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COOPERATIVE EDUCATION — NORTH CAROLINA STYLE

William Long[1]

Department of Public Health, Gaston County

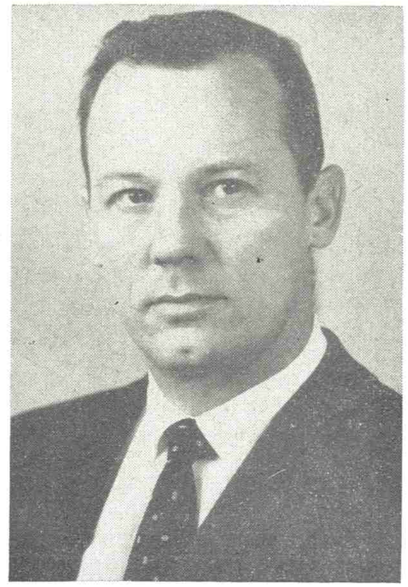
Gastonia, North Carolina

How can a county health department successfully sponsor a one day short course for dairymen? This was a problem faced by public health workers in the Gaston County Health Department, Gastonia, North Carolina. The course could be planned, held, and later reviewed as to possible results; but the one ingredient that was absolutely essential to a successful course was the voluntary attendance of the dairymen of the county. How could this best be obtained?

Farmers, in general, and dairy farmers, in particular are independent people. Neither the local health department, nor any other group or agency, can order them to attend a meeting. In order to obtain maximum attendance, it was necessary to plan a course to meet their interests (and ours). To plan such a course, it was decided to request the assistance of all resource groups in the area having dealings with the dairy farmer. These groups consisted of representatives of: *(a)* the local health department; *(b)* the North Carolina State Board of Health's Sanitary Engineering Division; *(c)* the local Farm Agent's office; *(d)* the local County Dairy Council; *(e)* the local pasteurizing plants and distributors; *(f)* equipment manufacturers; and *(g)* sanitizer and cleanser sales representatives.

Perhaps it might be advisable to clarify the responsibilities of local North Carolina Health Departments in regard to milk control. In this state the legal control of milk and milk products is, by state legislative action, a function of the North Carolina Department of Agriculture. In actual practice the public health control work - routine inspections, testing of equipment, etc. - is a function of the local health department (assisted by the North Carolina State Board of Health). The local department adopts a county-wide milk ordinance, patterned after the United States Public Health Service Ordinance, and enforces the Ordinance using local sanitarians. As a result of this heterogenous mixture of authority, it is usually the responsibility of the local department to provide the available educational opportunities to the dairymen of the individual county.

In the planning meeting the present day problems of the dairymen were discussed. Since the group felt



Mr. William N. Long received the B.S. degree in Chemical Engineering from North Carolina State College. After working as a marine engineer in Charleston, S. Car. and later as a sanitary engineer with the Chapel Hill, N. Car. Health Department he began graduate work at the University of N. Car. and received the M.S. degree in Sanitary Engineering in 1950. Mr. Long has been with the Gaston County Health Department for seven years and just recently resigned to activate his commission in the U. S. Public Health Service.

it would be necessary to point the meeting to the interests of the farmer and not necessarily to the health department, it was proposed that topics such as the following be included:

1. Taste and odors in milk.
2. The incentive pay plan.
3. Increasing yield through proper feeding.
4. Proper methods of cleaning of equipment.
5. Discussion of the United States Public Health Service Milk Ordinance.

While no definite program had yet been established, the group turned their attention to ways of boosting attendance. The following suggestions were made and later adopted:

1. Provide for a "free" barbeque lunch. This would attract the farmer and tend to keep him there until completion of the program.

2. Invite all workers - not just owner - the wives,

[1]Present address: Dept. of Health, Education, and Welfare, Public Health Service, Region III, Charlottesville, Virginia.

the hired help - all were asked to attend. This enabled us to reach the persons who, in many cases, were actually doing the work.

3. Mail out letters of invitation and a tentative program two weeks in advance.

4. Include with the tentative program a "return" postcard. This would provide the department with information as to who was coming and how many would come from the same farm.

5. Program and announcement - mail to farmers one to two days prior to meeting. This would serve as a final reminder.

6. Have appropriate news releases.

7. Make announcements of the meeting at other farm meetings. Two other regularly scheduled farm meetings were covered by the county farm agent and people were asked to indicate their intentions of attending the meeting.

8. Provide for audience participation through discussion and "open" time allowed for each part of the program.

9. Provide for door prizes - an incentive to attend; the prizes to be furnished by sales representatives.

10. Secure top-notch speakers-preferably men the dairy farmers knew by reputation.

These were the general plans for our one day dairymen's short course. The final program as adopted consisted of the following:

9 - 10 *a.m.*

"Simplified Bacteriology," presented by Mr. Tim Enright, representative of Klenzade Products, Inc. Mr. Enright presented an elementary, "down-to-earth," discussion with the aid of a planned series of color slides.

10 - 11 *a.m.*

"Cleaning of Equipment," by Dr. George Hopson of DeLaval Seperator Co., Inc. Dr. Hopson used very effective demonstrations, such as taking apart and reassembling a milking machine while talking to the group.

11 - 12 *noon*

"Flavors in Milk," presented by Dr. R. B. Redfern, Professor and Dairy Specialist at North Carolina State College. Dr. Redfern presented a subject of great interest to the farmer. The problem of off-flavors is one that directly affects the pocketbook.

Noon

A full plate barbeque lunch was served to all persons present. The distributors in the county area financed the meal.

1 - 2 *p.m.*

"United States Public Health Service Milk Ordinance" presented by Mr. Mason Caldwell, District Milk Sanitarian of the North Carolina State Board of Health. Mr. Caldwell handled this difficult subject by utilizing an audience participation approach supplemented by his own elaboration on points of particular interest to the dairymen.

2 -3 *p.m.*

"Panel Discussion - Any Producer's Problem," by Mr. Algie Wilson, local milk specialist. Dr. Redfern, and Mr. Caldwell were prepared to, assist in answering any questions from the floor.

As in all panel discussions, a preconceived effort was made to keep the action moving. When the questions lagged, two courses of action were taken: *(a)* the farm agent or one of his assistants would request assistance on a dairy problem he was acquainted with - using no names; or *(b)* the panel would elaborate on problems related to some previously asked and discussed.

The success of the one day meeting will not be known until some time in the future. Tangible results such as more efficient cleaning of equipment, or adherence to the milk ordinance by county dairy farmers, may or may not be obtained. There were, however, these results:

1. The farmers who attended enjoyed the meeting and so expressed themselves.

2. The planning groups (state and local health authorities, county farm agent, distributors, and sales representatives) worked together in harmony. The planning sessions resulted in closer working relations between all groups concerned.

3. The farmers came to the meeting. This made those concerned realize that proper planning is not just a trite expression, but essential.

Gaston County, North Carolina, has seven retail raw dairies, 113 plant producer dairies, and seven pasteurizing plants located in the county or selling milk in the county. It is perhaps of interest to note that: *(a)* 11 pasteurizing plants were represented including 100 per cent of those from Gaston County; *(b)* 98 or 86.6 per cent of the plant producers were represented; and *(c)* 4 or 50 per cent of the retail raw milk dairies were represented.

In addition to the above the following related fields were represented: *(a)* four dairy field representatives; *(b)* seven dairy equipment representatives; *(c)* ten health department representatives, four of which were from out-of-county departments; *(d)* three farm agents; and *(e)* one college representative.

It is sincerely hoped that this brief discussion of a local county health department's effort to successfully sponsor a one-day short course, the problems encountered, and the results of a cooperative planning effort will be of benefit to other organizations with similar problems.

THE STATE PROBLEM AND THE PROGRAM FOR FACILITATING INTRASTATE SHIPMENTS OF MILK IN WISCONSIN[1]

Karl A. Mohr
Green Bay Health Department
Green Bay, Wisconsin

The problems concerned in the intrastate shipment of milk are not strictly localized. but also assume importance to this conference in relation to the significance of the home rule authority existing in an individual state. Home rule is the right of municipalities to regulate and govern themselves in all matters except those reserved to the state government by state law. In Wisconsin, for example, cities and villages have greater home rule powers than are enjoyed by local government in most other states. Under this home rule authority, municipalities can, and do, regulate their milk supplies in the interest of the protection of public health. When such home rule power is exercised by a municipality, the same problems about which we are concerned on the interstate level, come into play intrastate.

However, these problems, when they exist on the intrastate level are not selfconfining to that level, but rather spill out and cause kindred problems in the interstate movement of milk. This is true, because no matter how well we provide for the free movement of milk supplies between states, unless we can move those supplies into the local community where they will be utilized, our work is in vain.

Every person has the inherent right to have access to a high-quality milk at any time and place. Morally and legally, milk should be permitted to move from one area to another, from one state to another, subject only to control based on sound principles of public health protection.

The situation is further intensified because the milk industry has progressed to the point, where it has solved its transportation problems with the advent of the high-speed motor truck, and it has solved its weight and return problems by the use of paper or single-service containers of multi-quart capacity. It is in the position to materially expand its effective sales marketing area, and it is doing this through intrastate and interstate movement of packaged milk and milk products.

[1]Presented at the Sixth National Conference on Interstate Milk Shipments, April 23-25, 1957, Memphis, Tennessee

Municipalities in Dual Role

At the intrastate level, most municipalities find themselves in the dual role of both shipping and receiving authorities. We are concerned with the problems presented by the free flow of milk in either direction from both sides.

On the one hand, as a shipping authority, we deplore the arbitrary restriction which would prevent milk, produced and processed under our supervision, from flowing freely to other communities. This tends to foster a feeling of revenge and strike back on the part of our own processors, and places pressure on us to violate our fundamental principles of sound public health control of milk.

We deplore spot-checking of supplies under our jurisdiction because they interfere with, and upset the normal regular control which we maintain; they accomplish nothing for the receiving authority in the way of supervision; they are duplication of other qualified inspections; they tend to confuse the milk producer and the milk processor; and they add an unnecessary cost on the milk supply to the consumer.

On the other hand, as receiving authorities, we are concerned about supplies of milk coming from outside of our inspectional jurisdiction as to whether or not they are of the same high quality that we demand in supplies under our immediate inspection.

Responsibilities Of Control Agencies

The milk industry as a whole is concerned with this situation, and responsible public health people are just as concerned. Public Health is a servant of the people and responsible to them. We have a duty to do everything in our power to protect, safeguard and encourage the people's health, but our duty is just as plain that we are to do nothing to abuse the power given to us, or to use it in any way to further our own interests, or the special interests of any group. Relating this duty to milk inspection, it means that the public health officer must do everything in his power to make sure that the milk offered to his people is pure, safe and of the best possible quality obtainable, but that he is to have no part in any attempt to use public health regulations as a means of erecting trade barriers.

In order to achieve this value of health protection, but at the same time permit the free flow of milk, it was evident that several factors had to be resolved. A regulation was needed which would be acceptable to all regulatory agencies and would thereby afford a measure of comparability. A means of determining the effectiveness of enforcement of the several agencies was needed because we realize a regulation is only as good as it is enforced. In any endeavor as complicated as a milk regulation, interpretations are necessary from time to time, and some method of uniformity in this field needed to be attained.

BASIS FOR RECIPROCAL INSPECTION

A means of achieving this presented itself, when a new concept of milk sanitation came, in the Recommended Grade A Milk Ordinance and Code of the United States Public Health Service.

In addition to the sound public health protection it offers, the chief contribution of the Grade A Milk Ordinance and Code is that it provides the basis of a comparability of requirements, interpretations and enforcement. This comparability is designed not only to eliminate conflict between inspection areas, but to provide the means for the free flow of milk from one community to another.

Section 11 of this model Code provides in part as follows: "Subject to laboratory tests upon arrival, the health officer should approve, without his inspection, supplies of milk or milk products from any area or shipper not under his routine inspection (1) when they are produced and processed under regulations substantially equivalent to those of this ordinance, (2) when they are under routine official supervision, and (3) when they have been awarded, by the milk sanitation authority of the State of Origin, a milk sanitation rating equal to that of the local supply, or if lower than that of the local supply, equal to 90 percent or more, on the basis of the Public Health Service rating method."

This is the heart of reciprocal inspection. And upon it is based the whole system. Yet certain clarifications and interpretations of this system over and above what is actually found in the model code had to be made in order to assure the local health officer that all milk coming into his jurisdiction is of the same high quality that he demands in his own supply, and so that he might have no hesitation in using the facilities afforded by the reciprocal inspection system of the Grade A Ordinance and Code. Many people do not realize that Section 11 of the Ordinance also says, "The Health Officer *shall bar* milk and milk products shipped in from beyond his normal milkshed, *unless he can assure himself* that they meet the provisions of his ordinance."

WISCONSIN INTRASTATE CONFERENCES ESTABLISHED

Local Wisconsin public health people who are, and have been for some time, working under Grade A code felt that they should have a part in making such clarifications and interpretations with the advice and help of the State Board of Health, The State Department of Agriculture, The University of Wisconsin, The Dairy Industry, and Farm Groups. Consequently, they formed the Wisconsin Conference on Intrastate Milk Shipments. The major objective of this Conference was to formulate agreements on problems relating to the free flow of milk from one community to another, and thus make reciprocal inspection work.

The Wisconsin Conference on Intrastate Milk Shipments was conceived in March, 1955 when a group of health officers and milk sanitarians from the Northeastern and Central parts of the State, along with representatives of the State Board of Health, met at Green Bay to discuss mutual problems concerning the movement of Grade A milk from dairy plants in one city to other cities, all operating under Grade A ordinances. This small group recognized their limitations and decided that if this principle of reciprocal inspection was really to function, it had to be established State wide.

Carrying out this idea, the First Wisconsin Conference was called at Oshkosh, Wisconsin on September 27-28, 1955. The Conference was organized along lines providing for voting power for the adopting of Conference Policy to be limited to official representatives of Local Public Health Departments. All other interested parties would participate in an advisory capacity, and would have voting privilege at the task force or committee level. Participation by industry, farm organizations, the University of Wisconsin and all other interested groups was urged.

Sixty-three people representing seventeen local public health departments, the State Board of Health, the State Department of Agriculture, the U.S. Public Health Service, the Dairy Industry, producer organizations, Farm Groups, and the University of Wisconsin, participated in this first conference.

The Second Conference was again held at Oshkosh, Wisconsin, on September 25-26, 1956. Seventy-three members were in attendance, representing 18 local health departments and all the other interested groups.

Results of Conferences

In both sessions of the Conference, task forces were set up to study specific problems brought before the Conference by its members. After careful deliberation, the task forces prepared recommendations for agreements to be considered by the Conference. In some problems, such recommendations could not be made by the task forces because of lack of time or specific information concerning them. These problems were then assigned to special committees set up by the Conference to work during the interim between conferences, with instructions to report to the next conference.

These agreements have already had a far-reaching effect on many of the problems concerned with reciprocal inspection. They have to do with the actual techniques involved, such as the channeling of information between shipping and receiving authorities; procedures to be followed in rating and certification; recommendations to the Public Health Service for changes in the rating and certification procedures; and, the frequency of survey and ratings. It has reached agreements on such related items as the use of dry milk powder in Grade A Milk products; water for condensing operation for dry milk powder and Grade A concentrated milk; bulk handling of milk; Grade A Cottage cheese; the use of quaternary ammonium compounds and other new chemical sanitizers; and many other miscellaneous problems.

Two agreements, vitally connected with the acceptance of reciprocal inspection, are worthy of mention to illustrate the work of the Conference. The first is a recommendation to the State Health Officer of "Procedures in Certification of Grade A Milk Supplies". These procedures, developed by the State Health Officer, were agreed upon by the Second Conference. The following is taken from the report of this conference (*1*):

"Out of experience it has been concluded that the following procedures would lend themselves to more effective results in the process of certification as to compliance with Grade A milk standards as carried out by the State Board of Health":

1. "That if the supervising agency agrees, one of its inspectors accompany the certifying representative. He may make an inspection, if he so desires, while the certifying representative makes his survey, each independently."
2. "On completion of the inspection and survey of a farm or plant, the two representatives confer, preferably in their own car, as to which survey and enforcement items were debited, how much and on what basis. (This arrangement provides the inspector with firsthand information as to the survey findings, an opportunity for discussion and agreement as to the findings and an opportunity for the inspection to point up non-compliances, if any, to the farmer or plant operator on a subsequent visit".)
3. "Should there be lack of agreement as to interpretations as reflected in the survey, the inspector and the survey representative are requested to substantiate their positions with facts to be submitted to a Conference to be called at which the director of the supervising agency and the State Health Officer or their representatives will review the evidence in an effort to solve the problem".
4. "Should there still be a difference of opinion, the supervising agency may appeal to the State Board of Health for relief".
5. "Enforcement directives to producers or plant operators are the responsibility and prerogative of the supervising agency, not the representatives of the State Board of Health doing survey".
6. "Copies of the rating record will be transmitted to the supervising agency and to the plant as promptly as they are available".
7. "Any correspondence relative to surveys coming from the State Board of Health will be relayed through supervising agencies except in unusual circumstances where direct correspondence is necessary, when a carbon copy of such correspondence will be transmitted to the supervising agency for its information".

The second agreement (*1*) concerns the channeling of information between shipping and receiving health departments: "This conference agrees that the following procedure shall be used in the channeling of information and responsibilities of shipping and receiving authorities":

1. "That any receiving authority desiring to receive information shall notify the shipping authority and ask to be placed on the mailing list so that the following information may be routinely sent".
   - A. "Any violation of bacteriological standards shall be reported to the receiving agency".
   - B. "Whenever a fifth sample is taken with standard plate counts in excess of the limit for Grade A, or coliform counts in excess of the limit for Grade A, it shall be reported to the receiving Agency".
   - C. "Any degrading action or suspension of permit comtemplated, shall be reported to the receiving agency".

"This conference further agreed that the responsibility of receiving authorities to shipping authorities shall be as follows: The information shall be generally the same as that sent from shipping authorities to receiving authorities, with the following addition; that in the case of any sample which does not meet the standards of the Grade A Ordinance and Code, the shipping agency shall be notified immediately of the violation and the distributor shall also be notified with a notation that the primary agency has been given this information."

But of even more importance, the conference has provided a means of bringing together health officers, industry people, farm groups, representatives of the University, the State Board of Health, and the Department of Agriculture, so that they can all get to know each other better. The result has been that we find we are all in basic accord with each other on what we are trying to do. We find that most of our problems are shared by all and that we are able through mutual cooperation to solve them.

We have in Wisconsin a milk inspection system or program which we feel is unique in the whole country. It is often referred to as the Wisconsin Plan. This Wisconsin Plan involves the participation of the local health department and the State Department of Agriculture in supervisory work, and the State Board of Health in rating and certification. This plan is set up by authority of local ordinance, Department Order Ag. 80, and through State Statutes on Rating and Certification. The plan has worked wonderfully well. Since the inauguration of Grade A in Wisconsin in 1944, we have progressed to where at the present time over 90% of all milk sold for fluid consumption in our state is Grade A. We are at the point where we are now considering a compulsory Grade A regulation to cover all such milk.

In spite of the progress which has been made, all our problems have not been solved, nor are we in any position to relax our efforts. We must constantly endeavor to maintain the trust and confidence we have in each other. We must practice the Golden Rule in our work and our dealings with each other. This applies to the producer, the processor, the fieldman, and the regulatory offical. Breaches of faith can only result in distrust and return to suspicion and restriction.

The Health Officer's duties are clearly and plainly marked out for him. It is his responsibility, and his alone, to assure himself that everything possible is being done to safeguard the health of the people. With but few exceptions, he has shown that he is willing to accept reciprocal inspection, he is willing to trust the milk industry and his fellow public health workers, providing that he has reasonable assurance that his trust is well founded. He has built up this trust by his belief in the Recommended Grade A Milk Ordinance and Code of the Public Health Service, by his confidence in the unbiased rating and certification system operated by the State Board of Health and the Public Health Service, and by the co-operation of the State Department of Agriculture in joint supervision of Grade A regulations in Wisconsin under Ag. 80.

Wisconsin cities and villages have great home rule powers. The result is that, in Wisconsin, state and municipal governments function more as a partnership and an association, rather than as a sovereign servant. We feel that this relationship has been very fruitful toward producing the climate under which all of us can work for a fuller achievement of our ideals and goals.

REFERENCES

1. Report of the Second Wisconsin Conference on Intrastate Milk Shipments, September 25-26, 1956, Oshkosh, Wisconsin.

TURBIDIMETRY AS A TECHNIQUE FOR DETERMINATION OF ESCHERICHIA COLI POPULATIONS IN CHAMBERS TEST INOCULUM

Andrew B. Law and Dorothy A. Claypotch
Rohm & Haas Company, Philadelphia, Pa.

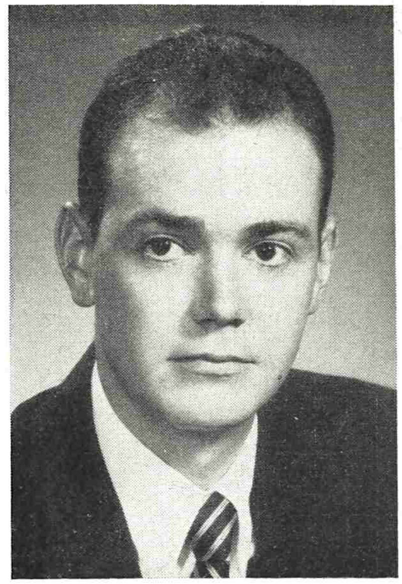
(Received for publication June 3, 1957)

In 1948 Weber and Black described a method for the evaluation of germicides intended for milk and food utensil sanitization (*9*). In 1953 Chambers described a modification of this technique (*1*) which was later revised and published (*2*). The Pesticide Regulation Section of the U.S. Department of Agriculture subsequently adopted regulations (*3*) concerning the labeling of germicides as described in *Appendix F* of the Public Health Service milk ordinance and code (*10*). The Chambers procedure was prescribed as the official test method for establishing hard water activity (*3*).

Over the past four years numerous germicides and commercial preparations have been evaluated in our laboratories according to the Chambers technique (*12*). The principal objection as far as technique is concerned has been the difficulty of standardizing the test inoculum to the prescribed range of 7.5 billion to 12.5 billion organisms per ml. prior to testing. The suggested dilution factor and specified incubation time for the test culture are at present the only means of controlling the inoculum population. This method of controlling the population has proven completely unreliable since it gives no indication of the actual number of bacteria in the inoculum until after incubation. Consequently, the number is frequently outside the specified range and these tests are considered invalid.

To conduct the test efficiently it was considered essential to know the number of organisms in the inoculum before testing. The turbidimetric technique described below has proven of considerable value in that respect and has reduced to a minimum the number of repeat tests due to an excessive number of organisms in the inoculum.

Lamanna and Mallett (*7*) have described the use of turbidimetry for determination of the population of bacterial suspensions. Other workers have employed electro-turbidimetric analysis as a means of measuring microbial populations (*4, 5, 6, 8*). These reports suggested that electro-turbidimetric estimation should provide a reliable means of adjusting the number of organisms in the Chambers test inoculum to comply with the specified range. After considerable basic study the technique described below was adopted and has proven satisfactory in several hundred determinations.



Mr. Law was graduated from the University of Scranton with a B.S. degree in 1949. He continued in graduate study in bacteriology at the Pennsylvania State University during 1949 and 1950 under a fellowship sponsored by the United States Naval Air Corps. In 1951 he joined Rohm & Haas Company as a research bacteriologist. Since 1954 he has been in charge of a laboratory group engaged in development and research work on bactericides.

Materials and Methods

A "Lumetron Photoelectric Colorimeter" Model 401[1] equipped with 14 mm. tubes was chosen for these studies. This instrument is equipped with a single photo cell which provides direct readings of 0-100% light transmission on a metered scale. A standard set of six glass color filters is provided which isolates properly spaced narrow spectral bands that are identified by the wave length of their transmission maxima (*11*).

The proposed procedure for adjusting the Chambers test inoculum by means of the Lumetron Colorimeter is described below.

The 18-24 hours growth is washed from the agar

[1]Photovolt Corporation, New York 16, New York

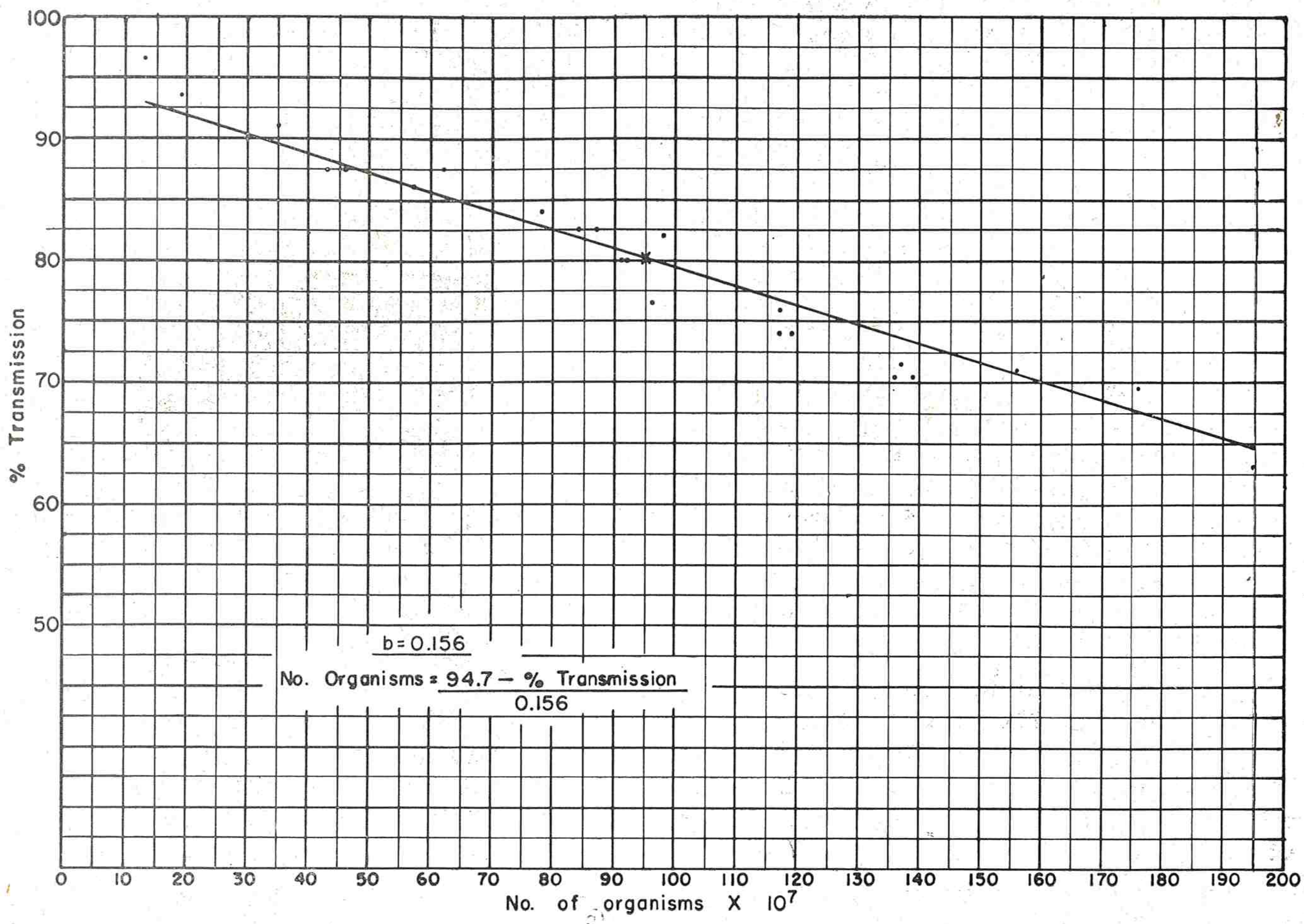


FIGURE 1. Per cent transmission (light) vs. concentration of *Escherichia coli* using Lumetron Photoelectric Colorimeter (550 millimicron)

culture bottles with 4 ml. of sterile buffered distilled water per bottle. The harvested suspension is then pooled and filtered in the prescribed manner (2). The filtered suspension is then diluted to a turbidity which experience has shown approximates 13 billion organisms per ml. This can be accomplished with reasonable accuracy after a minimum of experience. Care should be taken to avoid over-dilution.

For photoelectric estimation, 1 ml. of this culture suspension is made up to 10 ml. with buffered distilled water in a 14 mm. Lumetron tube. Using the 550 mμ filter, the instrument is adjusted to 100% transmission through a 14 mm. tube containing buffered distilled water. The solution should be identical to that employed in preparing the bacterial suspension.

Just prior to placing the tube containing the diluted suspension in the Lumetron, the preparation is agitated to insure homogeneity. The per cent light transmission is read and this value is applied to the graph shown in Figure 1. The approximate number of organisms per milliliter in the diluted suspension is obtained by comparison. This number is then multiplied by 10 to resolve the 1:10 dilution factor and obtain the approximate number of organisms present in the original suspension.

If the original suspension is found to contain greater than the desired number of organisms, a dilution is made on the basis of the graph reading, *i.e.*, if the graph indicates that the original suspension contains 14 billion organisms per ml. and 10 billion organisms are desired, then the original suspension is diluted by adding 0.4 ml. of sterile buffered distilled water for each ml. of suspension.

From this point on the Chambers test is conducted in the prescribed manner with considerable assurance that the number of organisms is within the specified limits.

DISCUSSION

The available Lumetron was equipped with only six glass color filters and it was not evident at the time whether or not these filters would provide the most satisfactory wave length of light for the purpose intended. To clarify this point, a Bausch & Lomb spectrophotometer (type 33-29-40) having a continuous 350 millimicron to 1000 millimicron range was chosen. The data shown in Table 1 were obtained

TABLE 1 — RELATIONSHIP BETWEEN WAVE LENGTH AND PER CENT LIGHT TRANSMISSION OF BACTERIAL SUSPFNSION[a]

Wave Length (millimicron)	% Transmission No. Org. x 10,000,000 75	125	% Difference
450	<0		
455	0		
460	1		
465	5		
470	8		
475	11		
480	14		
485	17		
490	21	<0	
495	24	0	24
500	26	3	23
505	29	5	24
510	31	6	25
515	32	7	25
520	34	8	26
525	35	9	26
530	37	10	27
535	38	11	27
540	38	11	27
545	38	11	27
550	37	11	26
555	35	10	25
560	34	9	25
565	32	8	24
570	30	6	24
575	27	4	23
580	25	3	22
585	20	1	19
590	16	<0	-
595	12		
600	7		
605	1		
610	<0		

[a]Applicable for Bausch & Lomb spectrophotometer (Type 33-29-40)

with this instrument.

These initial investigations of the relationship between wave length and per cent light transmission (Table 1) were conducted on both the maximal and minimal bacterial suspensions (7.5 billion to 12.5 billion organisms per ml.). Initial transmission readings were made on suspensions prepared and plated 18 hours previously and stored at 4° C. Replating and a further series of trials indicated that transmission did not change appreciably during refrigerated storage.

It should be noted at this point that suspensions containing from 7.5 billion to 12.5 billion organisms per ml. were too dense to allow sufficient differentiation by light transmission. It was observed, however, that a 1:10 dilution of the original culture suspension provided greater sensitivity. Therefore, these and all subsequent transmission studies were carried out using this dilution ratio.

Table 1 illustrates the observed relationship between wave length and per cent light transmission. It will be noted that both the peak transmittance and the greatest difference in transmittance between suspensions was reached at wave lengths from 535 to 550 millimicron. All further studies were conducted with the Lumetron using the 550 millimicron filter, as it most nearly approximated the optimum transmittance range demonstrated on the Bausch & Lomb instrument.

Light transmission values were then measured for a series of bacterial suspensions having a range of bacterial populations. The data given in Table 2 were obtained on four separate days using a fresh 24-hour culture suspension of *Esherichia coli* (No. 198) each day. The suspensions were prepared as prescribed by Chambers (2). Each day the suspension was diluted to five or six concentrations and the

TABLE 2 — LIGHT TRANSMISSION VALUES FOR A SERIES OF BACTERIAL SUSPENSIONS

Y % Transmission	X No. Org. x 10,000,000
96.5	13
93.5	19
91.0	35
87.5	43
87.5	46
86.0	57
87.5	62
84.0	78
82.5	84
82.5	87
80.0	91
80.0	92
76.5	96
82.0	98
76.0	117
73.5	117
73.5	119
70.5	136
71.5	137
70.5	139
71.0	156
69.5	176
63.0	195

$SY = 1836.0 \quad SX = 2193 \quad SXY = 1660.24$

$SY^2 = 148{,}218.5 \quad SX^2 = 260{,}549 \quad \frac{(SX)\ (SY)}{n} = 175{,}058.61$

$\bar{y} = 79.83 \quad \bar{x} = 95.35 \quad Sxy = 9034.61$

$\frac{(SY)2}{n} = 146{,}560.70 \quad \frac{(SX)2}{n} = 209{,}097.78$

$Sy^2 = 1657.8 \quad Sx^2 = 51{,}451.2$

$$b = \frac{Sxy}{Sx2} = \frac{-9034.61}{51{,}451.2} = -0.156$$

$$\bar{y} = a + b\ \bar{x}$$

$$79.83 = a - 0.156 \times 95.35$$

$$79.83 = a - 14.87$$

$$a = 94.7$$

Note: For every 1.56 decrease in transmission there will be a 10-million increase in population.

number of organisms determined by plate count. Lumetron readings were then taken on each dilution according to the technique described earlier.

The data are plotted in Figure 1 as per cent transmission versus concentration of organisms. The regression analysis is given in Table 2. The equation for the line as plotted is Y = 94.7 -0.156 x or number

$$\text{of organisms} = \frac{94.7 - \%\ \text{transmission}}{0.156}$$

An inspection of the points plotted will indicate noticeable variation from the straight line relationship at the lower bacterial populations. This has been confirmed in later studies. This discrepancy is of no practical concern since these populations are below the working range. Based on these data it is concluded that a straight line relationship exists between the number of organisms normally employed in the test inoculum and the per cent light transmission.

It should be noted that as a matter of convenience 14 mm. Lumetron tubes were employed in all of these studies. Further investigations are planned with the Lumetron using additional tube sizes as well as special thin cuvettes supplied by the Photovolt Corporation.

Prior to adoption of this supplementary procedure, 25% of the Chambers tests in this laboratory were invalid because the inocula did not fall within the prescribed range. In several hundred determinations conducted since the described photometric procedure was adopted, all inocula have been within the limits.

SUMMARY

An electro-turbidimetric procedure is presented for the estimation of the bacterial population of the inoculum for use in the Chambers modification of the Weber-Black technique. Invalid tests have been virtually eliminated.

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THE BACTO-STRIP TECHNIQUE FOR MAKING COUNTS OF BACTERIA, MOLDS AND YEASTS[1]

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Tests carried out by the Bacto-strip technique showed that the coliform counts were rarely comparable to those obtained by the desoxycholate agar plate count method. However, mold counts of the air in a cheese curing room by means of the Bacto-contact strips were in good agreement with those obtained in the usual manner. The technique is useful where laboratory facilities are lacking.

The Bacto-strip technique has been developed in Switzerland as a means of making microbiological determinations when laboratory facilities are not available. Favorable reports from European laboratories (*1, 3, 5, 6, 7*) on this technique prompted us to obtain a supply of three different types of Bacto-strips[2] for comparative tests with conventional methods.

Dr. C. K. Johns has been a member of the Bacteriology Division, Canada Department of Agriculture, Ottawa, Ontario, since 1927. In 1953 he was appointed Officer-in-Charge of the new Dairy Technology Research Unit there. A graduate of the University of Alberta, he obtained his M.Sc. from McGill University and his Ph.D. from Wisconsin. He served as President of the I.A.M.F.S. in 1934-35, and was honored with the Citation Award in 1954.

Coli-Strips

These are dry strips of sterile heavy filter paper impregnated with a specific culture medium. These, depending upon their size, absorb a definite quantity (1 or 0.1 ml) of milk and form a selective culture medium for the coliform bacteria present in the milk. To make the test a strip is removed from its sealed plastic envelope, dipped into the milk being tested, withdrawn, drained, returned to the envelope for incubation, and the upper portion (which has been contaminated during handling) torn off at the perforation and discarded. The open end of the plastic envelope is placed between two glass slides and heat-sealed by passing the exposed edges through a flame. After incubation at 37°C. for 8-10 hours the red colonies (resulting from the reduction of triphenyltetrazolium chloride) which have developed on one side of the strip are counted.[3]

Preliminary tests were conducted to determine the reproducibility of results by the Coli-strip and desoxycholate plating methods (*2*). Quadruplicate Coli-strips and plates were prepared using 1 ml portions of each of 4 samples of raw herd milk.[4] In order to minimize inconvenience the Coli-strips were refrigerated at 4°C. overnight; incubation was started at 8:30 *a.m.* next morning and counts made after 8 and 10 hours at 37°C. The desoxycholate plates were incubated at once, and counted after 20 hours at 37°C.[5] The results (Table 1) show little difference in reproducibility, but appreciably lower counts on the Coli-strips. Counts on Coli-strips after 8 hours generally were definitely lower than after 10 hours incubation.

Further tests were conducted in which the Coli-strips were incubated for 10 hours after being refrigerated at 4°C. for 6 hours, while the desoxycholate plates poured on a 1:10 dilution were incubated for 22 hours

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[2]We are indebted to the manufacturers, Bacto-strip, Ltd. Zollikon-Zurich, Switzerland, for supplying the Bacto-strips for these tests.

[3]See Addendum regarding this point.

[4]Satisfactory comparisons could not be made using either commercially pasteurized milk or Central Experimental Farm raw milk because of the low level of coliforms present.

[5]This departure from the 35°C. specified in Standard Methods was in order that direct comparison could be made with the Coli-strips incubated at 37°C.

TABLE 1 — REPRODUCIBILITY OF COLIFORM TESTS ON RAW HERD MILKS

Sample	Colony Counts per ml on replicates											
	Desoxycholate agar plates incubated 20 hrs.				Bacto-strips, 1 ml capacity Incubated 8 hrs.				Bacto-strips, 1 ml capacity Incubated 10 hrs.			
1	TNC	TNC	TNC	TNC[a]	12	14	16	17	20	23	24	24
2	62	75	79	72	1	4	5	5	3	5	7	8
3	34	20	22	30	9	12	13	14	15	16	17	20
4	59	44	49	61	0	1	1	1	1	1	2	4

[a]Too numerous to count on 1 ml plating. Bacto-strips refrigerated at 4°C. for 16 hrs. before incubation.

at 37°C. The results (Table 2, A) again show poor agreement in most cases. A final set of three samples was compared in which the Coli-strips were incubated for 16 hours at 37°C. after 2 hours refrigeration, in the hope that the counts would show better agreement with those on desoxycholate agar. The results (Table 2, B) indicate only a slight improvement.

SURFACE CONTACT STRIPS

These are of two types - white, for estimating molds and yeasts, and blue, for estimating total bacterial count. They are of heavy filter paper 12 x 86 mm impregnated with a suitable agar medium and covered on each side with a plastic strip. To use the Bacto-strip, the sealed plastic envelope is cut open, the Bacto-strip is removed and the plastic film is peeled off one surface. The exposed face of the strip is pressed firmly against the surface to be tested, then removed. The plastic film on the back, which has been contaminated in making the contact impression, is next peeled off and the strip inserted into the envelope in such a manner that the surfaces are not in contact with the envelope. The perforated portion, contaminated through holding, is torn off and the envelope heat sealed and incubated to develop the colonies for counting.

TABLE 2 — COLIFORM DETERMINATIONS ON RAW HERD MILKS

Sample	Bacto-strip (1 ml) No. of colonies	Plate count (desoxycholate) per ml.
A 1	1	<10
2	4	410
3	20	310
4	4	30
5	48	70
6	8	30
7	2	<10
8	TNC	TNC
9	TNC	1700
10	11	110
11	0	20
12	0	20
13	TNC	3100
14	0	10
15	8	10
16	1	<10
17	18	70
18	5	10
19	TNC	3700
B 20	47	40
21	28	240
22	90 (est.)	800

A = Coli-Strips incubated 10 hrs. at 37°C., following 6 hrs. refrigeration at 4°C.

B = Coli-Strips incubated 16 hrs. at 37°C., no refrigeration.

The blue contact Bacto-strips were used in determing the bacterial load on the inner surface of cheese vats, but the counts were too low to make satisfactory comparisons with results by other methods. More successful results were obtained with the white strips for mold and yeast count. These were exposed alongside poured plates of malt agar (2) in a cheese curing room for 5 minutes, then both were incubated at room temperature for 5 days. The count per strip was multiplied by 6.4 to compensate for the larger area of the petri dish. Table 3 shows the results obtained.

DISCUSSION

Since in North America the coliform count is made almost exclusively on pasteurized milk, it would have been best to have carried out these studies with pasteurized milk. However, the coliform level of pasteurized milks tested was too low to permit satisfactory comparisons, being of the order of 1 per ml or less. This was also true of samples of raw milk from the Central Experimental Farm herd. A considerable proportion of the limited supply of Coli-strips was used up in examining such milks; the results from the remainder, which are presented in Tables 1, 2, and 4, are consequently rather limited.

TABLE 3 — MOLD COUNTS OF AIR IN CHEESE ROOM (EXPOSURE FOR 5 MINUTES; INCUBATION AT ROOM TEMPERATURE 5 DAYS)

Trial	Bacto-Strip No. of colonies	Bacto-Strip No. x 6.4[a]	Colonies on poured Petri-plate (Malt agar)
1	42	270	225
2	48	310	407
3	110	700	1400
4	202	1300	1400
5	68	435	364
6	116	740	613
7	173	1100	808

[a]This factor represents area of petri dish divided by area of Bacto-strip.

The Bacto-strip technique is an ingenious method. It permits certain bacteriological examinations to be conducted where no laboratory facilities exist, and without the need for laboratory glassware. However, considerable manual dexterity is required, especially with the contact strips. The biggest objection is that the optimum incubation period for the Coli-strips, 8 to 10 hours, is most inconvenient. Unless some person can come back in the evening or later at night to (a) count incubated strips or (b) start strips incubating at 37°C. for counting early next morning, it

TABLE 4 — COLIFORM DETERMINATIONS ON RAW MILKS

Sample No.	Colonies on desoxycholate agar plates incubated 21 hrs.	Bacto-strips[a] Incubated 10 hrs.	Bacto-strips[a] Incubated 12 hrs.
1	51	92 + 93 = 185	95 + 98 = 193
2	18	0 + 0 = 0	1 + 1 = 2
3	48	29 + 35 = 64	32 + 37 = 69
4	27	112 + 104 = 216	105 + 89 = 194
5	130	29 + 41 = 70	42 + 65 = 107
6	18	46 + 47 = 93	57 + 43 = 100
7	95	13 + 13 = 26	13 + 15 = 28
8	84	4 + 6 = 10	17 + 21 = 38
9	10	3 + 3 = 6	5 + 6 = 11
10	94	31 + 78 = 109	33 + 77 = 110
11	25	3 + 12 = 15	2 + 13 = 15
12	273	65 + 73 = 138	113 + 107 = 220
13	382(est)	9 + 9 = 18	21 + 25 = 46
14	148	67 + 79 = 146	51 + 47 = 98
15	192	69 + 103 = 172	66 + 112 = 178
16	11	0 + 0 = 0	1 + 3 = 4
17	138	41 + 62 = 103	51 + 64 = 115
18	10	TNC	
19	55	15 + 24 = 39	15 + 26 = 41
20	285	19 + 67 = 86	17 + 42 = 59
21	261	63 + 117 = 180	79 + 91 = 170

[a]Bacto-strips refrigerated at 4°C. for 6 hrs. before incubation.

appears necessary to do as we have done in much of our work, *i. e.*, refrigerate the treated strips overnight and start 37°C. incubation early next morning.

If incubation is prolonged beyond the optimum, colonies of motile species tend to run together, as was reported by Galesloot (*4*). Beck (*3*) reports better results when incubating from 10 to 12 hours but this period is also most inconvenient.

Counts on the Coli-strips were frequently much below those obtained by the usual plate count method. It has been suggested that this may have been due to our practice of refrigerating the treated strips overnight (Table 1) or for shorter periods (Table 2) before incubating at 37°C. If the organisms were in the logarithmic growth stage before the strips were refrigerated, the "cold shock" might set the organisms back so that they would not form visible colonies within 8-10 hours at 37°C. This seems most unlikely since these samples were obtained in February and were kept at 10°C. or lower from the time they were taken.

For the examination of a flat surface, the contact strips are more convenient than many procedures we have tried. However, for examining irregular surfaces, sharp corners, etc., a swabbing technique (*2*) would be superior. The strips are also useful for determining the mold load in the air, but the technique is much less simple than exposing poured plates of malt agar. Counts by both methods showed good agreement.

Other shortcomings of the Bacto-strip technique include the high percentage of contaminated contact surface strips, and the cost. Of the contact strips for mold and yeast count, 32% were obviously contaminated with mold colonies as received; of those for total count, 26% were contaminated. As to cost, the the Coli-strips are quoted at around 17c each, and the contact surface strips at 47c each, plus whatever duty may be charged. (Against this must be set the costs for glassware, media, cleaning, sterilizing, etc. for the plate count method.) Another disadvantage lies in the fact that the surface contact strips must be used before their expiration date.

In summary, therefore, it would appear that the Bacto-strips offer a means of conducting certain bacteriological tests on milk or on surfaces on the farm or in small plants lacking laboratory facilities. (For example, they could be used by a plant as a routine check for coliform recontamination of bottled milks.) However, it should be borne in mind that the counts obtained are often not in close agreement with those obtained by standard procedures. Furthermore, the optimum period of incubation does not fit in with customary working hours.

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ADDENDUM

After this paper had been prepared for publication, it was discovered by accident that in the English translation of the manufacturers' "Instructions for Use for Strips to Detect Coliform Bacteria", it was erroneously specified that the colonies should be counted on only one side of the 1 ml strip. However, even if the counts on Coli-strips in Tables 1 and 2 were doubled, a high percentage would still be appreciably below those from desoxycholate agar plates. To obtain further data an additional series of 21 samples was tested in which the 10 and 12 hour counts from both sides of the Coli-strips were compared against the desoxycholate agar counts. In contrast to the previous series (Tables 1 and 2) the Coli-strip counts (Table 4) were sometimes higher, sometimes lower than the plate counts. In four instances the Coli-strip count was at least double that of the plate count; in 6 cases it was less than half that of the plate count. The lower counts after 12 hours on certain samples, e. g. Nos. 4, 14, and 20, are attributable to the tendency of the colonies to coalesce as they grew larger. The higher count obtained when both sides of the strip are counted is due in part to the fact that the same colony often shows on both sides of the strip and is therefore counted twice.

It has recently been learned that violet red bile Coli-strips with modified tetrazolium compounds are now available. These may be counted after 14 hours incubation, and results are said not to be seriously affected by longer incubation. Further tests are planned with these strips.

THE INFLUENCE OF THE MAXIMUM TEMPERATURE RISE IN BULK TANKS ON MILK QUALITY

II. THE EFFECT ON BACTERIAL COUNTS

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In this study of the influence of blend temperature on milk quality no significant difference on bacterial growth rates, either total, thermoduric, or psychrophilic was found with blend temperatures of 40°F., 50°F., or 60°F. With an increase in blend temperature to 70°F. a slight, but significant, increase in the rate of total bacterial growth occurred. Every-other-day pick-up studies indicate no greater increases in the rate of bacterial increase than with every-day pickup.

In establishing the effect of blend temperatures on milk quality, of equal importance to the influence on the rancidity of the milk is the effect on the bacterial quality of the milk. While a previous report (3) was devoted to the relation of lipase activity and blend temperature, the present report presents the results of a study on the effect of blend temperatures of 40°, 50,° 60° and 70°F. on the rate of increase of total, thermoduric and psychrophilic counts.

Procedure

The farms studies and the procedures used in obtaining milk samples, as well as obtaining various temperature blends for this study, were described in the preceding paper (3). Samples for bacterial analysis were taken at 0, 24, 48 and 72-hour periods. Psychrophilic and thermoduric bacterial counts were made according to standard methods (Standard Methods for the Examination of Dairy Products, Ninth Edition, 1948). Total bacterial counts were also determined according to standard methods, with the exception that agar plates were incubated at 28°C., in order to obtain a "true" total bacterial count of both psychrophilic and mesophilic types of microorganisms. Relative increases in bacterial counts were expressed as the slope of the curve of the logarithms of bacterial counts obtained at intervals within a period from 0 and 72 hours. This slope was determined by the method of least squares (2). The statistical significance of these experimental values was obtained by an analysis of variance (2).

This slope of the logarithm curve depicting the increase in the bacterial count is simply a means of expressing the rate of increase in the bacterial numbers during an experiment. If the bacterial quality is varied on changing blend temperature, this meas-

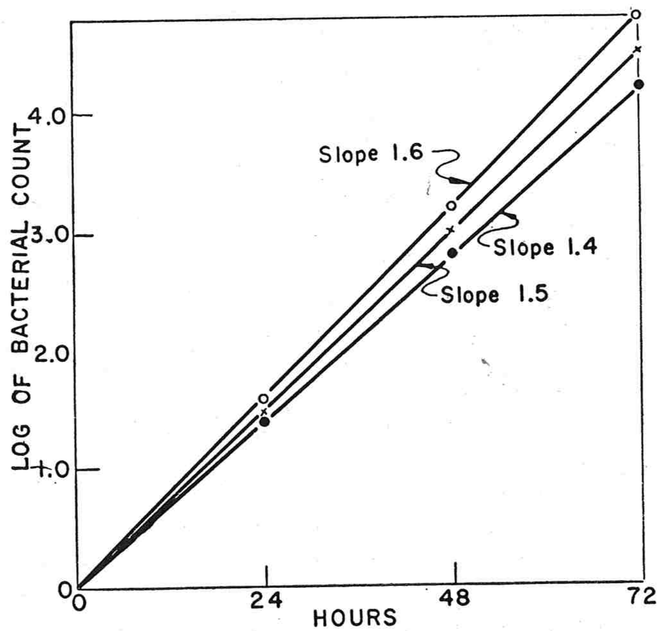

Figure 1. Illustration of how the increase in bacterial growth is expressed as the slope of the logarithm curve.

Table 1 — Relationship Between the Increase in the Total Bacterial Count and the Slope of the Log Curve of Total Bacterial Count

Blend temperature	Total bacterial count at time (in hours) 0	24	48	72	Log. of total bacteria at time (in hours) 0	24	48	72	Slope of log. curve of bacterial count
40	179,000	185,000	210,000	610,000	5.26	5.27	5.32	5.79	
	167,000	215,000	270,000	590,000	5.23	5.33	5.43	5.77	2.38
50	218,000	390,000	310,000	450,000	5.33	5.59	5.49	5.65	
	242,000	390,000	350,000	510,000	5.38	5.59	5.54	5.70	2.41
60	210,000	350,000	340,000	460,000	5.32	5.54	5.53	5.66	
	205,000	310,000	360,000	470,000	5.31	5.49	5.56	5.67	2.41

TABLE 2 — THE COMPARATIVE EFFECT OF BLEND TEMPERATURE OF 40°, 50° AND 60°F. ON THE BACTERIAL COUNT

	Rate of increase in bacterial counts (Expressed as slope of log. curve of bacterial count)								
	For total bacteria at blend temperatures of			For thermoduric count at blend temperatures of			For psychrophilic bacteria at blend temperatures of		
Run No.	40°F.	50°F.	60°F.	40°F.	50°F.	60°F.	40°F.	50°F.	60°F.
1	1.60	1.61	1.65	0.93	0.86	0.90	0.78	0.85	0.83
2				1.18	1.12	1.13	2.11	2.18	2.18
3				0.93	0.74	0.83			
4	1.23	1.52	1.74	0.80	0.75	0.76	1.37	1.44	1.78
5	2.86	2.98	2.96	1.19	1.32	1.30	2.72	2.74	2.66
6	2.38	2.41	2.41	1.51	1.45	1.47	2.19	2.26	2.21
7	1.64	1.59	1.56	0.94	0.88	0.95	1.43	1.44	1.43
8	2.45	2.42	2.43	1.37	1.33	1.33	2.26	2.38	2.40
9	2.08	2.08	2.07	1.08	0.98	1.10	1.89	1.82	1.82
10	2.20	2.24	2.25	1.30	1.28	1.31	2.28	2.19	2.26
11	2.23	2.73	2.15	1.18	1.19	1.21	2.07	2.09	2.08
12	2.01	2.05	1.95	1.15	0.81	0.90	1.99	2.00	2.10
13	2.60	2.88	2.50	1.38	1.48	1.29	2.03	2.15	2.00
14	2.50	2.42	2.48	1.17	1.12	1.18	2.38	2.48	2.42
15	2.34	2.34	2.40	1.52	1.47	1.49	2.42	2.44	2.44
16	2.75	2.90	2.80	1.99	2.18	2.13	2.78	2.92	2.89
17	2.36	2.32	2.44	1.73	1.72	1.74	2.33	2.36	2.40
Mean	2.215	2.299	2.252	1.255	1.216	1.236	2.064	2.108	2.118

urement will be a better gauge of this effect than total final bacterial counts, since total bacterial counts vary widely from farm to farm. In Table 1 is listed the actual log of bacterial counts at various time intervals for one farm of this study in order to better illustrate the relationship of the increasing bacterial count to the expression of the slope of the logarithm curve. Figure 1 is a graphic attempt to illustrate what is expressed by the slope of the curves plotted from the logarithms of the bacterial counts. The curves in this figure were arbitrarily chosen to show that changes of one-tenth of a unit in slope value are relatively small. The times of sampling and the method of plotting the rates of increase in bacterial numbers did not take into consideration any initial lag in the bacterial growth following the blending of milk samples. However, this omission appeared to be of little consequence since the rate of increase in the logarithm of bacterial numbers in the various experiments was essentially linear, which indicated that the lag was relatively insignificant.

In a final phase of this study every-other-day pickup was simulated and its influence on bacterial counts was studied. Procedures which simulated every-

TABLE 3 — THE COMPARATIVE EFFECT OF BLEND TEMPERATURES OF 40°, 60° AND 70°F. ON THE BACTERIAL COUNT

	Rate of increase in bacterial counts (Expressed as slope of log. curve of bacterial count)								
	For total bacteria at blend temperature of			For thermoduric bacteria at blend temperature of			For psychrophilic bacteria at blend temperature of		
Farm No.	40°F.	60°F.	70°F.	40°F.	60°F.	70°F.	40°F.	60°F.	70°F.
18	1.84	2.12	2.20	1.28	1.54	1.45	1.67	1.75	1.67
19	2.74	2.69	2.93	0.95	0.97	1.02	2.52	2.47	2.63
20	2.82	2.80	2.95	1.35	1.38	1.38	2.94	3.00	2.96
21	2.62	2.77	2.50	1.05	1.04	1.02	2.49	2.42	2.42
22	2.12	2.02	2.35	1.03	1.05	1.04	2.02	1.88	2.00
23	2.59	2.50	2.52	1.09	1.10	1.07	2.24	2.24	2.45
24	2.48	2.65	2.45	1.35	1.28	1.40	2.54	2.52	2.40
25	2.75	2.81	2.94	1.79	1.78	1.62	2.58	2.78	2.96
26	1.95	2.07	2.30	1.68	1.66	1.73	2.19	2.28	2.35
27	2.55	2.56	2.80	0.92	1.22	1.05	2.39	2.34	2.74
28	2.05	2.25	2.29	1.54	1.58	1.51	2.13	2.00	2.02
29	2.40	2.38	2.44	1.80	1.74	1.71	2.57	2.54	2.52
30	2.42	2.56	2.70	1.27	1.15	1.19	2.39	2.39	2.50
31	1.79	1.88	1.90	1.21	1.13	1.18	1.58	1.67	1.64
33	2.96	2.96	2.98	0.97	0.97	1.02	2.85	2.87	2.93
Mean	2.405	2.468	2.550	1.285	1.306	1.292	2.34	2.34	2.41

TABLE 4 — THE INFLUENCE OF BLEND TEMPERATURE ON THE RATE OF BACTERIAL INCREASE WITH SIMULATED EVERY-OTHER-DAY PICK-UP

Run No.	Rate of increase in bacterial counts (Expressed as slope of log. curve of bacterial count) For total bacteria at blend temperatures of				For thermoduric bacteria at blend temperatures of				For psychrophilic bacteria at blend temperatures of			
	40°F.	50°F.	60°F.	70°F.	40°F.	50°F.	60°F.	70°F.	40°F.	50°F.	60°F.	70°F.
32	2.17	2.29	2.24	2.35	0.95	0.95	0.91	0.92	2.15	2.22	2.26	2.39
34	1.75	1.64	1.67	1.87	0.99	0.98	1.00	1.02	1.79	1.80	1.79	1.88
35	1.30	1.48	1.49	1.50	0.93	0.94	0.93	0.95	1.37	1.51	1.47	1.56
36	3.09	3.00	3.07	3.04	1.40	1.39	1.46	1.55	2.87	2.90	2.89	2.90
Mean	2.08	2.10	2.12	2.19	1.07	1.07	1.08	1.11	2.05	2.11	2.10	2.18

other-day pickup were described in the previous paper (3). Bacterial counts were made at 0, 24, 48 and 72 hour time periods.

RESULTS AND DISCUSSION

The results of studies of the relative effect of blend temperatures of 40°, 50° and 60°F. on total, thermoduric and psychrophilic bacterial counts are shown in Table 2. The mean values for the rate of increase in total bacterial count were 2.22, 2.30 and 2.25 at 40°, 50° and 60°F., respectively, whereas the rate of increase in the thermoduric count was considerably less having mean values of 1.26, 1.22 and 1.24 at the same respective blend temperatures as above. The increase in psychrophilic counts closely paralleled the total counts with means of 2.06, 2.11 and 2.12 at 40°, 50°, and 60°F., respectively. Since the differences in means at the varying blend temperatures were slight, the significance of these differences was analyzed statistically. A statistical study of these values by means of an analysis of variance showed that the differences in these values of increases in total, thermoduric and psychrophilic counts, with respect to blend temperatures, were no greater than that due to chance. However, this same analysis of variance showed a significant difference between farms, apparently indicating a marked difference in the types and numbers of bacterial flora encountered at various farms.

Since no significant difference in the various bacterial counts could be demonstrated between blend temperatures of 40°, 50° and 60°F., a second phase of this study was undertaken in which the effect of blend temperatures of 40°, 60° and 70°F. on bacterial count was undertaken. Table 3 illustrates the results of these latter experiments. The mean values for the rate of increase in bacteria at the respective temperatures of 40°, 60° and 70°F. were 2.41, 2.47, and 2.55 for the total count; 1.29, 1.31, and 1.29 for the thermoduric count and 2.34, 2.34, and 2.41 for the psychrophilic count. A statistical study of these values by means of an analysis of variance showed a slight but significant difference in the increase in total bacterial count with an increase in blend temperature from 60° to 70°F. With both the thermoduric and psychrophilic counts the differences in rate of increase with changing blend temperature were not significant. As found with the previous experiments in Table 2, increase in bacterial count when one increased the blend temperature from 40° to 60°F. was not statistically greater than one would expect due to chance variation.

The results shown in Tables 2 and 3 indicated that one could increase the blend temperature to 60°F. without significantly increasing the total, thermoduric or psychrophilic bacterial growth rates. However, on raising the blend temperature to 70°F. the over-all bacterial growth rates were slightly but significantly raised.

In the final phase of this study, every-other-day pickup was simulated. As shown in Table 4 the mean values for the rate of increase in total bacterial counts were 2.08, 2.10, 212 and 2.19 at respective temperatures of 40°, 50°, 60° and 70°F. The increase in thermoduric counts had mean values of 1.07, 1.07, 1.08 and 1.11 at 40°, 50°, 60° and 70°F., respectively. The means of the increase in the psychrophilic counts at the same respective temperatures were 2.05, 2.11, 2.10 and 2.18. A statistical analysis of the influence of the temperature on the rate of increase in these bacterial counts indicated that there was no significant increase in bacterial counts over and above that presumably due to chance with blend temperatures through 70°. Results shown in Table 3, which were obtained under conditions of everyday pickup, revealed that a significant rise in the rate of total bacterial increase occurred when the blend temperature was increased to 70°F. The failure to get this marked increase in bacterial growth rate under conditions of every-other-day pickup may indicate that the third and fourth additions of fresh milk inhibited to some extent the increase in bacterial numbers, as well as diluted the total bacterial population.

SUMMARY AND CONCLUSIONS

A study of the influence of blend temperature on milk quality indicated no significant difference in the bacterial growth rates, either total, thermoduric or psychrophilic between blend temperatures of 40°, 50°, or 60°F. When the blend temperature was increased to 70°F. a slight, but significant increase in the rate of total bacterial growth occurred.

Every-other-day pickup studies indicated no greater increases in the rate of bacterial multiplication than with everyday pickup.

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THE ACID DEGREE OF MILK OBTAINED WITH PIPELINE AND BUCKET MILKERS

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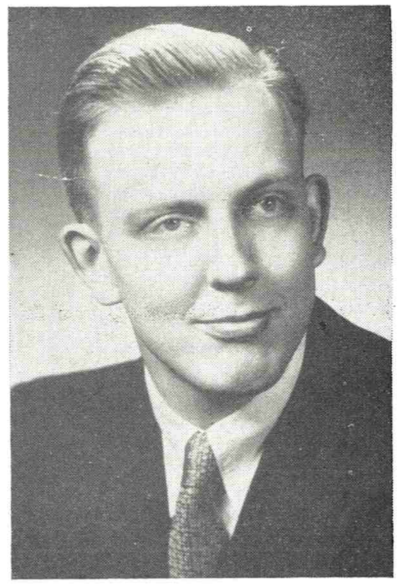
(Received for publication July 21, 1957)

Pipeline milking as compared to bucket milking increased the magnitude of the acid degree values (silica gel method) of milk samples. Passage of the milk through a diaphram pump further increased the acid degree values in some cases.

The increased incidence of hydrolytic rancidity in milk during recent years has been attributed in part to the expanded use of pipeline milkers (*1, 3, 4, 5, 6, 7*). However, there are few papers containing data on the differences in the acid degree values of milk obtained by pipeline and bucket milkers.

Rancidity is related to the acid degree value of milk, but according to Harper *et al.* (*2*) most methods for the determination of acid degree values have been either inaccurate or too lengthy or both. The silica gel method, of Harper *et al.*, used in this study appears to be quite satisfactory in these respects.

The purpose of this investigation was to measure, using an accurate and rapid method, the acid degree values of milk obtained by pipeline and bucket milkers.



R. G. Jensen was born and raised in Carthage, Missouri. He graduated from the University of Missouri in 1950 with the B.S. degree in Agriculture, in 1951 with the M.S. degree in Dairy Husbandry and in 1954 with the Ph. D. degree in Dairy Husbandry. Since then he has been an Instructor and Assistant Professor of Dairy Husbandry at the same institution and presently is an Assistant Professor of Dairy Manufacturing at the University of Connecticut.

PROCEDURE

In the University of Connecticut Dairy Barn there are two DeLaval pipelines (north and south), with no risers, terminating in one receiver jar, as shown in Figure 1. Milk was transferred from the jar to a bulk tank by means of a diaphragm pump. There were two sampling periods, July 9-16 and December 16-31, both in 1956. During both periods samples were taken from the milk of 17 cows on the north end and 10 on the south end. Bucket sampling was interspersed with pipeline sampling. In the summer sampling period 12 bucket milk samples (six A.M. and six P.M.) were obtained by taking an aliquot portion from each bucket before the milk was transferred to the bulk tank. Twelve samples of pipeline milk (six A.M. and six P.M.) were obtained by fastening a bottle to a milk valve in the line with an adapter and allowing the milk to drip into the bottle throughout the entire milking. The milk valve was placed immediately before the receiver jar. In the winter sampling period, 24 bucket (11 A.M. and 13 P.M.), and 24 pipeline (11 A.M. and 13 P.M.) milk samples were obtained in the same manner. In addition 24 samples of each type were taken by means of a drip sample from a milk valve installed after the diaphragm pump. Both the bucket and pipeline milks were transferred to a bulk tank by the use of this pump which was operated intermittently. However, the bucket milk was transferred directly into the pump by placing a rubber tube in the bucket after the milk was sampled.

The samples were cooled in ice water, placed in a cold room maintained at 4°C. and held for 72 hours. In the first sampling period acid degrees were determined at 0 and 72 hours. During the second sampling period all analyses were made 72 hours after sampling.

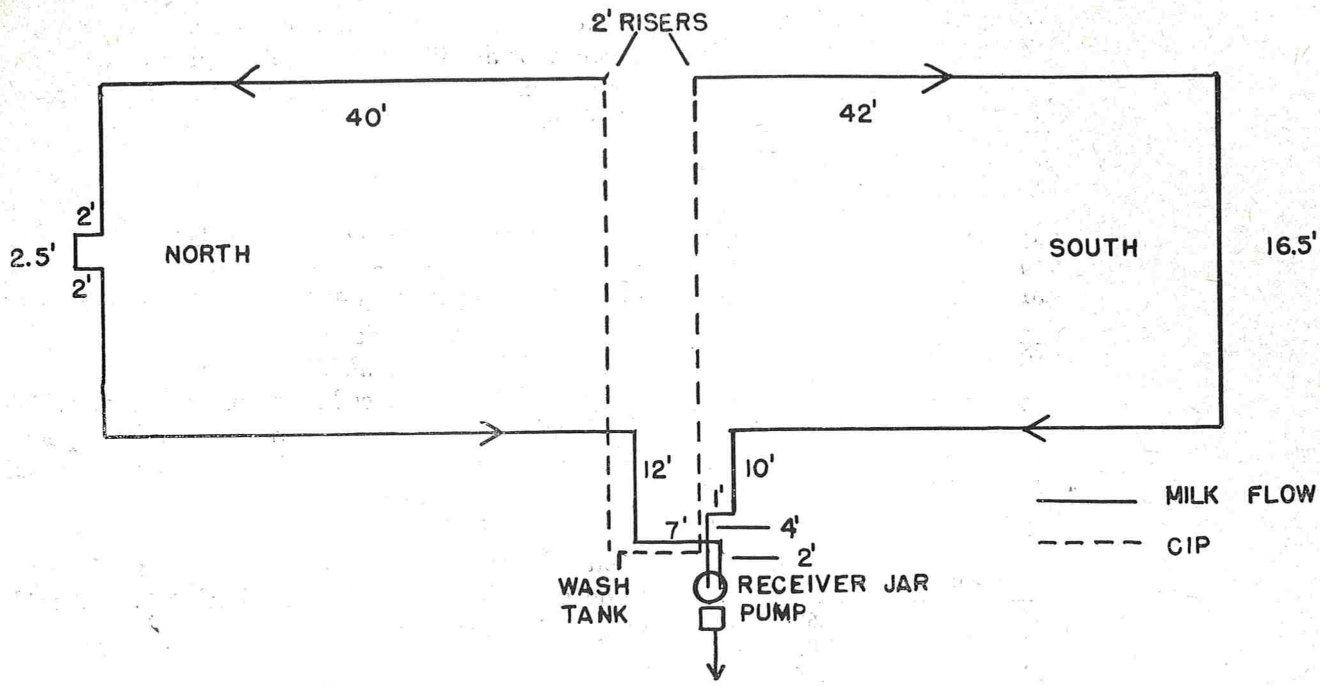


FIGURE I MILK PIPELINE DAIRY BARN UNIV. OF CONN.

The acid degree values were determined by the silica gel method of Harper *et al.*(2).

T tests (9) were run on the data to indicate whether the average acid degree value of the intermittently pumped milk samples (bucket and pipeline) was significantly different from that of the samples (bucket and pipeline) subjected to no pumping treatment, and whether the pipeline milk sample average value was significantly higher than the bucket milked sample average value.

Results and Discussion

The results of the summer sampling presented in Table 1, show that the acid degrees of most of the samples were increased only slightly by storage for 72 hours at 4°C, for this reason the acid degree determination on the 0 hour samples was omitted on the winter samples. Reference to Table 1 indicates that pipeline milk had significantly higher acid degree values than the bucket milk samples (P = <0.05).

The results from the winter sampling period are shown in Table 2. The milk obtained in this study by pipeline milkers had higher acid degree values than milk obtained by bucket milkers (P = <0.001). Because of the relationship between acid degree values and rancid flavor development, pipeline milk samples exhibiting the higher acid degree values might be expected to exhibit increased susceptibility to the development of rancid flavors. The results in Table 2 indicate that passage of the milk through a diaphragm pump actually increased the acid degree values of both sets of north samples (P = <0.01). The acid degree values of the south samples were lower than the acid degree values of the north samples and were not increased significantly by the pumping treatment.

As shown in Tables 1 and 2 the average acid degree values of the summer and winter bucket samples were remarkably similar. Pipeline treatment of milk did not increase the acid degree values of the summer

Table 1 — Acid Degree Values of Summer Milk Obtained by Bucket and Pipeline Milkers

	BUCKETS			
	North[a]		South[a]	
Date	0 hrs.	72 hrs.[b]	0 hrs.	72 hrs.[b]
July 9-P.M.	0.48	0.55	0.56	0.56
July 10-A.M.	0.68	0.71	0.61	0.68
July 10-P.M.	0.71	0.78	0.60	0.73
July 11-A.M.	0.38	0.67	0.26	0.63
July 14-P.M.	0.40	0.50	0.42	0.50
July 15-A.M.	0.39	0.46	0.40	0.61
Average	0.51	0.61	0.48	0.62
	PIPELINE			
July 11-P.M.	0.63	0.79	0.62	0.79
July 12-A.M.	0.63	0.84	0.64	0.72
July 12-P.M.	0.73	0.79	0.73	0.77
July 13-A.M.	0.63	0.64	0.43	0.54
July 15-P.M.	0.62	1.29	0.56	0.82
July 16-A.M.	0.87	0.89	0.75	0.85
Average	0.69	0.87	0.62	0.75

[a]North and south refer to ends of the barn.
[b]Analyses made after 72 hrs. at 4°C.

TABLE 2 — ACID DEGREE VALUES OF WINTER MILK OBTAINED BY BUCKET AND PIPELINE MILKERS AFTER 72 HOURS OF STORAGE AT 4°C.

Date	North[a] Before pump	North[a] After pump	South[a] Before pump	South[a] After pump
BUCKET				
Dec. 16-P.M.	1.16	0.89	0.60	0.77
Dec. 17-A.M.	0.87	1.28	0.99	1.02
Dec. 18-P.M.	0.89	0.90	0.60	0.68
Dec. 19-A.M.	0.51	0.91	0.44	0.63
Dec. 20-P.M.	0.80	0.97	0.44	0.33
Dec. 23-A.M.	0.85	0.82	0.40	0.45
Dec. 24-P.M.	0.77	0.88	0.61	0.54
Dec. 26-A.M.	0.60	0.78	0.63	0.55
Dec. 27-P.M.	0.64	0.74	0.35	0.32
Dec. 28-A.M.	0.74	1.22	0.62	0.51
Dec. 28-P.M.	0.74	0.93	0.60	0.66
Dec. 29-A.M.	0.63	0.81	0.52	0.46
Average	0.76	0.93	0.57	0.58
PIPELINE				
Dec. 15-P.M.	1.37	1.49	1.60	1.53
Dec. 17-P.M.	1.24	1.69	1.64	1.60
Dec. 18-A.M.	1.62	1.78	1.15	1.19
Dec. 19-P.M.	1.40	1.73	1.31	1.00
Dec. 20-A.M.	1.48	2.46	1.63	1.82
Dec. 23-P.M.	1.00	2.02[b]	1.00	0.92
Dec. 24-A.M.	1.22	1.26	0.64	0.85
Dec. 26-P.M.	1.28	1.58	0.93	1.30
Dec. 27-A.M.	1.28	1.69	0.88	1.39
Dec. 30-A.M.	1.10	1.35	0.99	1.07
Dec. 30-P.M.	1.17	1.40	1.03	0.77
Dec. 31-P.M.	1.53	1.35	1.32	1.31
Average	1.31	1.65	1.18	1.23

[a]Refers to ends of the barn.
[b]This sample tasted rancid.

samples to a great extent, but it did markedly increase the acid degree values of the winter samples. One of the factors to which the increase in acid degree of the winter samples might be attributed was undoubtedly differences in the operation of the two pipelines. Another factor might have been related to feed and stage of lactation. Tarassuk and Henderson (8) stated that cows late in lactation and on dry feed might produce lipolytically active milk. Thus the fact that the cows in this study were on dry feed and 5 of them had been milked 10 months or longer in the winter sampling period may offer a possible explanation. These five late lactating cows were located on the north pipeline which may possibly account for the difference in acid degree values of the winter samples (Table 2) from the north and south pipeline.

SUMMARY

Milk samples obtained from bucket and pipeline milking systems during July and December were held for 72 hours at 4°C. and the acid degree values of milk samples were determined by the silica gel method of Harper *et al.*(2).

Although the pipelines had no risers through which the milk flowed and no observable air leaks, pipeline treatment as compared to bucket treatment increased the acid degree values of the milk samples.

Passage of the milk through an intermittently operated diaphragm pump increased the acid degree value of both the pipeline and bucket treated milk samples in some cases.

ACKNOWLEDGMENT

The authors wish to acknowledge the financial aid provided by the DeLaval Separator Company, Poughkeepsie, New York.

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NEWS AND EVENTS

IOWANS CHARTER BUS TO ATTEND 44TH ANNUAL MEETING — LOUISVILLE

When the Iowa affiliate decides to do something, they do it together. To attend the 44th annual meeting at Louisville, they chartered a bus out of Cedar Rapids. They had a barrel of fun and lots of good fellowship. Best of all they loyally supported the annual meeting, twenty-three strong. We hope our Iowa friends will do this same thing again and that their experience will encourage other affiliates to plan a trip to the annual meeting together. This is one way to beat the high cost of transportation. Our hats off to the Iowa delagation!

Iowa delegation loading at Cedar Rapids for trip to annual meeting, Louisville

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PAPERS PRESENTED AT AFFILIATE ASSOCIATION MEETINGS

Editorial Note: The following listing of subjects presented at meetings of Affiliate Associations is provided as a service to the Association membership. Anyone who desires information on any subject is encouraged to write to the Secretary of the Affiliate Association concerned for the address of the speaker. Information desired then may be requested from the speaker (a copy of the paper presented may be available for the asking).

South Dakota Association of Sanitarians
(Annual Meeting and Short Course June 10-14, 1957)
Robert P. Hayward, *Sec.-Treas.*, State Dept. of Health, Pierre, So. Dak.

Great Expectations. J. W. Kaye
Revisions of Appendix 'F'. N. J. Stromstad
A Discussion of C.I.P. Farm Systems. H. E. Eagan
Plumbing in Eating and Drinking Establishments. Frank Kohler
Public Relations and Public Health. Bill Dixon
Official Sampling of Bulk Tanks. M. E. Held
Summary – Intra-Regional Milk Seminar. Charles Halloran and Milt Held.
Legislative Changes – 1957. Charles E. Carl
Indian Health Service Program. George Amundson
New Story on Dishwashing. Armin A. Roth
Pollen Counting Program. Johannah Wulf

New York State Association of Milk Sanitarians
(Thirty-fourth annual conference and Fifth joint conference with the 13th Cornell University Dairy Industry Conference September 9, 10, 11, 1957)

Mr. R. P. March, Sec.-Treas., Dept. of Dairy Industry, Cornell University, Ithaca, N.Y.

Fats, Fads and the Diet. Dr. D. H. Jacobsen
Trends and Developments in the Dairy Industry. Dr. C. R. Roberts
One Hundredth Anniversary of Bordens. William Baulkwill
Insecticides and Pesticides. Dr. H. H. Schwardt
Antibiotics. Dr. Frank V. Kosikowski
The Therapeutic Value of Antibiotics Used Promiscuously to Treat Bovine Mastitis. J. S. Taylor
Extension Problems in Milk Quality. Dr. James C. White
Care and Maintenance of Farm Bulk Tanks. Richard P. March
The Application of Vacuum-Steam Distillation Equipment for Flavor Standardization in Fluid Milk and Cream Operations. Dr. W. M. Roberts
The Use of Plastics in the Milk and Dairy Industry. Dr. D. F. Siddall
Sanitary Milk Regulation and Trade Barriers. Dr. Arthur C. Dahlberg
Filtration of Milk on the Farm. Dr. Clyde L. Kern
Sediment Testing in Farm Tank Milk and Other Bulk Supplies. Michael Roman
Experience in Control of Off Flavors and Odors in Milk. Milford R. Juckett
Barn Ventilation in the Control of Off Flavors. W. A. Dodge
A New Approach in the Investigation of Staphylococcal Food-Borne Outbreaks. Alex F. Clinton
Supervision of the Salvage of Food and Drugs Damaged by Fire, Flood and Explosion. Allen T. Retzlaff
Bacterial Aspects in the Holding of Foods Prepared in Quantity. Dr. Karla Longres and Dr. J. C. White
Cleaning of Milk Handling Equipment on the Farm. Dr. W. E. Parks
Reducing Labor Costs and Cutting the Drudgery Out of Dairying. *C. H. Worley*

Oregon Association of Milk and Food Sanitarians
(Association Meeting June 18, 1957)

Mr. Ellis Rockleff, *Sec.-Treas.*, Office of Meat and Milk Inspector, City of Eugene, Ore.

Trouble Shooting Farm Water Supply Quality Problems. H. C. Clare

Pennsylvania Dairy Sanitarians Association
(Fourth Annual Meeting July 11, 1957)

Bulk Tank Sediment Research. Michael Roman
3A and National Conference Interstate Milk Shipment - Development. I. E. Parkin

Indiana Association of Milk and Food Sanitarians
(Seventh Annual Meeting June 4, 5, 6, 1957)
Mr. Karl K. Jones, *Sec.-Treas.*, 1330 W. Michigan St., Indianapolis, Ind.

Controlling Special Food Services:
Churches, Clubs and Caterers. G. D. Elliott

Mobile Food Units. Siegel Osborn
Itinerant Food Stands. James Collins
Construction and Servicing of Food Vending Units:
Construction Requirements. Sam H. Hopper
Food Vending. J. Richard Howard
Controlling Special Food Services:
Controlling the Rodent Problem. Charles Richardson
Enforcement of Sec. II of 1953 Ordinance and Code (Inter and Intrastate Movement Of Milk. L. C. Peckham
Labeling of Milk and Milk Products. John Taylor
Automation in the Dairy Industry. Dale Seiberling
Common Sense Program for Production of Quality Milk. B. E. Horrall and E. E. Kihlstrum
Mastitis Control. F. A. Hall
The Dairy Industry and Environmental Sanitation in India. Dale Seiberling
Administration and Organization of an Effective General Sanitation Program. James H. McCoy and A. P. Bell

WASHINGTON MILK SANITARIANS ASSOCIATION

Mr. Frank Logan, *Sec.-Treas.*, Seattle-King County Health Dept., Public Safety Bldg., Seattle, Wash.
Antibiotics in Dairy Products. Arnold N. Morton
Sanitizers and Sterilizers. Dr. Spencer
Farm Bulk Milk Handling Problems. W. R. Knutzen

ASSOCIATED ILLINOIS MILK SANITARIANS

(Spring Conference June 13, 1957)

Mr. P. E. Riley, *Sec.-Treas.*, Dept. of Public Health, 1800 W. Fillmore St., Chicago, Ill.
Making a Dairy Farm Inspection. James A. Meany
Problems Involved in the Development of Suitable Plastics for the Dairy and Food Industry. Dr. D. F. Siddall
Milk Flavors – Good and Bad. Dr. Ernest O. Herreid
Some Experiences in Food Poisoning Investigations. Dr. Timothy J. King
Mastitis and Public Health. Dr. C. A. Brandly
Relation of Sanitation to Insect and Rodent Control. Emmet Champion

MISSOURI ASSOCIATION OF MILK AND FOOD SANITARIANS

(April 3, 1957)

John H. McCutchen, *Sec.-Treas.*, Mo. State Dept. of Health, Jefferson City, Mo.
Who's Telling Who? Phillip D. Johnson
Radioactive Fallout in Food. Ralph L. Spink
Food Preservation – Antibiotics:
Red Meats. George G. Kelly
Poultry Products. Orme J. Kahlenberg

RHODE ISLAND ASSOCIATION OF DAIRY AND FOOD SANITARIANS

(Spring Meeting May 15, 1957)

Dr. R. M. Parry, *Sec.-Treas.*, Box 22, Warwick, R. I.
Newer Developments in Dairy and Food Industry. Dr. W. S. Mueller
Corrosion of Equipment in the Food Industries. Charles Acuff

CONNECTICUT ASSOCIATION OF DAIRY AND FOOD SANITARIANS

(Dairy Flavors Symposium May 21, 22, 1957)

Mr. H. Clifford Goslee, *Sec.-Treas.*, 356 Palm St., Hartford, Conn.
The Problem. K. E. Geyer
The Cow and Management. V. A. Smith
The Udder to the Tank. R. G. Jensen
Flavor Improvement Panel:
The Producer's Responsibility. K. E. Geyer
Barn Ventilations. W. W. Irish
Preventing Rancidity. R. G. Jensen
Farm Bacterial Flavors. M. E. Morgan
Bulk Handling. W. M. Roberts
Proper Management. V. R. Smith
A Dealer's Viewpoint. L. E. Hall
The Tank to the Bottle. W. M. Roberts
The Container to the Consumer. H. L. Wildasin
Flavor Improvement Panel:
Flavor from Equipment. L. R. Glazier
Consumer Satisfaction. L. E. Hall
Massachusetts Flavor Program. D. J. Hankinson
Flavor Elimination. W. M. Roberts
Effects of Light. A. C. Smith
Flavor After Pasteurization. H. L. Wildasin
Flavor Identification. Patricia MacLeod

NEW METHOD OF STAPH. IDENTIFICATION DEVELOPED

A New York bacteriologist who introduced to this country a method of "fingerprinting" different strains of staphylococus bacteria has been selected to receive the 1957 Kimble Methodology Research Award, one of the nation's outstanding honors in the public health field.

The research pioneer is John E. Blair, Ph. D., bacteriologist at the Hospital for Joint Diseases, New York City, who was recognized for this achievement by being presented with the award at the Conference of State and Provincial Public Health Laboratory Directors held in Cleveland on November 11.

Dr. Blair's technique, now widely used in the United States, makes it possible for doctors and research scientists to determine the precise source of such staphylococcal infections as outbreaks of food poisoning, osteomyelitis, boils and carbuncles, pneumonia, meningitis and related diseases.

Dr. Blair's award-winning research stemmed from the discovery 40 years ago in France that there were viruses, called bacteriophages, which were noted to be highly selective in their action – a certain type would affect only a specific kind of bacteria, leaving others untouched.

It was this discovery which led a London scientist in 1945 to develop the idea of applying a variety of bacteriophage strains to a staphylococcus culture. By observing which strains were effective, it was possible to determine which type of 'staph' was present.

Dr. Blair was the first in this country to adopt the British technique, known as bacteriophage typing, and develop it for use in American laboratories. He became the principal source of supply in the U.S. for pure strains of bacteriophage now being used for typing in laboratories throughout the nation. His laboratory at the Hospital for Joint Diseases has been designated as the central reference laboratory for this work for the U.S.

By using Dr. Blair's adaptation of phage typing, scientists and public health officials can, for example, determine exactly who, or what, is responsible for an outbreak of food poisoning. By typing the precise strain of 'staph' causing the trouble, it is possible to break through the enormous amount of other strains which are often present and, much as a detective uses fingerprints, trace the staphylococcus back to its source, often a human carrier.

Dr. Blair's recognition came as the result of 25 years of research on the staphylococci, including ten years of work on phage typing. He is recognized as an international authority and has served as U.S. delegate to world-wide conferences on this subject. He has assisted in the establishment of regional laboratories for 'phage typing of staphylococci in this country.

A native of Monroe, Maine, Dr. Blair is a graduate of Clark University and holds a master's and doctoral degree from Brown University.

The Kimble Methodology Award consists of $1,000 and an engraved plaque. It is sponsored by the Kimble Glass Company, a subsidiary of Owens-Illinois Glass Company, to give recognition to outstanding contributors of improved procedures in the field of public health.

Q FEVER MILK STUDIES CALL FOR TEMPERATURE INCREASE FOR VAT PASTEURIZATION

Technical papers reporting results of joint University of California - Public Health Service Q Fever pasteurization research were published in October as Public Health Monograph 47. The Monograph reviews the findings of an extensive study of the servival of *C. burnetti,* the causative organism of Q fever, in relation to milk pasteurization.

One of the significant conclusions from results of the study was, "The minimum recommended standard for pasteurization of milk at 143 degrees F for 30 minutes was inadequate to eliminate all the viable rickettsiae from cow's milk. However heating milk for 30 minutes at 145 degrees F would accomplish this. Results of the study strongly supported as adequate the minimum recommended standard for pasteurization of milk at 161 degrees F for 15 seconds."

A limited number of free copies of Monograph 47 are available to official agencies and others directly concerned on specific request to the Public Inquiries Board, U.S. Public Health Service, Washington 25, D.C. Quantity orders should be placed with the Supt. of Documents, Government Printing Office, Washington, D.C. Single copies from GPO, 25 cents.

CONNECTICUT ASSOCIATION SPONSORS "CAREER DAY"

The Connecticut Association of Dairy and Food Sanitarians in cooperation with the local dairy and food industries recently sponsored a "Career Day" at the University of Connecticut. Some fifty high school students enjoyed lectures and tours and then attended the University of Connecticut - University of New Hampshire football game.

The Association sponsors two annual scholarships at the University through the College of Agriculture and these were awarded to two successful candidates. This is a fine project and the Connecticut affiliate is to be congratulated.

Their 33rd annual meeting will be held at the Waverly Inn, Cheshire, Conn., January 14, 1958.

NATIONAL FOOD CONFERENCE ANNOUNCED

The White House has announced that President Dwight D. Eisenhower has accepted the invitation of the nation's major farm and food organizations to address the National Food Conference in Washington on February 24, 1958. The conference will bring together leaders of American agriculture, industry and education "to consider the vital role of food in the life of the family and the nation".

The National Food Conference is being organized as a public service by private enterprise groups representing every phase of the food industry - farmer, processor, distributor and merchandiser. A cross section of America's opinion leaders - physicians, nutritionists, educators, industrialists and representatives of leading voluntary groups - will be among those invited to consider the role of food in every aspect of national life.

Invited participants will be addressed by the President at the opening breakfast at the Statler Hotel. Following this, health authorities will report on the latest findings in nutrition research, industrialists will discuss the contribution of food to the national economy, and physicians, educators and experts in family living will explore the role of food in the varied aspects of American life.

Charles B. Shuman, President of the American Farm Bureau Federation, has been named General Chairman of the all-industry sponsoring group. In announcing the Conference plan, he said, "The National Food Conference will be the most important food event of 1958. It will offer full sweep to all variety of opinion on the consumption of food in the United States in order to contribute to general public knowledge on the most important element to our life and health - the food we eat."

GEORGIA CHAPTER PRESENTS AWARDS

Recipients of the outstanding milk and food sanitarians award in Georgia for 1957. Awards consisted of $50.00 checks, citations and plaques.

From left to right: Carl Williams, President, Georgia Chapter, IAMFS; Eucle George, Perry, Ga., outstanding food sanitarian; William Weaver, Columbus, Ga., outstanding milk sanitarian; H. W. Anderson, Atlanta, chairman of the awards committee.

ASSOCIATED ILLINOIS MILK SANITARIANS HOLD 15th ANNUAL MEETING

The Associated Illinois Milk Sanitarians celebrated its 15th Anniversary this year by holding its Fall Conference and Annual Business Meeting at the Conrad Hilton Hotel, Chicago, on Monday, December 16, 1957. The conference program was attractively diversified to interest all members.

New and Potential Reservoirs of Food-Borne Disease Outbreaks. L. C. Peckham, Regional Milk and Food Consultant, U. S. Public Health Service - Chicago

Wisconsin's New Sanitarians' Registration Law. Rob't. M. Keown, Milk Sanitarian, Inter-City Milk Control, Elkhorn, Wis.

What Is The Correlation Between High Protein Diets and Mastitis. Dr. Karl E. Gardner, Professor, University of Illinois, Champaign

Luncheon and Annual Business Meeting.

Grade A Fieldwork — It's Importance and Responsibility. Louis A. Zaradka, General Manager, Falls Cities Co-op, Milk Producers Assoc., Louisville, Ky.

The Grade A Program — Observations And Plans At State Level. Dr. L. R. Davenport, Deputy Direstor, Illinois Department of Public Health, Springfield.

HELPFUL INFORMATION

Editorial Note: Listed below are sources of information on a variety of subjects. Requests for any of the material listed should be sent by letter or postcard to the source indicated.

Methods and Standards for the Production of Certified Milk - 1956 Edition. Available from The American Assoc. of Medical Milk Commissions, Inc., 405 Lexington Ave., New York, N.Y.

Blackhead of Turkeys and Chickens-How to Control It. Bulletin. Available from Supt. of Documents, Washington, D. C. Price 10 cents.

Recommendations for the Production of Peas. Cornell Ext. Bulletin No. 942. Available from Agric. Bulletin Room, Cornell University, Ithaca, N. Y.

Insect Control in 1957. Circular No. 520. Available from Bulletin Room, College of Agric., University of Wisconsin, Madison, Wisc.

Design for Better Beef. Movie about Aureomycin for cattle. Available from American Cyanamid Co., Farm and Home Div., Room 1220, 30 Rockafeller Plaza, New York, N. Y.

Bulk Milk Tanks on Ohio Farms. Research Bulletin 776. Ohio Agric. Expt. Sta., Wooster, Ohio.

Advances in Food Research. Book. Vol. 7. 404 pages. Available from Academic Press, 111 Fifth Ave., New York, N. Y. Price $9.50.

A Study of Plastic Pipe for Potable Water Supplies. Report. 90 pages. Available from National Sanitation Foundation, School of Public Health, University of Michigan, Ann Arbor, Mich. Price $1.00.

The Freezing Preservation of Foods. Book by D. K. Tressler and C. F. Evers. 3rd ed. Vol. 1, Freezing of Fresh Foods. 1240 pages. Price $18.00: Vol. 2, Freezing of Precooked and Prepared Foods. 550 pages. Price $10.00.

The National Poultry and Turkey Improvement Plans and Auxiliary Provisions. Bulletin. 34 pages. Available from Supt. of Documents, Washington, D. C. Price 20 cents.

Sterilization in Food Technology. Book by C. O. Ball and F. Olson. 653 pages. Available from McGraw-Hill Book Co., 330 W. 42nd St., New York, N. Y.. Price $16.00.

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RESEARCH ASSOCIATE

The Department of Microbiology and Public Health at Michigan State University E. Lansing has an opening for a full-time research associate to take charge of a research project involving cleaning and sanitation of dairy equipment. A Ph. D. is desirable but an M. S. or B. S. will be considered; the latter may take some course work toward an advanced degree. A background in bacteriology is required; dairy training would also be helpful. Salary is open and dependent on qualifications.

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Sample of Experiment Station publication citation: Watrous, G. H., Doan, F. J. and Josephson, D. V. Some Bacteriological Studies on Refrigerated Milk and Cream. Penn. Agr. Exp. Sta. Bull. 551. 1952.

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