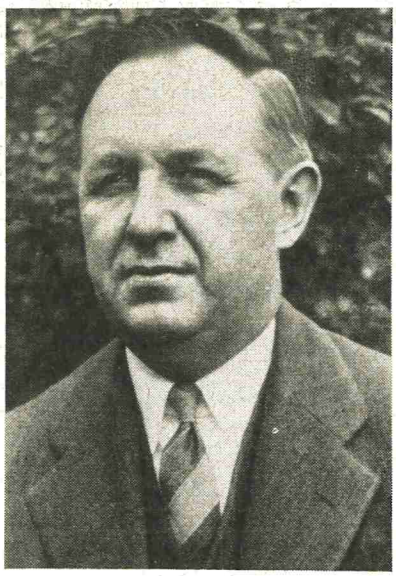


JOHN RICHARD PERRY
1895-1956

John R. Perry, assistant to the director of Plant Production National Dairy Products Corporation, who died October 25th, at 61, was one of the most widely known and respected men in the field of dairy technology.

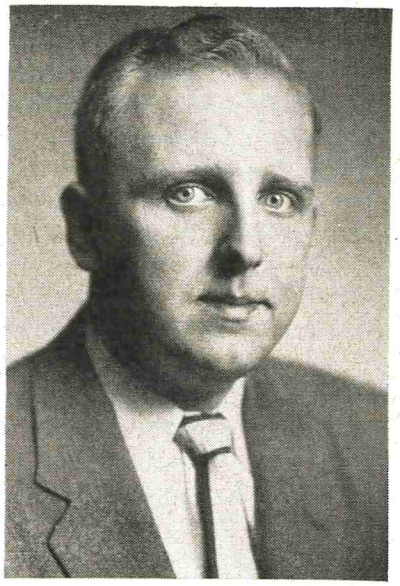
Mr. Perry's activities were manifold and varied — covering Sealtest production functions, plant and equipment engineering, Health Department contacts, surveys of operations, attendance at Government and industry meetings and service on industry committees.

Among his many industry activities were: The Plant Committee of the Milk Industry Foundation; the Committee on Definitions and Standards of the IAMD; Advisory Committee, New Jersey Milk Control Board; and membership in such organizations as the International Association of Milk and Food Sanitarians and the New York Association of Dairy and Milk Inspectors. He was the author of a wide variety of magazine articles on various dairy subjects.

Mr. Perry also represented the Milk Industry Foundation on the Sanitary Standards Subcommittee of DIC. In this capacity he was active in the development of 3A Sanitary Standards for Dairy Equipment. His knowledge of plant operation and sanitation was of great value in the deliberations of equipment manufacturers, milk processors, US Public Health Service and International Association of Milk and Food Sanitarians in the formulation of acceptable standards.

Mr. Perry was born near Bernardsville, N. J. and had lived in East Orange, N. J. for thirty one years, where he was active in community affairs. As a member of St. Bernard's Episcopal Church, Bernardsville, Mr. Perry had served as Sunday School Superintendent. He graduated from Rutgers College in 1920, where he received a Bachelor of Science degree in dairy agriculture. On April 9, 1926 he received the rating of Professional Mechanical Engineer in New Jersey.

A farm boy, Mr. Perry once commented that "I had to make my own way in the world, first beginning to work away from home at 14." An all-round high school athlete, he said that "however, in college I had to work — no time for athletics." Mr. Perry had served with the U. S. Army during World War I enlisting as a private, and being commissioned as an officer in the Field Artillery. He was in combat on the Western Front, and his decorations included the Victory medal with three stars and the Verdun medal.



THADDEUS F. MIDURA

Dear Professor Sheuring:

I want to thank you as Chairman and the rest of the Committee on Education and Professional Development for awarding me the three hundred dollar ($300.00) scholarship. I deem it a great honor to be the first recipient of this scholarship sponsored by your Association, of which I hope to become a member whenever I enter the field of public health.

Here is the short autobiography of myself which you have requested.

I am a resident of Chicopee, Massachusetts, having been born there on December 2, 1931, the son of Mr. and Mrs. Stanley B. Midura. I attended the local school system and graduated with honors from Chicopee High School. After graduation, I was employed with my father as a milkman and in 1951, I entered the Massachusetts College of Pharmacy.

Becoming interested in the field of public health and bacteriology, I transferred to the University of Massachusetts, where I am presently a Senior.

Yours truly,
Thaddeus F. Midura

JOURNAL OF MILK AND FOOD TECHNOLOGY

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JOURNAL OF MILK AND FOOD TECHNOLOGY
INSTRUCTIONS TO CONTRIBUTORS

Manuscripts. — Manuscripts should be submitted on suitable 8½″ x 11″ paper. The original typewritten copy double or triple spaced with wide margins not less than 1″ on all four sides should be submitted. Tabular material and illustrations should accompany the manuscript; also, each manuscript should be accompanitd by (a) a glossy personal photograph of the author, (b) a brief biographical sketch of the author not more than 50 - 75 words, and (c) an abstract of the paper not to exceed 75 words. These will be used at time of publication of the paper. All material should be sent by first class mail in flat form to the Managing Editor, H. L. Thomasson, P. O. Box 437, Shelbyville, Indiana.

Authors should make every effort to present their material accurately and in a clear and concise form. In preparing manuscripts, use of the first person should be avoided. Manuscripts should be proofread carefully before they are submitted. Each manuscript will be reviewed by one or more Associate Editors. Anonymity of reviewers will be preserved.

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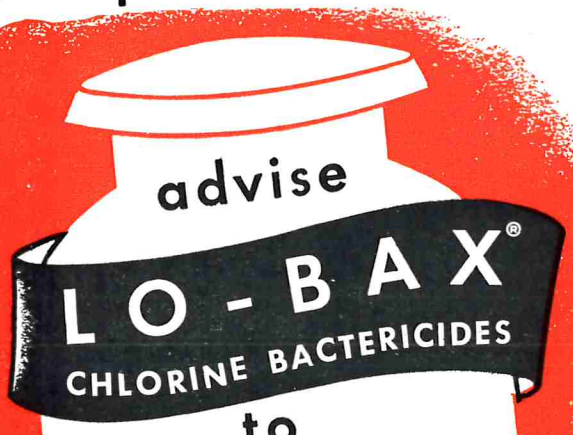

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