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Editorials

The opinions and ideas expressed in papers and editorials are those of the respective authors. The expressions of the Association are completely recorded in its transactions.

How Can Our Association Best Serve?

OUR Association, founded in 1911, is now going into the second generation of milk inspectors. The charter members who founded the Association are getting scarce. Now, any organization that has carried on for 35 years through two World Wars, one depression and the exuberant Twenties must have something or else it, like many other organizations, would have long since folded up. We believe that for the past three and a half decades the life blood of the Association has been the free exchange of ideas amongst a widely scattered membership during the formative period of milk sanitation. It was soon found that one of the most effective methods of disseminating the latest and best in milk sanitation was the annual meeting where were discussed the successes and failures of new methods, and technics. It should be remembered that it was during this time in which practically all the dairy equipment and the sanitary procedures which we have at present were evolved. For example, it was not until 1910 when the first Report of the Committee on Standard Methods for the bacterial examination was printed. So it can readily be seen that our Association is really a pioneer in dairy sanitation with a long and honorable history of achievement.

However, let us not rest on past performances but let us look to the future and see how we can best serve so that the next 35 years will be as fruitful as the past have been. There are four ways which at present need the wholehearted support and the backing of the Association.

1. *Get back of the unifying and codifying of all rules and regulations pertaining to farm inspection so that we shall present a united front.* Find the best known way of doing things and do them that way until science shows a better way. This will require that certain inspectors discard their non-cooperative attitude, their pet schemes, their bullheadedness, and their traditional methods in favor of better and more scientific ones.

2. *Standardize dairy plant procedures throughout the country to do away with confusion.* There is not such a great difference in the machinery or the set up of the machinery in the plants but that it would be possible to standardize

the necessary sanitary requirements under which dairy products shall be produced. We have made fine progress in standardizing dairy equipment, let us go one step further and see that dairy products are produced under minimum sanitary requirements such as clean machinery, sanitary floors, adequate lighting, ventilation, washrooms, toilets, etc. Let us be more specific. For example, instead of "adequate lighting", let us say at least five foot-candles for halls, runways and 15 foot-candles for manufacturing operations, etc. Likewise for all the rest of the terms, instead of using generalized terms give specific minimum requirements.

3. *Outline a minimum course in dairy sanitation to be taught to all dairy plant operators.* There is plenty of subject matter and a great need for the knowledge among dairy operators. They would welcome the opportunity. The employer should be willing to bear a part or all of the cost. Make all dairy inspectors take the same course as the operators. They would then understand each other perfectly and there would be no alibis.

4. *Foster laws for the licensing of milk plant operators.* If we would educate and license our milk plant operators, we would elevate them to a professional status. Properly done and controlled, it would insure more sanitary dairy products because they would be handled by more intelligent workers. Ignorance of sanitation produces not only an inferior product, but also a potentially dangerous one.

F. W. F.

There Is Only One Standard In Sanitation—The Best

SANITATION is a harsh master. Anything short of the best is potentially dangerous. From the standpoint of quality, we frequently have several grades. From the standpoint of sanitation, there can be but one grade—SAFE. Classifying milk into two or three different grades has always seemed foolish, if not down right dangerous. New York City took a step in the right direction by establishing one grade of milk for human consumption. Other cities should emulate here and have but one grade of milk instead of several as is so frequently the case. The milk producer and the sanitarian should get it firmly fixed in their minds that there is only one class of milk—THE BEST.

For example, suppose it were necessary for you to have a major operation, say appendicitis, and you called a surgeon to operate. In discussing the operation, he informed you that he had three classes of service. A first class service in which he sterilized all instruments, bandages, sutures, thoroughly washed his hands, and used sterile gloves in the operation. With this type of service you were practically certain of living. A second class of service in which the sterilizing of instruments, bandages, sutures, and other materials was uncertain and not guaranteed. If he had the time, he would do a good job of "cutting and sewing" but if he were rushed, you would have to take what you got. Your chances with this type of operation, he thought, would be about 50–50. Finally, a third type in which nothing was sterilized or guaranteed (about the same conditions that prevailed 75 years ago) and that if you were lucky you would live, but the majority died. There is no question as to the class of service you would choose. Likewise in the dairy industry there should be no question as to the type of dairy products that should be produced at all times. There should be but one grade—SAFE, but one class of product—THE BEST.

F. W. F.

Retrospective and Prospective

YEARS ago someone who was asked how he had liked a certain speaker said: "Well, he rumbled and rambled but, at that, it wasn't so bad." So, if the following lines seem to rumble and ramble, it is hoped that JOURNAL readers may still find something of interest in them.

The writer is just completing twenty years of membership in the International Association of Milk Sanitarians and thirty years of service with a State health department, from the latter of which he is about to retire. In reminiscence of the past he still is looking to the future.

Twenty years ago the Association was relatively small, having a membership under two hundred. It was made up wholly of people interested in milk sanitation, most of them actually working at it. There was an evident and very apparent community of interest. Evening sessions were held and programs were, at times, too full for comfort. But members were in their seats on the dot, stayed until the last gavel fell and discussion never languished. The enthusiasm was contagious and, of all the organization meetings which the writer had occasion to attend, these were the most interesting and inspiring.

The "king-pin" of the Association, in those early days, was Ivan C. Weld. He was the first secretary-treasurer of the Association and served until his death, in 1929. A year or two later the writer was drafted to take over. He was a man of high character and ideals, whose * "Practical experience with both men and methods, . . . tact and kindliness, patience, thoroughness, and tenacity of purpose" made him outstanding.

There were others who made important contributions to the success of the Association then, and there have been many since. Nevertheless, it is not too much to say that the younger members of the Association have missed something in not having known Ivan C. Weld. He was a leader among the pioneers who established the Association on a substantial foundation. They started it on its way to becoming what it is today: the greatest and most influential organization in its field.

By 1936 the Association, originally "Dairy and Milk Inspectors", had become the International Association of Milk Sanitarians. That change came about only after a great deal of very active discussion. As was only natural, some of the older members were reluctant to depart from a cherished tradition. Ultimately they agreed that the term "Milk Sanitarians" was more comprehensive and descriptive and, possibly, more dignified. The idea "took", as evidenced by the present names of some of the local associations. A rose by another name may smell no sweeter but it may look better in the catalogue.

The creation of the JOURNAL marked another and by all means the most important epoch in the later history of the Association. This accomplishment, as is well known, was the culmination of the persistent and seemingly tireless efforts of two men, William B. Palmer and Dr. James H. Shrader. They long insisted and finally demonstrated that it could be done. Largely as a result of successful publication of the JOURNAL the Association, as they predicted, has grown vastly both in size and in prestige. The next step, by the way, so far as the JOURNAL is concerned, should be to monthly publication. Its one serious defect is that it doesn't come often enough.

* From memorial address by William H. Price.

Growth of the Association in membership and prestige has brought new responsibilities. For many years it was its policy not to attempt to set standards. This policy was gradually relaxed when it became apparent, a few years ago, that the studies being made by the then existing Committee on Milk Plant Equipment (subsequently merged, apparently, in the Committee on Sanitary Procedure) were having the highly desirable effect of setting reliable standards likely to be generally accepted. The work of the Committee to Study Milk Ordinances and Regulations was a step in the same direction.

Because the Association is the best-known and most outstanding organization of its kind in the world, already including in its membership most of the authorities in its special field, the writer is firmly of the opinion that the responsibility for developing standards, where new standards are needed, is one which it should accept and assume.

The American Public Health Association, through its Committee on Standard Methods of Analysis of Dairy Products, under the able leadership of Dr. Breed, did pioneer work and its standards, today, are generally accepted and, often, legally adopted. But it is only a matter of time before Dr. Breed and his fellow pioneers, like other old-timers, will be retiring. The Laboratory Section of the American Public Health Association has a variety of interests in the laboratory field. The International Association of Milk Sanitarians has but one interest. It specializes on milk. When the time comes for changes, the American Public Health Association should seriously consider transferring this responsibility to the organization now best equipped to assume it. This is the opinion of the writer. "The expressions of the Association are completely recorded in its transactions."

One more "last word". Although the membership of the Association is, today, at least ten times that of twenty years ago, it still is an organization of milk sanitarians. The largest factor in its strength and vitality is its community of interest. Distinguished members have suggested that it should become an association of milk *and food* sanitarians. It should beware of Delilahs approaching with shears.

P. B. B.

The Use of Milk Solids Formulae in the Detection of Watered and Skimmed Milks

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A RECENT report [1] suggests that formulae for the calculation of total solids in milk from fat test results and specific gravity readings are not sufficiently accurate for legal grading of milk and implies that such formulae have little value for use in an official control laboratory. Because certain discrepancies appear to have been made in that report and because experience in the Bureau of Laboratories of the Connecticut State Department of Health has been otherwise, a presentation of some of our work is offered.

Numerous formulae for the determination of milk solids have been used by different investigators with varying reported results. Among these, Babcock's formula,[2] Babcock's short formula,[3] and Richmond's formula [2] are probably in widest use. Wiggers [1] also made use of Davis' modification [4] of Hawley's formula.

Laboratories performing a large number of examinations of milk samples can and do facilitate operations by applying such formulae to routine examinations to determine the necessity for carrying out further tests for watering or skimming. The methods used in the Bureau of Laboratories of the Connecticut State Department of Health are described below.

METHODS OF TESTING

In any laboratory, accuracy of results is essential. Accuracy is especially demanded of a laboratory responsible for results which may be used in court cases. To assure accuracy in this Bureau a series of checks is used.

Fat tests on all milks not meeting legal standards are run in duplicate by the Babcock test performed by licensed operators. The accuracy of results obtained by the Babcock test is checked at intervals by the Mojonnier method. The specific gravity is determined by means of a Quevenne lactometer. Whenever a new lactometer is put into use it is checked against the Westphal balance. The temperature of the milk at the time of making the lactometer reading is determined by a thermometer which has been checked against a standard thermometer. If the presence of water is indicated, the freezing point is determined with the cryoscope and the refraction is obtained on the milk serum using the copper sulphate method. As an additional check, sour serum refraction and sour serum ash are frequently determined. If skimming is suggested, the percentage of protein in the milk is determined by the Kjeldahl method and the result used to determine the protein-fat ratio. Total solids are run by the Mojonnier method on all milks suspected of being watered or skimmed.

All methods mentioned above with the exception of the test for total solids are those defined in Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemistry, 5 ed., 1940. While the Mojonnier test differs from the official method in a few respects, it has been found to give results in close agreement with the official method.

Lactometer readings are corrected to 60° F. using the Richmond scale [5] which varies slightly from the method [6] whereby one-tenth of a lactometer unit (.0001 unit expressed as specific gravity) is added for each degree of temperature above 60° F. or one-tenth of a lactometer unit subtracted for each degree of temperature below 60° F. The Richmond formula is used because the Richmond dairy scale is employed in this laboratory.

MANNER OF CALCULATION AND PRESENTATION OF DATA

The primary purpose of the examination of all milk samples submitted to this Bureau is to determine their conformity with state laws and regulations. The samples are submitted by inspectors working under the direction of the State Dairy and Food Commissioner and by local enforcement officials of the towns and cities. Very little is known to the analyst about the breeds of cattle, and the size of the herd or herds that the sample represents. Samples yielding results within fat and calculated solids limits that are normal for herd milks are assumed to be normal; the others are considered abnormal and require further testing. An exception to this is made for samples with abnormally high fats and slightly low lactometer readings. These are classified as not representative.

Any milk with a corrected lactometer reading below 30.0 is set aside to be tested for added water, except for an occasional low fat milk with a lactometer reading just under 30.0. A low fat milk is arbitrarily any milk testing below the Connecticut legal standard of 3.25 percent. Another criterion frequently employed to determine whether a doubtful sample requires further testing is the calculated percent of solids-not-fat. When the calculated solids-not-fat fall below 8.4 percent, the milk is suspected of having been watered and further tests are conducted.

Milk with low fat tests are set aside to be tested for skimming if the fat tests fall below the expected fat range determined from the calculated total solids. This range is that cited by Woodman.[7] That author presents a table entitled "Calculated Limiting Values for Unadulterated Milk", which gives limits of butter fat for milk with total solids ranging from 10.5 to 14.0. Further use in this article of the term "fat range" refers to the above. This table has been found useful as a guide in determining whether or not a milk is within the normal limits of variation

TABLE 1

COMPARISON OF DETERMINED SOLIDS WITH CALCULATED SOLIDS OF MILKS SHOWING EVIDENCE OF SKIMMING

	Determined			Calculated									
Sample No.	*Lact.*	*Fat*	*T.S.*	*SNF*[1]	*SNF*[2]	*Dif*[6]	*SNF*[3]	*Dif.*[6]	*SNF*[4]	*Dif.*[6]	*Fat Range*[5]	*Protein Fat*
1	33.5	2.9	11.94	9.04	9.10	.06	8.96	.08	10.26	1.22	3.5–3.8	1.27
2	32.5	3.2	11.76	8.56	8.91	.35	8.78	.22	10.09	1.53	3.5–3.9	1.02
3	30.1	2.8	10.87	8.07	8.23	.16	8.08	.01	9.31	1.24	2.8–3.1	1.07
4	31.6	2.9	11.36	8.46	8.62	.16	8.48	.02	9.75	1.29	3.1–3.5	1.07
5	32.0	2.8	11.39	8.59	8.70	.11	8.57	.02	9.82	1.23	3.1–3.5	1.16
6	32.1	2.9	11.40	8.50	8.75	.25	8.62	.12	9.88	1.38	3.3–3.6	1.03
7	32.8	2.9	11.62	8.72	8.92	.20	8.79	.07	10.07	1.35	3.3–3.7	1.22
8	33.5	3.2	12.14	8.94	9.16	.20	9.02	.08	10.36	1.42	3.7–4.1	1.11
9	31.2	2.9	11.19	8.29	8.52	.23	8.38	.11	9.64	1.35	3.1–3.4	1.02
10	31.2	2.7	10.96	8.26	8.48	.22	8.34	.08	9.58	1.32	2.9–3.2	1.12
11	32.0	2.9	11.22	8.32	8.72	.40	8.59	.27	9.86	1.54	3.2–3.5	.94
12	34.6	2.9	12.13	9.23	9.37	.14	9.24	.01	10.56	1.33	3.7–4.0	1.27
13	31.3	2.8	11.08	8.28	8.53	.25	8.38	.10	9.64	1.36	3.0–3.3	1.12
14	31.0	2.9	11.24	8.34	8.47	.13	8.33	.01	9.59	1.25	3.1–3.4	1.03
15	32.1	2.8	11.36	8.56	8.73	.17	8.60	.04	9.85	1.29	3.1–3.5	1.14
16	31.0	2.8	11.00	8.20	8.45	.25	8.31	.11	9.56	1.36	3.0–3.3	1.13
17	37.0	3.3	13.06	9.76	10.05	.29	8.93	.17	11.33	1.57	4.3–4.7	1.31
18	32.9	3.1	11.82	8.72	8.99	.27	8.86	.14	10.17	1.45	3.5–3.9	1.01
19	32.0	2.5	10.83	8.33	8.64	.31	8.50	.17	9.73	1.40	2.8–3.2	1.18
20	32.1	3.1	11.65	8.55	8.79	.25	8.66	.11	9.95	1.40	3.4–3.7	1.06
Average						.221		.097		1.364		

[1] SNF = Determined T.S. —F.
[2] Richmond Formula.
[3] Babcock Long Formula.
[4] Hawley-Davis Formula.
[5] Woodman — "Food Analysis", 3rd Ed. (Based on solids calculated from Richmond's Formula.)
[6] Dif. = Difference between determined and calculated solids-not-fat.

of chemical composition. Woodman states "If the fat is higher than that stated in the table the milk may be suspected of having added water; if lower, it may be skimmed, the difference increasing with the adulteration."

It is seen from the above that calculated solids are assigned an important role in determining whether further testing of a given sample is required. The formulae for calculating solids discussed in this paper are:

Babcock formula $SNF = \left(\frac{100S - SF}{100 - 1.0753\ SF} - 1\right) \times (100-F)\ 2.5$

Babcock short formula $SNF = 0.25L + 0.2F$

Richmond formula $SNF = 0.25L + 0.2F + 0.14$

Hawley-Davis formula * $SNF = 287.2\left(\frac{D-1}{D}\right) + 0.328F$

While a large number of samples have been tested for evidence of watering or of skimming, data on only twenty of each type of adulteration will be presented. This permits presentation of all data on each sample rather than a summary of averages. Supporting data on many more samples are available but are omitted in this brief discussion.

Table 1 presents data on the first twenty milks tested for skimming in 1943.

Table 2 presents data on the first twenty milks tested for the presence of added water in 1943.

For comparison, solids figures on twenty milks classified as normal, are

TABLE 2

COMPARISON OF DETERMINED SOLIDS WITH CALCULATED SOLIDS OF WATERED MILKS

	Determined				*Calculated*							
Sample No.	*Lact.*	*Fat*	*T.S.*	*% added Water*	*SNF*[1]	*SNF*[2]	*Dif.*[6]	*SNF*[3]	*Dif.*[6]	*SNF*[4]	*Dif.*[6]	*Range*[5]
1	27.9	3.0	10.63	18.7	7.63	7.72	.09	7.58	.05	8.78	1.15	2.6–2.9
2	29.1	3.5	11.23	14.2	7.73	8.12	.39	7.98	.25	9.27	1.54	3.2–3.5
3	29.3	3.0	10.84	4.7	7.84	8.07	.23	7.92	.08	9.16	1.32	2.8–3.2
4	29.0	3.6	11.30	13.1	7.70	8.11	.41	7.98	.28	9.28	1.58	3.3–3.6
5	27.5	3.3	10.68	19.5	7.38	7.68	.30	7.54	.16	8.77	1.39	2.8–3.1
6	27.7	3.4	10.97	18.0	7.57	7.75	.18	7.60	.03	8.86	1.29	2.9–3.2
7	29.9	3.0	11.09	6.9	8.09	8.22	.13	8.08	.01	9.32	1.23	2.9–3.2
8	28.5	3.1	10.65	16.2	7.55	7.89	.34	7.74	.19	8.98	1.43	2.8–3.1
9	28.0	4.1	11.75	19.5	7.65	7.96	.31	7.83	.18	9.17	1.52	3.5–3.9
10	25.7	3.2	10.25	23.8	7.05	7.21	.16	7.06	.01	8.25	1.20	2.4–2.6
11	25.3	2.4	9.18	26.9	6.78	6.95	.17	6.80	.02	7.88	1.10	1.7–1.9
12	28.4	2.9	10.52	16.7	7.62	7.82	.20	7.68	.06	8.88	1.26	2.6–2.9
13	28.4	3.9	11.67	17.1	7.77	8.02	.25	7.89	.12	9.21	1.44	3.4–3.7
14	27.5	4.0	11.55	19.8	7.55	7.82	.27	7.68	.13	9.00	1.45	3.3–3.7
15	29.4	3.5	11.65	9.6	8.15	8.19	.04	8.06	.09	9.30	1.15	3.3–3.6
16	27.9	3.2	10.73	10.7	7.53	7.76	.23	7.62	.09	8.85	1.32	2.8–3.1
17	22.1	2.2	7.98	31.8	5.78	6.11	.33	5.96	.18	6.93	1.15	1.0–1.2
18	27.1	3.6	11.05	10.9	7.45	7.64	.19	7.50	.05	8.75	1.30	2.9–3.2
19	28.2	3.6	11.21	12.4	7.61	7.91	.30	7.78	.17	9.06	1.45	3.1–3.5
20	28.2	3.5	11.21	12.6	7.71	7.89	.18	7.76	.05	9.03	1.32	2.4–2.6
Average							.235		.110		1.330	

[1] SNF = Determined T.S. —F.
[2] Richmond Formula.
[3] Babcock Long Formula.
[4] Hawley-Davis Formula.
[5] Woodman — "Food Analysis", 3rd Ed. (Based on solids calculated from Richmond's Formula.)
[6] Dif. = Difference between determined and calculated solids-not-fat.

* The Hawley-Davis formula, designed for use under tropical conditions is included since it was discussed in Wiggers' report.[1]

TABLE 3

COMPARISON OF DETERMINED SOLIDS WITH CALCULATED SOLIDS OF MILKS CONSIDERED UNADULTERATED

Sample No.	Determined			Calculated							
	Lact.	Fat	T.S.	SNF[1]	SNF[2]	Dif.[6]	SNF[3]	Dif.[6]	SNF[4]	Dif.[6]	Range[5]
1	32.8	4.4	13.36	8.96	9.22	.26	9.10	.14	10.58	1.62	4.5–4.8
2	31.7	3.9	12.56	8.66	8.85	.19	8.72	.06	10.10	1.44	4.0–4.3
3	31.6	3.8	12.59	8.79	8.80	.01	8.67	.12	10.04	1.25	3.9–4.2
4	31.5	3.9	12.56	8.66	8.80	.14	8.66	.00	10.04	1.38	3.9–4.2
5	32.5	4.9	13.95	9.05	9.25	.20	9.12	.07	10.65	1.60	4.9–5.2
6	32.1	4.7	13.62	8.92	9.11	.19	8.98	.06	10.47	1.55	4.6–5.0
7	31.5	6.2	15.20	9.00	9.26	.26	9.17	.17	10.81	1.81	6.1–6.4
8	32.0	4.6	13.42	8.82	9.06	.24	8.94	.12	10.42	1.60	4.5–4.9
9	31.4	4.3	13.09	8.79	8.85	.06	8.72	.07	10.15	1.36	4.2–4.6
10	32.0	4.6	13.50	8.90	9.06	.16	8.94	.04	10.42	1.52	4.5–4.9
11	32.3	4.7	13.67	8.97	9.16	.19	9.04	.07	10.53	1.56	4.7–5.0
12	32.3	4.0	12.81	8.81	9.02	.21	8.88	.07	10.30	1.49	4.1–4.5
13	31.4	4.0	12.71	8.71	8.79	.08	8.66	.05	10.06	1.35	4.0–4.3
14	31.0	4.7	13.33	8.63	8.83	.20	8.70	.07	10.18	1.55	4.4–4.8
15	30.5	4.5	12.96	8.46	8.67	.21	8.54	.08	9.98	1.52	4.2–4.6
16	32.2	3.9	12.64	8.74	8.97	.23	8.84	.10	10.24	1.50	4.1–4.4
17	30.8	4.9	13.55	8.65	8.82	.17	8.69	.04	10.19	1.54	4.5–4.9
18	31.7	3.8	12.49	8.69	8.83	.14	8.70	.01	10.07	1.38	3.9–4.2
19	31.9	3.9	12.77	8.87	8.90	.03	8.76	.11	10.16	1.29	4.0–4.3
20	31.6	3.8	12.61	8.81	8.80	.01	8.67	.14	10.04	1.23	3.9–4.2
Average						.159		.083		1.477	

[1] SNF = Determined T.S. —F.
[2] Richmond Formula.
[3] Babcock Long Formula.
[4] Hawley-Davis Formula.
[5] Woodman — "Food Analysis", 3rd Ed. (Based on solids calculated from Richmond's Formula.)
[6] Dif. = Difference between determined and calculated solids-not-fat.

presented in Table 3. These include samples from small producer dealers and from large dealers.

A summary showing average differences obtained on the three sets of milk samples using various formulae is presented in Table 4.

TABLE 4

SUMMARY OF AVERAGE DIFFERENCES BETWEEN DETERMINED SOLIDS AND SOLIDS CALCULATED BY THE VARIOUS FORMULAE FOR SKIMMED, WATERED AND NORMAL MILKS

	Richmond	Babcock Long	Babcock Short	Hawley-Davis
Skimmed	.221	.097	.081	1.364
Watered	.235	.110	.095	1.330
Normal	.159	.083	.019	1.477
All Types Combined	.205	.097	.065	1.390

Because of reference to Wiggers' paper throughout the text a summary of the table appearing in his article [1] is presented in Table 5. The "fat range" based upon the determined solids is included as well as the differences between the calculated and determined solids.

DISCUSSION

Table 1 shows how formulae have been used to indicate possible skimming on preliminary examination. The fat test, in each case, falls below or at the lower limit of the "fat range". The "fat range" is in each case the one given for the solids calculated by use of Richmond's formula. In all cases but one, the protein-fat ratios sum-

TABLE 5

Recapitulation of Data Presented by Wiggers, with Differences and Ranges Included

Sample No.	*Determined* Sp.G.	Temp.	Fat	T.S.	*Calculated* SNF[1]	SNF[2]	Dif.[7]	SNF[3]	Dif.[7]	SNF[4]	Dif.[7]	SNF[5]	Dif.[7]	Range[6]
1	1.032	65	3.5	13.05	9.55	10.05	.50	8.44*	.84	8.86	.69	8.88	.67	4.1–4.5
2	1.032	62	3.4	13.55	10.15	10.01	.14	8.69	1.46	8.74	1.41	8.76	1.39	4.4–4.8
3	1.031	61	3.7	12.86	9.16	9.83	.67	8.44	.72	8.52	.64	8.54	.62	4.1–4.4
4	1.031	62	3.6	13.11	10.51**	10.50	.99	8.43	1.08	8.53	.98	8.55	.96	4.2–4.5
5	1.033	62	3.5	13.07	9.57	10.34	.77	8.97	.60	9.04	.53	9.03	.54	4.2–4.5
6	1.032	63	3.7	13.75	10.05	10.12	.07	8.67	1.38	8.85	1.20	8.87	1.18	4.5–4.9
7	1.032	62	3.6	13.34	9.74	10.08	.34	8.87	.87	8.77	.97	8.79	.95	4.3–4.6
8	1.033	63	3.7	13.75	10.05	10.40	.35	8.42***	1.05	9.10	.95	9.11	.94	4.5–4.9
9	1.032	64	3.7	13.18	9.48	10.11	.63	8.66	.82	8.88	.60	8.89	.59	4.2–4.6
Average Dif.							.50		.98		.89		.87	

[1] SNF = Determined T.S. = Fat.
[2] Hawley-Davis Formula.
[3] Babcock Long Formula.
[4] Babcock Long Formula with temperature corrections.
[5] Babcock Short Formula.
[6] "Fat Range" Based on determined solids.
[7] Dif. = Difference between determined and calculated solids-not-fat.
* Should be 8.71 — presumably calculated without temperature change.
** Should be 13.11 — 3.6 = 9.51.
*** Should be 9.00 — presumably calculated without temperature change.

stantiate the conclusions drawn from the relation of the determined fat to the "fat range". Sample 11 has a protein-fat ratio of 0.94 which is below the standard of 1.0, but Woodman[8] states that 0.90 is a better limiting figure and cites Lythgoe to show that average market milk may have a protein-fat ratio as low as 0.82 while the mixed milk of the Guernsey and Jersey breeds of cows may have a protein-fat ratio as low as 0.60.

In these laboratories a protein-fat ratio from 1.0 to 1.10 is reported as suspicious of skimming, a ratio greater than 1.10 as evidence of skimming. It is not coincidental that in every case when the protein fat ratio exceeds 1.10 the calculated solids-not-fat, using Richmond's formula, do not fall below 8.45. This table illustrates the value of sound use of results calculated by solids formulae; a low fat testing milk with solids-not-fat above 8.5 percent (based upon Richmond's formula) should be regarded as a sample requiring further testing for skimming. This is substantiated by available data on skimmed milks over several years.

Table 2 illustrates the use of the formulae to indicate the necessity for further testing of a milk for added water. In no case does a calculated solids-not-fat figure using Richmond's formula exceed 8.3 percent. Should the calculated solids-not-fat exceed 8.3 it is very doubtful that evidence of watering could be obtained by further testing. It will be noted in Table 2 that the fat tests of water milks fall either above the "fat range" or near the upper limits of the "fat range". A few samples with a small amount of added water have fat tests that fall within the "fat range". Such samples, however, have solids-not-fat percentages that fall below 8.3; hence, they should be tested for watering.

It is not to be inferred that all milks falling below 8.3 percent solids-not-fat will be found to be watered. Unadulterated low-fat milks occasionally have solids-not-fat figures that are low. Reference to the "fat range" will indicate whether or not the milk in question needs further examination.

Table 3 presents data on 20 milks considered to be unadulterated. Close examination brings out points that should be related to the above discussion. All fat tests fall within or near the "fat range". All of the fat tests do not fall within the "fat range" due in part to the higher calcluated solids derived by the Richmond formula which tends to give results slightly higher than determined solids or calculated solids using other formulae.

Should the fat test fall below the "fat range" with low testing milks, skimming might be suspected but a milk with a fat test of 3.8 percent or 3.9 percent would not give a protein-fat ratio great enough to constitute confirmation of skimming.

Table 4 summarizes the differences between the solids-not-fat values obtained by using various formulae and solids-not-fat values as actually determined. The differences between the several formulae values and the determined value are so slight in each case with the exception of the Hawley-Davis test that there is no question that formulae properly applied give results which can be used with confidence as a close measure of the solids-not-fat in milk. The Hawley-Davis modification is included because it was recommended by Wiggers as a better formula than either the long or the short Babcock formula even though the modified Hawley-Davis formula was devised for use under the conditions generally found only in the tropics and was not recommended by its author for use elsewhere. The large differences between calculated and determined solids that occur with the use of the Hawley-Davis formula are in sharp contrast to the differences obtained when using the other formulae.

This report would be incomplete without a discussion of the work of Wiggers which has been abridged in table form (Table 5). Apparently, in applying both the Hawley-Davis formula and the Babcock long formula, Wiggers calculated the solids-not-fat without making specific gravity-temperature corrections although in applying the Babcock short formula he appears to have corrected for temperature before calculating solids-not-fat. Nevertheless, he indicated in the text that in all cases the specific gravity was corrected to 60° F. It must be noted that he recorded the specific gravity only to the third decimal place whereas even in routine work we determine the specific gravity to the fourth decimal place. This would not have occurred had Wiggers used a lactometer instead of a hydrometer. Attention should also be called to inaccuracies in some of the computations. As examples: The total solids figure for sample 4 using the Hawley-Davis formula is given as 10.50; it should be 9.87. The total solids figure for sample 8 using the Babcock long formula is given as 8.42, while the figure (not correcting for temperature which he failed to do in the other calculations in the column) should be 9.00. In this latter instance the solids-not-fat would be 9.10 after correcting for temperature.

It will be noted that in every case the fat test falls well below the "fat range". The following conclusion is suggested: Either every sample tested by Wiggers represented milk that had been standardized with skimmed milk, or the results of one or more of the determinations are inaccurate.

The actual fat tests are so far below the "fat range" that it seems possible that skimming would be indicated in some cases. In the case of Wiggers' sample 2 which showed a fat test of 3.4, the "fat range" based upon the determined total solids is 4.5–4.8. In our experience some milks testing 3.4 percent and 3.5 percent with abnormally high solids-not-fat have given a protein-fat ratio indicative of skimming.

The data from Wiggers' report are presented in graphic form in Figure 1. The solid line represents the determined solids of the samples arranged in order from the lowest value to the highest. The dotted lines are corresponding values valculated by formula as noted in the legend. As each formula treats the same figures in the same general way the trend in each case should have the same general relationships to the determined solids trend. As this is not the case either the determined solids or the calculations are inaccurate. That some of the calculations are inaccurate has been pointed out. The correct solids-not-fat for sample 9 should be 9.51 instead of 10.51 ($13.11 - 3.6 = 9.51$). It is readily seen that close checks between determined and calculated solids were not obtained by Wiggers. Differences of this order are attributable to use of improper formulae, to errors in applying formulae or to improper technique and interpretation.

Wiggers' report covers nine milks whereas the figures given herein are based upon sixty milks (Table 4). The larger number of milks in our report might influence the average difference but it would not be expected to alter markedly the range wherein the difference might fall on a single sample. The average differences shown in Table 4 and the individual differences shown in Tables 1, 2 and 3 are of an order entirely different from those reported by Wiggers (Table 5). Reviewing the data presented herein, it is apparent that the differences which may be expected between calculated solids-not-fat and determined solids-not-fat are well within a satisfactory working range when an applicable formula is correctly used.

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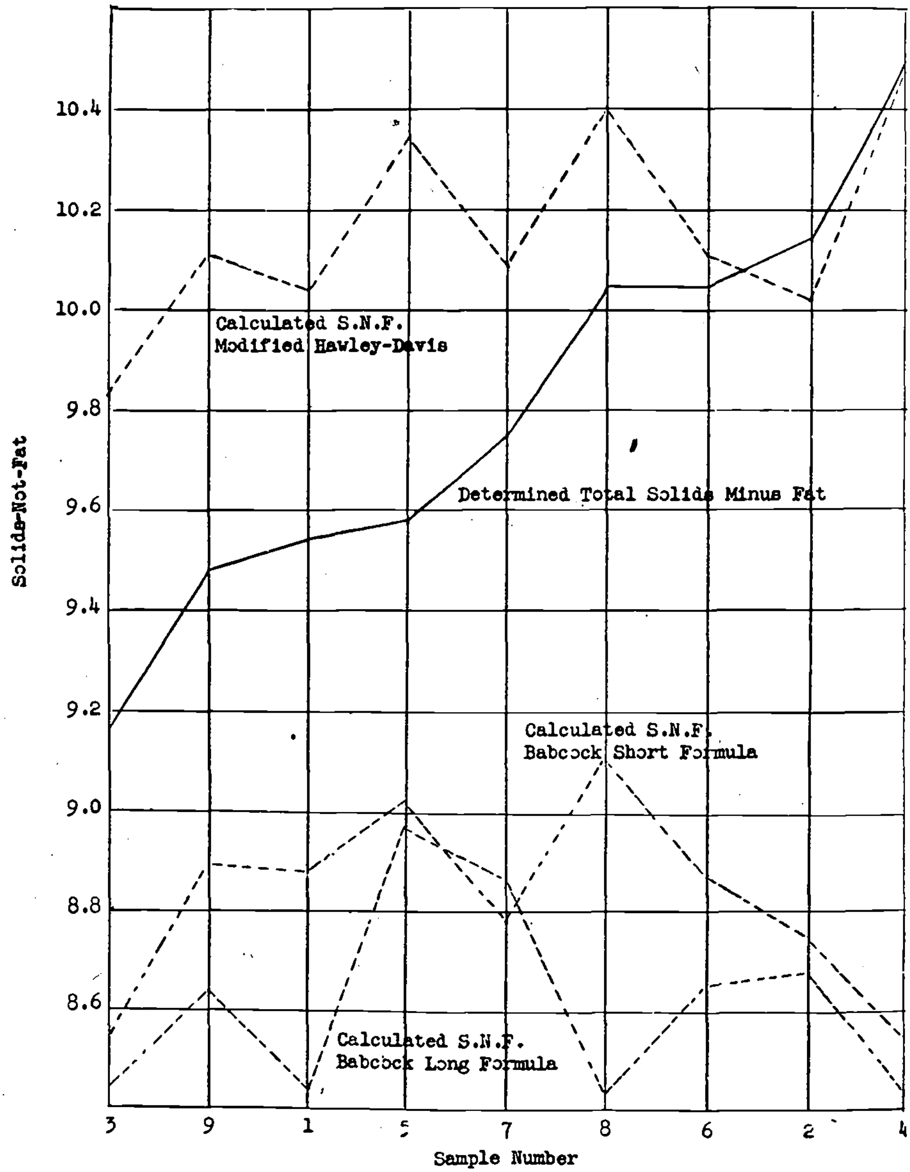
Figure 1. Graphic Presentation of Solids-Not-Fat
Data Given by Wiggers (1944).



Practical Applications of Several Coliform Tests to Pasteurized Milk

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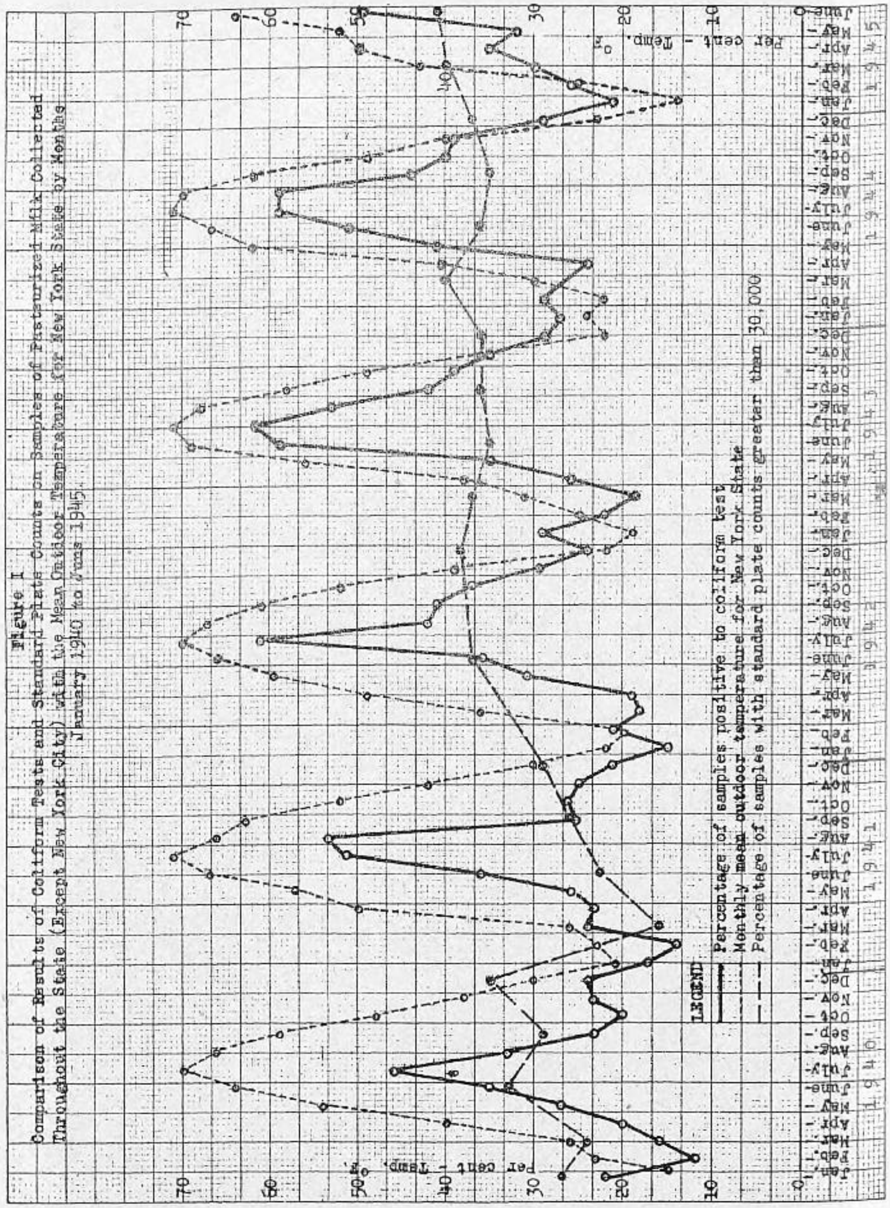
THE frequency with which coliform organisms are found in bottled pasteurized milk by the standard fermentation tube procedure has led to the suggestion by some authorities that freedom from coliform organisms in three 1 ml. portions is too much to expect. Others in trying to explain the marked increase in positive findings during the summer months have theorized that the growth of coliform bacteria in samples of pasteurized milk held at 50° F. or lower for as much as 24 hours while enroute to the laboratory was responsible for positive findings that otherwise would be negative. The investigations here reported were instigated with a view to finding an answer to some of the questions and, if possible, to suggest improved testing and enforcement procedures.

Health officials are interested in coliform organisms in pasteurized milk not because they are harmful in themselves but because the presence of these organisms offers a useful index of recontamination after pasteurization. Different kinds of bacteria ferment lactose and therefore are included in the coliform group. Outstanding among these are *Escherichia coli,* a common inhabitant of the intestinal tracts of animals including men, cows, rodents and insects, and *Aerobacter aerogenes* frequently present on dust particles in the air in cow barns and milk plants.

It often is assumed that because of the prevalence of these bacteria in manure and in dust, they always must be present in raw milk. However, in a survey made by mobile laboratory crews of the New York State Department of Health in 1931, about 6 percent of more than a thousand samples of raw milk for pasteurization showed no coliform organisms in the single 1 ml. portions tested. Of course this cannot be interpreted as meaning freedom from coliforms in this 6 percent but simply a very low concentration. A standard of fewer than 10 coliform organisms per ml. is set for certified raw milk.

The seasonal variation in coliform positive findings on market pasteurized milk has been mentioned. We know this to be true at least in the northern states. A summary of the results of coliform tests on samples of bottled pasteurized milk in New York State shows a marked seasonal trend in the coliform positive findings. The curve (Figure 1) showing the percentage of positive samples by months almost parallels the mean temperature curve. However, pasteurized milk in most of our plants is cooled to and held at the same temperature in summer as in winter. Also the fact that the percentages by months of standard plate counts in excess of 30,000 on milk from the same bottles from which the coliform samples were taken do not show this fluctuation (Figure 1) indicates that temperature is not a direct factor. It is of interest to note that the period of maximum positive coliform tests comes during the fly season. Dr. G. S. Graham-Smith in an English investigation in 1909 reported finding coliform organisms in the feces of 35 out of 148 flies examined. There is some evidence that flies in city plants which do not have access to privies may carry coliform bacteria. Gilcreas reports finding coliform organisms on the legs of



a fly caught in a city milk pasteurizing plant. Colvin reports finding flies and roaches in the spreader pipe of a surface cooler. His explanation is that these insects crawled under the loosely fitting covers into the warm pasteurizer after it was sterilized and were flushed by the milk through the outlet and into the perforated spreader tube where they were caught. When bottles are sterilized well in advance of filling and are allowed to stand inverted in cases to cool they also constitute preferred resting places for flies. However, if flies were the main factor the percentage of coliform positive samples of pasteurized milk would continue to be high in September and probably October instead of dropping with the mean outdoor temperature. In advocating the use of in-the-bottle pasteurization in England on a large scale Enock points to improperly sterilized bottles as a major factor and reports coliform organisms generally absent in 1 ml. portions of such milk. In pasteurizing milk in the bottle on a small scale in New York State we have not found a sample that was coliform positive in 1 ml. No doubt other factors such as dust blown through open windows and doors in the warm months, condensation dripping from pipes and perspiration from workers may contribute to the positive coliform findings. We do not as yet have sufficient evidence positively to state the cause of the increase in positive findings in the warm months.

In looking for possible sources of coliform organisms in bottled pasteurized milk it is well to keep in mind that the improper sterilization or recontamination of any of the equipment such as the piping, cooler, bottler and capper or of the bottle or cap may result in introducing coliform organisms. It is interesting to note, however, that we have examined samples of pasteurized milk from some well operated plants at intervals throughout the year without finding any positive coliform results on the 1 ml. portions examined.

A study of the results of coliform tests made in routine work indicates that the fermentation tube method is too sensitive a test to be applied to pasteurized milk with plant sanitation at its present level. If all three 1 ml. tubes are positive this gives a most probable number of 230 or more per 100 ml. which means that the number of coliform organisms per ml. may be as low as 2 or 3. However, the count frequently is higher than this and the enforcement official should know whether it is 2 or 3 per ml. or 200 or 2,000. When results by the fermentation tube method frequently are positive in one or more tubes the use of the plate method is indicated.

This is demonstrated by the summary in Table 1 of the results of 1,630 tests by the formate ricinoleate fermentation tube, and by the desoxycholate agar plate method on samples of pasteurized milk, cream and milk products. These are combined because there is not enough difference in the trend of results to justify individual study. All the tests herein reported were made in accordance with Standard Methods for the Examination of Dairy Products, 8th Edition, 1941. It is interesting to note that of the 896 samples showing no fermentation, i.e., gas production, 821 or 91.6 percent gave no count and

TABLE 1

COMPARATIVE COLIFORM TESTS BY FERMENTATION TUBE AND DESOXYCHOLATE PLATE METHODS ON SAMPLES OF PASTEURIZED MILK (1,227 SAMPLES), CREAM (315) AND MILK PRODUCTS (88) ALL BOTTLED AT PLANTS

AUGUST 18, 1944, THROUGH AUGUST 10, 1945

Fermentation Tube Results on 3—1 ml. Portions	*Desoxycholate Plate Counts on 1 ml. Portions from Same Samples*					
+ = Gas — = No Gas	*0*	*1 to 3*	*4 to 10*	*11 to 100*	*More than 100*	*No. of Samples*
— — —	821	56	6	9	4	896
+ — —	89	36	2	3	1	131
+ + —	41	40	17	7	1	106
Sub-total for all having less than 3 tubes +	951	132	25	19	6	1133
+ + +	12	46	89	152	198	497
Totals	963	176	114	171	204	1630

an additional 56 or 6.2 percent gave counts of between 1 and 3 colonies per ml. which is good correlation for bacteriological tests. Due to the possibilities of chance contamination too much significance should not be attached to the presence of from 1 to 3 colonies per ml. A total of 877 of the 896 negative samples or 97.8 percent gave counts of 3 colonies or less per ml.

The groups of samples developing gas in one, two and three 1 ml. portions respectively show progressively higher counts as would be expected. However, 95.4 percent of the samples with one of the 1 ml. portions positive for gas and 76.4 percent of those having two 1 ml. portions positive gave counts of 3 colonies or less on desoxycholate agar.

Examining the results in Table 1 of the desoxycholate plate counts on the 497 samples which showed gas in all of three 1 ml. portions, we find only 12 or 2.4 percent of these produced no growth on desoxycholate plates and only 58 or 11.7 percent produced 3 colonies or less per ml. Of this group 350 samples or 70.4 percent gave counts of more than 10 colonies per ml.

It is apparent that the results showing gas in only one or two of three 1 ml. portions are generally speaking of little importance. Only 12 of 237 samples or about 5 percent gave counts of more than 10 per ml, and 206 or about 87 percent gave counts of 3 colonies or less per ml. Grouping these with the negative results we find that of 1,133 samples showing no gas in at least one of the three 1 ml. portions 1,083 or 95.5 percent gave counts of 3 colonies or less and only 25 or 2.2 percent gave counts in excess of 10.

Although the production of gas in all three 1 ml. portions examined is good evidence of real coliform contamination it is apparent that the desoxycholate plate count gives more information on samples of this kind than does the examination of three 1 ml. portions. With desoxycholate plate counts the control official has the opportunity to concentrate his attention first on the plants showing the highest counts rather than dispersing it among plants furnishing samples showing gas in all three 1 ml. portions the counts on which may vary from 0 to too numerous to count. In Table 1 the 375 counts in excess of 10 per ml. represents 23 percent of all the samples included in the study extending over a year. It appears that a temporary standard of not more than 10 coliform organisms per ml. would be a good starting point for a clean up program. These samples were from all sorts of plants, large and small, city and rural. In dealing only with large city plants compliance with a more rigid standard could be expected. After working with rural plants a more severe standard could be met. After plant methods generally are materially improved a return to the use of the fermentation tube may be in order.

A series of tests summarized in Table 2 were made to determine whether the violet red bile agar would give results comparable with those obtained with desoxycholate agar. It will be seen that the correlation is very good between the results obtained in plating 836 samples of milk, cream and milk products on each of these media. Differences of the order of those shown in this table are likely to occur between duplicate plate poured with the same media. It is evident from this that these media are equally satisfactory for this use.

To investigate the possible increases in coliform counts on iced samples enroute to the laboratory a set of 4 samples was examined immediately by the fermentation tube method using three 1 ml. portions in formate ricinoleate broth and by the desoxycholate and violet red bile plate methods and then held at refrigeration temperature varying from 6° C. (48.8° F.) to 12.5° C. (54.5° F.) and portions were examined by the same tests after 1, 2, 3 and 8 days storage respectively. A simi-

TABLE 2

COMPARATIVE COLIFORM TESTS BY FERMENTATION TUBE, DESOXYCHOLATE PLATE AND VIOLET RED BILE PLATE METHODS ON SAMPLES OF PASTEURIZED MILK (598 SAMPLES), CREAM (192) AND MILK PRODUCTS (46) ALL BOTTLED AT PLANTS

AUGUST 18, 1944, THROUGH AUGUST 10, 1945

Fermentation Tube Results on 3 — 1 ml. Portions + = Gas — = No Gas	*Plate Counts on 1 ml. Portions from Same Samples*										No. of Samples	
	0		1 to 3		4 to 10		11 to 100		More than 100			
	Des.[1]	VRB[2]	Des.[1]	VRB[2]	Des.[1]	VRB[2]	Des.[1]	VRB[2]	Des.[1]	VRB[2]	Des.[1]	VRB[2]
— — —	421	414	24	28	5	3	4	4	0	0	454	454
+ — —	58	50	17	21	0	3	2	2	0	1	77	77
+ + —	19	11	18	23	8	9	0	2	0	0	45	45
Sub-total for all having less than 3 tubes +	498	475	59	72	13	20	6	8	0	1	576	576
+ + +	5	5	22	20	31	37	79	80	123	118	260	260
Totals	503	480	81	92	44	57	85	88	123	119	836	836

[1] Desoxycholate agar. [2] Violet red bile agar.

lar set of samples was held in ice water in the refrigerator and examined at the same intervals. However, the ice melted on the 6th day (Sunday, July 15) and the temperature of the water in which they were being held in the refrigerator rose to 48° F. They were reiced during the morning of the seventh day. The results of this test are shown in Table 3.

In another series 3 samples of pasteurized milk and 2 of pasteurized cream were tested for coliform organisms by all three methods and then stored in ice water in the electric refrigerator and portions examined again after one, two and three days, respectively. All results were negative by all three tests except one of the samples of cream which on initial test showed gas in two out of three 1 ml. portions with the desoxycholate plate count 0 and the violet red bile count 1. After one day these were + — —, 0 and 1 respectively, after 2 days + + —, 0 and 1, and after 3 days — — —, 2 and 1.

Carrying this further Table 3 also shows the results of coliform tests by all three methods on split samples of pasteurized milk and cream at intervals with part held at refrigerator and the other part at incubator temperature. The results on the refrigerated samples confirms the results given in Table 3 for other samples. The results on the incubated samples seem to show that in samples A and B all coliform organisms were destroyed by pasteurization. This has been a disputed point, the argument being that a few organisms must be there although they were not discovered in the 1 ml. portions examined. Although samples C and D had a very low initial coliform content as indicated by the presence of gas in only one of the three 1 ml. portions, these organisms multiplied rapidly at incubation temperature. This shows that coliform bacteria will multiply rapidly in milk at 37° C. if a few are present at the start.

These results make it apparent that samples of pasteurized milk or cream showing none or few coliform organisms per ml. may be held in ice water or in an electric refrigerator without affecting the results of coliform tests. The results do not support the theory that coliform organisms grow in iced samples enroute to the laboratory and that such samples cannot be shipped. Since some members of the coliform groups may react differently than others the examination of larger numbers of samples by this method is necessary before concluding that holding

TABLE 3

Effect of Cold Storage and Incubation on Coliform Content of Pasteurized Milk and Cream

Source of Sample—Date	*Initial Test*			*Av. Storage Temp. °F.*	*1 Day*			*2 Days*			*3 Days*			*8 Days*			*9 Days*			*10 Days*		
	**F*	**D*	**V*		**F*	**D*	**V*	**F*	**D*	**V*	**F*	**D*	**V*	**F*	**D*	**V*	**F*	**D*	**V*	**F*	**D*	**V*
6/18/45																						
A Past. Milk—Bottle	−−−	1	0	32+	+−−	1	0	++−	1	0	−−−	0	0									
A Past. Lt. Cream—Bot.	+++	37	50	32+	+++	34	43	+++	45	52	+++	42	43									
A Past. Milk—Bottle	−−−	0	0	32+	−−−	0	0	−−−	0	0	−−−	0	0									
A Past. Lt. Cream—Bot.	+++	6	9	32+	+++	7	6	+++	7	7	+++	5	7									
7/9/45																						
A Past. Milk—Vat	−−−	0	0	32+	+−−	0	0	−−−	0	0	−−−	1	0	+++	14	37						
A Past. Lt. Cr.—Vat	−−−	0	0	32+	−−−	0	0	−−−	0	0	−−−	0	0	+−−	19	42						
A Past. Milk—Bottle	−−−	0	0	32+	+−−	0	0	−−−	0	0	−−−	0	0	+++	11	32						
A Past. Lt. Cr.—Bottle	++−	1	1	32+	++−	1	1	+−−	1	1	++−	1	0	+++	110	81						
Following 4 samples split from 4 above																						
A Past. Milk—Vat	−−−	0	0	48±	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0						
A Past. Lt. Cr.—Vat	−−−	0	0	48±	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0						
A Past. Milk—Bottle	−−−	0	0	48±	−−−	0	0	−−−	0	0	−−−	0	0	+−−	0	0						
A Past. Lt. Cr.—Bottle	+++	1	1	48±	+++	1	1	+++	23	15	+++	44	54	+++	5000+	5000+						
7/30/45																						
A Past. Milk—Vat	−−−	0	0	46±	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0
A Past. Lt.Cr.—Vat	−−−	0	0	46±	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0
A Past. Homo. Milk—Bot.	+−−	0	0	46±	+−−	0	0	+++	1	0	+++	2	2	+++	26	31	+++	28	88	−−−	130	160
A Past. H. Vit. D Milk—B.	−−−	0	0	46±	+−−	0	0	+−−	0	0	++−	0	2	++−	1	0	−−−	1	0	++−	0	4
Following 4 samples split from 4 above																						
A Past. Milk—Vat	−−−	0	0	97±	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0
A Past. Lt. Cr.—Vat	−−−	0	0	97±	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0	−−−	0	0
A Past. Homo. Milk—Bot.	+−−	0	0	97±	+++	5000+	5000+	Discontinued														
A Past. H. Vit. D Milk—B.	+−−	0	0	97±	+++	5000+	5000+	Discontinued														

*F = Formate ricinoleate broth, 3 - 1 ml. portions, + = gas, − = no gas. D = colony count per ml. on desoxycholate agar.
V = colony count per ml. on violet red bile agar.

samples cold for from 24 to 48 hours before examining them does not change the result materially.

In striving for perfection in preventing the recontamination of pasteurized milk it is desirable to examine more than one or even three 1 ml. portions as is common practice. Tests were run to determine whether this could be readily accomplished by adding more than 1 ml. of milk to each desoxycholate or violet red bile agar plate. In the first series all the milk used was from a pint bottle of Grade A pasteurized milk showing on initial examination gas in two out of three 1 ml. portions. Twenty plates were poured with 1 ml. each, then 10 with 2 ml. and so on with 3, 4 and 5 ml. aggregating 20 ml. of milk for each. The agar in all these plates hardened well although those containing 4 and 5 ml. of milk were rather cloudy and therefore more difficult to count. These results are summarized in Table 4. The counts were low but the results show that if a single plate were poured the chance of getting the true picture were greater using 4 or 5 ml. of milk. A second series also is shown in Table 4 made on milk having a higher coliform count. The results show the highest count on both desoxycholate and violet red bile agar using 4 ml. per plate. A single test was made plating 6, 7, 8, 9, and 10 ml. per plate on desoxycholate agar. The agar hardened satisfactorily but more slowly than when less milk was used. The plates were so cloudy it was difficult to see the guide lines in counting. This work indicates that 4 or 5 ml. of milk per plate may be used satisfactorily.

CONCLUSIONS

It is evident from this discussion that much of the bottled pasteurized milk on the market is not completely free

TABLE 4

COMPARATIVE COUNTS PLATING 20 ML. PORTIONS OF PASTEURIZED MILK ON DESOXYCHOLATE AND VIOLET RED BILE AGAR USING FROM 1 TO 5 ML. OF MILK PER PLATE

Sample	*No. and Size of Portions Plated*	*Colonies per Plate*		*Total Count Per 20 ml.*	
		Desoxycholate	*Violet Red Bile*	*Desoxycholate*	*Violet Red Bile*
A	20 — 1 ml.	3 with 1 each 17 with 0 each	3 with 1 each 17 with none	3	3
A	10 — 2 ml.	3 with 1 each 17 with none	3 with 1 each 17 with none	3	3
A	6 — 3 ml. and 1 — 2 ml.	1 with 1 6 with none	7 with none	1	0
A	5 — 4 ml.	2 with 1 each 3 with none	3 with 1 each 1 with 2 1 with none	2	5
A	4 — 5 ml.	2 with 1 each 2 with 2 each	1 with 2 3 with none	6	2
B	20 — 1 ml.	9, 5, 9, 13, 8, 9, 15, 10, 2, 1, 6, 8, 8, 7, 5, 7, 8, 6, 3, 18	8, 8, 11, 6, 8, 9, 13, 8, 5, 7, 16, 8, 9, 9, 17, 7, 7, 7, 8, 8	159	179
B	10 — 2 ml.	25, 30, 45, 25, 18 26, 25, 30, 22, 21	29, 21; 19, 22, 27 31, 21, 27, 18, 20	267	235
B	6 — 3 ml. and 1 — 2 ml.	47, 61, 55, 46, 42, 31, 24	41, 38, 36, 56, 44, 38, 24	306	277
B	5 — 4 ml,	80, 75, 56, 64, 68	65, 55, 46, 54, 65	343	285
B	4 — 5 ml.	68, 67, 48, 72	61, 60, 80, 72	255	273

Sample A — 1 pint bottle Grade A Pasteurized milk with 2 out of 3 — 1 ml. portions positive for gas on initial examination.

Sample B — ½ pint bottle Grade A Pasteurized milk with 3 — 1 ml. portions positive for gas on initial examination.

from coliform organisms particularly during the summer months. The fermentation tube method of examination for coliform bacteria is a very critical test which does not differentiate between milk containing 2 or 3 coliform bacteria per ml. and that containing several hundreds or thousands. The plate methods, either desoxycholate or violet red bile give such differentiation and provide for the examination of 4 or 5 ml. of milk on a single plate. With plants at the level of sanitation of those furnishing the samples herein summarized the standard for raw certified milk is suggested as a temporary year around standard namely less than 10 coliform bacteria per ml. Although better results will be obtained during the winter months it is not considered necessary to set a higher standard for the winter months to attain that end. After considerable work has been done on sanitation in the plants failing to meet this suggested standard it should be possible to set a higher standard which need not necessarily be the ultimate one. The evidence indicates that freedom from coliform organisms in 1 ml. portions of pasteurized milk in well operated plants is an attainable goal.

Let's Look at Ourselves

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No industry is ever without problems. No food industry is ever without problems involving quality. This is certainly true of the milk business. Problems in connection with the quality of products in the fluid milk business might well be segregated into those involved in attaining a desired quality and into those affecting the desired quality. I believe at present the most difficult zone lies in the attainment, which is of immediate importance to sanitarians.

Fundamentals of Requirements

One of the problems inherent in fluid milk operations is a tendency to absorb requirements that ignore fundamentals. Perhaps a few examples illustrate what has happened, and what should be avoided.

A few years ago milk ordinances frequently required that milk houses be built a stipulated number of feet away from the barn. Today milk houses are being built adjacent to the barn on the basis that by conserving a producer's time and reducing unnecessary work effort he can more effectively produce more and better milk. This should have been recognized long ago.

Milk products are food products. In some areas, by rule, only dairy products can be in or near the dairy plant. But strangely in the same areas dairy products both in the package and in open trays are on display in food counters with a variety of other products, including fish, fowl, pickles, spaghetti, meats, etc. Actually the dairy industry is perhaps one of the most capable of purveyors of foodstuffs. It knows the problems of regular delivery, it knows refrigeration, and it knows deterioration and sanitation better than any other business. From an over all viewpoint, it can contribute much to public health in the handling of other foods. In other words, the "know how" bound up in the dairy industry should be utilized to fullest advantage in the food field with the encouragement of sanitarians.

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Black Market in Reverse

The disparity between the requirements or standards of quality established for fluid market milk, and for certain manufactured milk products is a deterent to maintaining quality standards, and health improvement efforts. The market requirements and the price paid are greater for fluid milk. But in most markets milk from adjacent unapproved farms, or milk rejected because of substandard qualities, eventually finds its way into a given city under the cloak and wrapper of a manufactured product. There are, of course, "reasons" why this situation exists. But this situation is a millstone around any given market's quality and health improvement intentions. It is of no accomplishment to have health improvement and maintenance standards circumvented by a form of black market operating in reverse.

Time and Labor, and Quality

Consideration of labor efficiency has but scratched the surface in milk quality improvement work. Progressively better sanitary standards have increased the duties necessary in producing and handling milk. But the time and effort required to do these operations also has increased. Yet it is evident that if the time and labor effort to perform the necessary duties is reduced, they can be more readily performed and with much better co-operation. I refer you to the studies such as have been made in Vermont, and are under way in other institutions on time, energy and motion studies in producing and handling milk. Better organization is making it possible to produce better milk, more easily. Sanitarians must capitalize on these developments to simplify the quality procurement problems.

MERCHANDISING PRODUCERS

One of the unfortunate situations in the dairy industry is that many milk producers have never learned to merchandise their milk. Milk producers go through some terrific mental, financial and labor pains to turn out several cans of milk. They work long hours, full weeks. They lay out, plan and rotate certain crops, ultimately for a herd of cows. They invest heavily in barns and silos. A lifetime is spent in developing a productive herd. Yet when all the time and money is spent in acquiring the final product, it is left uncooled, the utensils unwashed, and the attitude is often one of indifference. Sanitarians, and all others in the industry, have a share in encouraging producers to feel the necessity of "merchandising" milk. It is a consensus of fieldmen who have pondered this situation that actually producers, once aware of the real significance and meaning of milk quality, really prefer and want to produce quality milk. They acknowledge a loss of pride in their enterprise if they fail to meet occasionally the market's standards.

MILK STANDARDS IN SMALL COMMUNITIES

The lack of milk inspection and laboratory supervisory service and of acceptable processing facilities is greatest in smaller communities and in rural areas. Vital statistics bear this out. The improvement of this situation requires joint effort. The volume of business in many small communities is such as to require inspection service greater than should be expected of state supervision. It should be locally conducted and financed. It has not been sufficiently impressed upon the management of small communities. Two developments have and will continue to influence this situation. Adjacent communities or areas can support, politically, a joint milk inspection and appraisal service. There is no reason why a community cannot undertake the use of the facilities of an impartial nearby city or commercial sanitarians service. A second possibility is in the joint support and use of laboratory service by dairy plants and producer distributors. A third development, inherently difficult to establish in some areas, easy to do in others, is the servicing of outlying communities with the milk supply produced under the same conditions by and for the larger city. These things do not always come about by themselves. It more often requires the help of those already established in other areas. It is proper to point out that the successful establishment of such programs in outlying small community areas in several respects simplifies the problems for the larger political areas.

PUBLIC HEALTH AND MILK

One of the fluid milk industries problems is to get across to consumers an appreciation of all that is inherent in a bottle of milk or a package of fresh dairy products. There is no other food that has the qualities of diversity of use as milk. It can be utilized by young and old. It can be used in all meals, between and after meals. It can be incorporated in dozens of ways in kitchen cookery. It has very valuable qualities in balancing out weaknesses in the average diet. It is one of the most economical of foods. But the opportunity of the industry and of sanitarians to provide milk of good acceptable quality to all in a given market can be lost. It can be lost if the requirements imposed for its production, processing and distribution become unreasonable or excessive. Consumers have two alternatives if costs appear excessive. The first is to patronize outside roadside or farm stands. It is to the shame of sanitarians in particular, as well as the industry, that many of the patrons of roadside markets are well able to afford and to understand the benefit of services implied in a well supervised milk supply. The second alternative is to turn to various forms of manufactured milk products, whether frozen, condensed, dehydrated, or sterilized. In either event, the source of supply of dairy products obtained by the consumer falls gradually without the jurisdiction of the community milk inspection organization.

The fluid milk industry and the sanitarians profession have two distinct jobs before them. The first is to better acquaint consumers of the efforts and values involved in making available a bottle of milk or a package of product, and the second is to encourage people to use more of it. Improving the quality of fluid milk products is one thing. The realization of the value of this service is to get people to take advantage of it. This is not alone the milk distributors' problem. There is ample and abundant evidence large segments of our population exist upon what are reckoned to be insufficient or inadequate diets. It is probable as great a contribution to public health can be made by milk sanitarians through seeing to it there is increased utilization of milk as has been made in the past through the improvement of milk supplies. Sanitarians must accept an increasing responsibility in weighing the factors of increased costs of getting milk into the hands of consumers, and of getting consumers to use more milk in their diets.

SELLING THE IDEA OF THE ADVANTAGES OF MILK SANITATION

One of the fluid milk industry's big problems lies in the necessity of a tremendous educational program on the part of sanitarians to sell to various groups the advantages of their services.

In the first place a piece of aldermanic created and legally phrased printed matter is about as uninteresting reading matter as any ever conceived. It lacks every conceivable advantage or property that could be desired in the selling of an idea. The objective of a milk ordinance should be to establish the standards, provide for their attainment, and then to prove its merit. Milk ordinances at least ought to be rewritten, and illustrated, and, substantiated with evidence of past results in the field of public health. They should be so arranged as to make interesting reading to school groups, and to city and farmer dairymen. If sanitarians, if men in the industry, if milk producers want consumers and each other to appreciate their respective efforts, they must first understand what, and why, and how it is being done.

Plant managers, but more particularly, plant employees frequently are perfunctorily required to modify old, or institute new procedures. Unfortunately, too often an understanding of the need for the change is never provided. Yet there is no better assurance that a thing will be done than through understanding. Of all the people in need of assurance that things will be done properly it is the milk and food sanitarian.

The consuming public seems not too duly impressed with the efforts of milk sanitarians. They do not know about them. The public patronizes roadside markets. It follows often the "whims" of ill informed health practitioners, whom incidentally like the public seemed to have been "missed".

Most of our cities have milk ordinances of high caliber. But the proof of the idea, the real advantages of the service have never been recognized by nearby small communities. They do not have, nor do they demand, such services. Nor have they ever understood or recognized them. Nevertheless the extension of the idea into nearby adjacent smaller communities would minimize some of the sanitarian's problems. It is an axiom of business that more sales are made when competitors are nearby than when they are on the other side of town.

It should be highly significant that the most successful dairy organizations in the country, expressed in terms of public relations both with consumer and with the producer, are those that have the most capable field men sanitarians. It is not too broad a claim to lay down that this is because these men know how to use effective educational methods.

There are two other examples which bring light upon this need for better merchandising on the part of sanitarians. Young people are not preparing themselves early in their educational careers for service in the milk sanitarians profession. They stumble upon it in the course of their advanced educational work. The opportunities, the accomplishments and the challenges of the profession are hiding under a bushel basket. Perhaps the most vital statistic on this point is in the want of remuneration commensurate with the responsibilities of the work. By selling themselves and the knowledge of their work, sanitarians can advance the industry. After all, if milk as a food is not utilized, milk sanitarians won't be considered essential.

FLUID MILK BY-PRODUCTS

One of the fluid milk industry's immediate problems is the mental approach to, and the conditions of handling of dairy plant by-products. There is a tendency on the part of processors and of sanitarians to focus all their attention upon fluid milk and cream. These receive the care, the scrutiny and the blessing of all concerned. The by-products fare for themselves. The cottage cheese, the buttermilk, the chocolate milk, etc., are processed in the older equipment in the back room. The employees handling them are often the less pertly interested, or interesting of individuals. Yet the by-products often yield great returns economically. I simply want to call attention to two facts. Sometimes the most flagrant violations of fundamentals of the proper handling of milk are to be seen in the handling of by-products. It is known that the public health significance of these violations is no less than for the handling of fluid milk.

From time to time those especially in publicly operated laboratories receive from individuals with a curiosity samples of food products accompanied with a request for a "complete analysis". A "complete analysis" represents a terrific amount of work not appreciated in such inquiries. It is probably in this vein laboratory technicians and sanitarians have chosen to use various "standardized procedures" in appraising the quality of various dairy products. One of the great needs in quality appraisal is a simplification of the work that must be done. But herein lies a danger of which there appears to be some neglect. There is a tendency to rely too heavily upon certain tests in making quality appraisals.

The introduction of high temperature short time pasteurizing systems brought light upon the fact that our laboratory procedures so commonly used were not making evident to us significant defects in milk quality, and particularly farm handling methods. High temperature pasteurizers sent field men on a field hunt.

Emphasis upon the absence of sediment in milk is a useful technique if originally the sediment was never there. It is an unfair and unwise procedure if it diverts our thinking into correcting milk to comply with the test instead of correcting the cause of presence of sediment. Similarly, emphasis upon temperature of milk at an intake is a good ideal if it does not penalize the wrong producer. Sometimes warm milk is cooled at the expense of adjacent cold milk during transit in enclosed trucks.

Plate count procedures indicate the approximate numbers of organisms that thrive under a given set of conditions. These conditions are quite defined; but they do not permit an estimate of many other organisms that also may be present in the milk, such as those that can thrive at high incubator, or at refrigerator temperatures. Reliance upon a given procedure as final may mislead the appraiser and curtail the service that can be rendered.

COMPLEXITY OF EQUIPMENT CONSTRUCTION

Newer milk processing equipment is becoming more complex in construction. It tends to become more simple in operation. The equipment is becoming more complex in terms of parts, but becomes more readily operative by push button control. The probability of employees understanding, much less recognizing necessary basic principles of operation, becomes more remote. Fewer of a given plant's employees know the technical basis of unit operations. The significant point of these developments is that management and health supervisors must become more fluent in their capacities to recognize factors that interfere with the satisfactory performance of equipment. Sanitarians and management have the responsibility of seeing to it that employees have the necessary level of training, and that schools of instruction in principles are utilized. Even though processes are reduced to push button controls there exist frequent opportunities for error that should not be condoned.

CANS AND CAN WASHERS

Probably one of the weakest links in our system of handling milk is the can washer and can handling systems. It might seem desirable to scrap the whole system and to start anew. The faults appear to be numerous.

The effectiveness of the applications of various volumes and pressures of fluid used in hydraulic washing of cans is affected by extremely variable conditions of temperature, water hardness, detergent composition and concentration. From an examination of cans from many can washers, there is ample evidence the "system" leaves much to be desired. It contributes to serious bacteriological and quality control problems in the handling of milk.

The washing of external portions of containers is quite inadequate. Eventually the materials or debris on can exteriors become a part and parcel of the detergent solution. The solution is not sufficiently germicidal to destroy many undesirable organisms. The solution becomes increasingly contaminated as the period of operation progresses.

In most can washing systems the outsides of cans are not washed. It gets at best a spray. The accumulation is enhanced by slime from cooling tank waters. It is a potent contaminant for milk when cans are inverted at weighing tanks. In like manner can lids receive at best a spray rinse.

While many can washers eject cans too hot to hold, and apparently dry, they are not necessarily free of bacteriological defects upon delivery to the farm.

Cans, through our system of distribution and handling on trucks and on farms, become laden inside and out with dust and other sediment.

In all fairness to the canwashers now in use, it should be noted a major portion are operated improperly, and are not given the mechanical attention due them. The shortcomings of operators are as great or are greater than those of the machines.

These unclean factors all lead to a vicious cycle of bacteriological transfers, from farm, to plant, to farms. They help the pattern of indifference so often seen in the reaction of producers for whom other sanitary practices are urged. I am always impressed with the apparent recognition of these problems by commercial photographers. They invariably show bright clean cans in a picture of a conveyor line.

The answers to these problems are not simple. That is why we might consider starting all over. Perhaps we could eliminate the can and can washer entirely. Certainly we can hope for three needed improvements — can washers that operate on the inside and out of the can, cans that have improved cleanability features, and cans of lighter weight. Milk haulers make at least six lifting motions for each milk can in transferring it from farm to plant and back to farm. At existing weights a hauler lifts 16,200 pounds of metal for each 8,300 pounds of milk delivered in 100 full cans. No wonder milk haulers do not always seem anxious to participate in certain desirable movements. They are too tired.

NEW IDEAS

The price of market milk is of great concern to a large number of people. The job of making available milk at a continued low price appears increasingly difficult. The requirements under which milk must be produced, processed and distributed certainly are not less simple than formerly. Economies cannot forever be obtained by improvements only in certain departments of operation. The industry has witnessed somewhat radical changes in the past few years; homogenization, vitamin fortification, and every other day delivery. Radical changes in our thinking can allow attention to be given the methods and schedules of farm milk collection and transportation of dairy plant operating capacities and schedules, and of modified products and packages. The potential effect of milk in modified forms, as fluid condensed, frozen, and powdered, and of related products of butter oil, powdered skim-milk, cream and ice cream mix can readily alter our usual mode of thinking, our standards, and our methods. Fortunately, all changes usually go through the gamut of research study where undesirable features are screened. The fluid milk industry as such may undergo some marked changes. Fluid milk as such is still the most convenient of all dairy products utilized. Continued distribution of this and its associate products suggests that we give as much attention as possible to removal of legal restrictions that in effect serve no significant useful purpose.

REVIEW

It might seem, in considering the problems that must be encountered in providing milk of quality, that milk quality improvement work is a thankless task. On the contrary, it has been and is a real, necessary and important service.

Milk consumption is greater than ever before. It could not have been so without quality. The cases of transmission of disease traceable to milk or milk products are invariably to be charged to milk and products without quality. One of the most perishable of foods is now made available to large segments of our population regularly in safe nutritious condition without hardly a consideration on their part. It has come to be considered a vital adjunct of school child health improvement activities.

Tuberculosis, so rampant a few decades ago that dairy wagon advertising consisted essentially of the term "tuberculosis tested", is abolished. Bang's disease is now under a nation wide program of control. Sanitarians have made the industry conscious of the necessity of controlling and eliminating mastitis.

Improvements in quality have made possible the industry as it exists today. It was able to come through in the past six years with raw fluid milk and with pasteurized bottled milk that could be and is shipped half way across the country, requiring at least up to three days enroute. The know how of quality enabled manufactured dairy products to be shipped and used around the world.

There is now a great movement in rebuilding and reorganization of worn out operations. The industry is going to invest tremendous sums of money. The faith in the worth of these investments is due to the establishment of quality. The industry will necessarily have to make many decisions on details of costly installations that will demand the counsel of men whose consideration has been essentially that of quality. This is particularly true now when the want of men with training in this field is greatest. The reserve of knowledge acquired in meeting the difficult problems over the years can serve even more in the immediate future.

Pest Control in Dairies*

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Insect control will always be a problem around dairies because of the nature of the trade and the fact so few people understand the habits or life histories of the insects involved. Sanitary measures reduce the insect population, but plain good housekeeping, plus an understanding of a few academic principles concerning the habitat of the species, helps immensurably.

Flies and cockroaches are among the more important pests. Flies are a seasonal problem, but cockroaches must be considered the year around.

The flies found in dairies are the same as those found in restaurants, or in the home kitchen. Several different kinds of flies are always present, but the common housefly *(Musca domestica)*, the stable fly *(Stomoxys calcitrans)*, and the little housefly *(Fannia canicularis)*, can always be depended upon to be present, as well as several species of blow flies and reasonably flesh flies.

It has been estimated that more than 95 percent of all flies in houses are common houseflies, and the same holds for dairies. This is unfortunate since the common housefly also ranks first among the disease carriers. It prefers to breed in filth, it feeds on filth, then settles on food or utensils used in the preparation of food, leaving numerous colonies of organisms wherever it alights. It is often referred to as the typhoid fly and is known to be a carrier of the organisms causing dysentery, diarrhea, and tuberculosis as well as a number of other bacterial or coccal disease organisms, including many causing food spoilage and off flavors. It is a casual carrier, picking up and redistributing organisms as it moves about. It has sucking mouthparts and all food taken must be reduced to a liquid; accomplishing this the fly regurgitates on any solid substance, then sips up the liquid, leaving the pale fly specks so common on cupboards, windows, or dishes. It is especially inquisitive, visiting any number of places in a period of a few hours. The life cycle is short, and each female averages more than 1,000 offspring.

Houseflies breed in any decaying organic matter but prefer horse, hog, or chicken manure, or human excreta. There may be as many as 10 or 12 generations. The female is 10 to 12 days old before she starts ovipositing (this makes trapping practical, since it is often possible to collect the individuals before any eggs are laid). Each female lays 20 to 25 batches of eggs, each batch containing between 100 and 150 eggs. The eggs may hatch in 24 hours. The larvae complete their development in about 5 days. The pupal stage requires at least 4 days, and the adults may live for a month or more.

The stable fly, sometimes known as the biting housefly, seeks inside protection just before a rain or whenever the barometer goes down. It has sucking mouthparts and lives on blood. The life cycle is considerably longer than that of the common housefly, often requiring 3 weeks or more. The eggs are laid in decomposing organic matter, such as rotting straw in the manger, or bases of old hay stacks, in lawn clippings or any accumulation of vegetation.

Other flies found in dairies are of lesser importance in comparison with the common housefly, and since the

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control measures suggested for the common housefly will also control the other species, the details of their development will be omitted.

Control: The elimination of as many breeding places as possible is the first step in any housefly campaign. It is seldom possible to remove all possible breeding places, necessitating the maintenance of certain sanitary measures throughout the breeding season.

1. Fresh horse manure spread every third day will dry out before the larvae can mature.

2. Flies cannot complete their development in manure stacked on a concrete platform, surrounded by a concrete trough containing 2 to 3 inches of water. The maggots cannot reach soil suitable for pupation.

3. Dispose of garbage daily. Use containers with tight fitting lids and sterilize the empty containers.

4. The eggs or the maggots of flies in manure can be killed with borax. The fertilizing value of the manure will not be materially affected when borax is used as a spray or dust at the rate of an ounce per 10 bushels of manure. (An excess of borax may injure some plants where more than 15 tons of treated manure is spread per acre.)

5. Fly traps are too well known to need description. They should be set where flies naturally congregate. They should be cleaned out at least when one-fourth full—for sanitary reasons, the oftener the better.

6. Flies may be drawn out of a room by darkening all windows except for a small opening on the brighter side of the room. All flies will shortly find their way out of a darkened room.

7. Several poison baits are used to control flies. Formalin 1 part in 19 parts water attracts fles and gives a satisfactory homemade fly poison. It should be served in a shallow container such as a plate or saucer and gives best results where it is set on a window ledge or in the sunny part of a room.

8. The value of screens, fans, blowers, electrocutors, and fly paper must not be underestimated.

A clever method of keeping flies out of buildings and one that works especially well around dairies is the use of a false entrance. Extend the entrance out beyond the door, like an anteroom, for 3 or 4 feet with screened windows on either side and use an ordinary wooden door for an outside entrance. The flies attracted by the odor will settle on the screen, making it possible to come and go, admitting the minimum of flies.

The screens may be equipped with electrocutors or they may be painted with a formulation of DDT.

Under the present regulations of the Bureau of Milk Sanitation, DDT may be used in the receiving room, the can washing room, the bottle washing room, and in rooms where milk equipment is not located. It cannot be used in any room where milk or milk products are being prepared for sale.

There are a number of formulations for DDT each for a specific purpose. DDT dissolved in oil, such as Deo-base or kerosene, DDT dissolved in emulsifiable oils, or DDT in the form of a wettable powder, are used to kill flies around buildings. The important thing is to get a deposit of DDT on the surface where flies come to rest and for this reason any formulation used should contain at least 5 percent DDT, often 10 or 20 percent to assure protection for a reasonable period. The method of application is fully as important as the strength of the material used. The oil solution should be applied with a paint brush.

The emulsifiable oil may be applied with a brush, broom, or a paint syrayer.

Wettable powders are safer to handle than oil solutions. They are used in spraying buildings and can be applied to livestock. The distribution of DDT is improved by the use of soy flour, glue, or blood albumin as a spreader. Calculate the amount of actual DDT present and use half as much spreader. Mix the spreader with a small amount of water before adding to the tank and do the same with the DDT. The amount used will be governed by the length of time protection is required. The application can be made with a power sprayer or in the case of small lots with a knapsack sprayer.

Use 20 to 40 pounds of a 20 percent wettable powder in 100 gallons of water (12 ounces per gallon) or 16 to 32 pounds of a 25 percent (10 ounces per gallon) or 8 to 16 pounds of 50 percent (6 ounces per gallon).

Avoid excess of lime in any DDT spray.

DDT as a wettable powder is as safe as any of the arsenical sprays.

DDT is a new insecticide, and its toxic possibilities in different formulations are not too well understood. The following precautions should be observed in dealing with this material.

1. Treat DDT in any form as a poison.
2. Handle it carefully, not casually.
3. Do not get the oil solution on the skin or clothing. Where it accidently contacts the skin, wash immediately with soap and water.
4. Wear a mask to prevent inhaling the mist while making an application.
5. Do not spray DDT on food or on utensils to be used in the preparation of food.
6. Do not apply the oil solutions on animals.

Cockroaches: Cockroaches present an entirely different problem than flies. We import our cockroaches. The species infesting dwellings, warehouses, and other heated buildings are tropical and subtropical species, which have been able to adapt themselves to conditions such as exist in our buildings. Of the dozen or more species which find their way up to us from time to time, only three have been able to establish themselves permanently, and while other species may appear occasionally, their appearance usually does not warrant control measures.

The following species require control measures:

The German cockroach, *Blatella germanica,* sometimes known as the Croton bug, measures slightly over one-half inch in length. The sexes are similar in color and appearance, being light brown with two distinct dark brown, longitudinal stripes on the thorax and with wing covers extending slightly beyond the tip of the abdomen.

Each female produces 6 or 8 egg capsules and each capsule contains 48 eggs. The eggs hatch in from 3 to 6 weeks and the nymphs mature in 6 to 8 months. The adults live for 6 to 8 months after maturity. Under most conditions this is the predominating species.

The American cockroach, *Periplaneta americana,* is the largest species infesting Michigan homes. It thrives at a temperature range of 70° F. to 80° F. where there is an abundance of moisture and food.

The two sexes are similar in appearance, measuring from 1½ to 2 inches in length and with wing cover extending to or beyond the tip of the abdomen.

They live for 3 to 5 years, and each female produces about 90 egg capsules, each containing 16 eggs. These hatch in about 2 months and the nymphs reach maturity in 9 to 18 months.

The Australian cockroach, *Perieplaneta australasiae,* resembles the American cockroach but is slightly smaller and the golden yellow band ornamentin the thorax is extended down the front margin of the wing cover. This species occurs occasionally but is not established in the state. It is occasionally imported with fruit or other merchandise from the South.

The Oriental cockroach, *Blatta orientalis,* sometimes known as the "black beetle" is not general in its distribution as either the American or the German cockroach. It is a notorious scavenger often found around slaughter houses, garbage dumps, incinerators, sewers, and drain pipes. It is also very fond of fresh bread and may become a problem around bakeries.

The uniform, dark, reddish-brown adults are about 1 inch long. The wing covers of the males cover about ¾ of the abdomen while those of the females are mere stumps. Each female produces about 14 egg capsules, each containing 16 eggs. The eggs hatch in 7 to 12 weeks, and the nymphs reach maturity in about 10 months. Mature specimens live about 10 months.

Several factors tend to complicate cockroach control. The eggs are usually laid between walls, under floors or behind some stationary object. The eggs are laid over a protracted period and roaches in all stages of development are present. Both adults and young shun daylight, and in this way a serious infestation may build up before it is discovered. In buildings when cockroaches can get to water, they do not respond to baits attractive in dry places, and where there is an excess of moisture dusts are not effective.

Cockroach Control

Prevention: Good housekeeping deprives cockroaches of breeding quarters. To do this, eliminate cracks, crevices, boxes, etc., in which they may hide. This together with prompt destruction of garbage and proper storage of food supplies will go a long way toward preventing a serious infestation.

Control: Powders containing pyrethrum or thiocyanate or combinations of these materials and sodium fluoride are the most satisfactory control in dry places because powders will float into cracks and out-of-the-way places and remain effective for a longer period than sprays. In addition to blowing the powder into hiding places, it may be utilized by spreading in thin layers on shelves and covering with paper or spreading beneath trunks, boxes, or furniture.

Phosphorus Paste: Rotting vegetables, fruits, or warm bread smeared with a 2 to 3 percent phosphorus paste or where it is spread on boards or paper has been successfully used to kill cockroaches. It is particularly useful in damp places where powders fail.

The following are 7 separate suggestions for homemade roach powders and they are presented in order of effectiveness. Thiocyanate 2 percent may be substituted for pyrethrum or starch for pyrophyllite.

1. Pyrethrum (½ percent pyrethrins) .. 20 percent
   Sodium fluoride .... 10 percent
   Pyrophyllite .... 70 percent
2. Sodium fluoride .... 25 percent
   Pyrophyllite .... 75 percent
3. Sodium fluosilicate (fine) .... 50 percent
   Pyrophyllite .... 50 percent
4. Boric acid
5. Powdered borax (fine)
6. Sabadilla
7. DDT

Commercial roach powders are made from the same materials and by similar formulas. There are many good commercial roach powders.

In dry situations a self servicing roach poison station may be made by filling a bottle with a wick or a drinking fountain for chickens with a solution of 1 tablespoonful of borax in one quart of water.

Cockroach powders made from Sabadilla, DDT, pyrethrum, thiocyanates, borax, or boric acid are considered nonpoisonous to warm-blooded animals, while those containing sodium fluoride, sodium fluosilicate, or phosphorus are poisonous.

Sabadilla, at 20-percent grade or even higher concentration can be used to kill roaches. The German roach appears to be especially susceptible to this powder.

DDT kills cockroaches. The initial application tends to disturb them and they scatter out over the premises, but where a 5- or 10-percent powder is applied at regular intervals the control is more satisfactory than where ordinary roach powders are used. In damp places where powders are not effective, DDT dissolved in oil used as a 5- to 10-percent solution and injected back of baseboards or wherever cockroaches hide gives a kill over a prolonged period. DDT dissolved in oil is poison to warm blooded animals. Where it comes in contact with the skin wash immediately with soap and water.

Factors Which May Affect the Sanitary Quality of a Water Supply*

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THE dairy or milk sanitarian should be able to recognize the various factors which may affect the sanitary quality of a water supply, since a safe water is highly important and essential for every phase of the dairy industry whether it is the producer farm, milk depot, cream station, or processing plant.

It would be very difficult if not impossible to satisfactorily operate any one of the various steps in the producing or processing of dairy products without an adequate water supply and to process such products it is very essential from a health protection standpoint that the supply of water be of a safe, satisfactory quality. When a municipal or public water supply is available, connection to it should be made, since it probably provides the safest and most reliable supply which could be secured.

Type, location, construction, and operation are all important factors in determining the quantity and quality of a water supply. Let us take each item separately and consider how the supply may be affected by it.

I. Type. Water supplies may be divided into two general types: (a) surface supply; (b) underground supply.

(a) A surface water supply is one obtained from a lake or stream and cannot be considered satisfactory without some degree of treatment to make sure that disease producing organisms will not be transmitted by it. A spring, the source of which is within 10 feet of the ground surface, should be placed in this classification. After the spring has been developed it may be quite difficult to determine the source especially where there is no enclosure with an inspection manhole. When it is apparent that the area within a radius of 150 feet of the accepted source of the spring is free from surface contamination which might come from privies, septic tanks, seepage pits, disposal fields, etc.; and when the flow is relatively uniform and does not increase immediately after a heavy rain nor dries up completely; and where a series of water samples have shown safe analyses, approval of such a water supply would be justified.

Rain water which is oftentimes collected from roofs and stored in cisterns should be classified as a surface supply.

A surface water supply obtained from lakes or streams, shallow springs, and cistern water should first be filtered to remove all suspended material after which the entire supply should be chlorinated. Although there are a number of satisfactory ways in which this may be done, they all involve close supervision and regular attention and this type of water supply cannot be recommended where either driven or drilled wells, which will produce a suitable water, can be secured.

(b) An underground water supply is one obtained from a point at least 10 feet below the ground surface usually by means of a well. Wells may be designated as dug or bored, driven and drilled.

Dug wells are usually in excess of 2 feet in diameter, while the majority of bored wells are less than 12 inches in diameter. Dug or bored wells are

* Presented at the Dairy Inspectors' Course held at Michigan State College, April 9–13, 1945.

rarely more than 35 feet in depth and the majority of dug wells are less than 25 feet deep. The walls of dug wells are ordinarily poured concrete, vitrified clay pipe, concrete pipe, timber, brick, or stone, while most bored wells are constructed with concrete or vitrified clay pipe. It is difficult to construct a dug well so the wall and platform will prevent surface water from gaining access to the supply and therefore this type of well should not be recommended whenever a drilled or driven well can be secured. In localities where the upper soil formation is quite dense and where no or very thin water bearing formations are encountered, dug wells are necessary for storage especially where salt, oil, or gas renders the deeper ground water useless.

Driven wells are usually constructed of 1¼ inch iron pipe and are less than 50 feet in depth. The advantages of this type of well is low initial cost, both from a material and labor standpoint, since little equipment and no trained personnel are required. The disadvantage of a driven well is the difficulty of maintenance. The entire casing must be pulled up to replace a screen; there is no simple way to prevent freezing in cold weather without jeopardizing the safety of the supply; the upper part of the casing usually acts as a suction pipe and should a break occur near the ground surface contamination of the supply could easily result.

Drilled wells are constructed of iron pipe 2 inches or more in diameter and may be as deep as several hundred feet. This type of well is very permanent and extreme care should be exercised in its location. While the services of a skilled person and special equipment are required during construction and maintenance, it is seldom necessary to abandon a properly located and constructed drilled well.

In considering the type of a water supply and how it may affect the sanitary quality of the water, you should look with suspicion upon springs and surface water supplies. First choice should be given to drilled wells and second choice may be given to driven wells. A special type of well which would be least affected by possible surface contamination would be an artesian or flowing well. Since the casing is under pressure at all times, there is little chance that anything could enter this special type of well.

Since the majority of water supplies coming to the attention of milk sanitarians will be from wells, the following discussion will be limited, for the most part, to this type of supply.

II. Location. A well site should be selected so that two things are accomplished.

1st. The area immediately surrounding the casing should be free from flooding with surface water.

2nd. Sources of possible contamination such as privies, septic tanks, cesspools, seepage pits, sewer lines, disposal fields, etc., should be far enough away so that the source of the water supply will not be endangered.

A well site in order to be free from flooding should be on high ground and the well casing should preferably extend above the surface of the surrounding ground. Where a natural site which slopes away from the casing in all directions cannot be found, the same degree of protection can be provided by extending the casing a few feet above the natural ground elevation and forming a mound by filling in with clay or clay loam. Before a well is located in or near a basement, you should make sure there is no history of the basement flooding and that there is a drain provided which functions properly.

It is very difficult to state in feet the safe distance between a water supply and possible sources of contamination due to the presence of so many unknown and variable factors. Some of these factors are: type of soil formations between the ground surface and source of supply; direction and rate of ground water flow; elevation of the ground water table and degree of fluctuation; and amount of draw-down at various pumping rates. If all of the above factors could be determined under circumstances which would produce maximum hazardous conditions you might arrive at some such figure as 36 feet or 58 feet as a distance necessary to isolate a well from a certain source of contamination. Since it is impractical to do this it becomes necessary to base requirements on findings resulting from actual field tests made by various health agencies.

A private well equipped with a hand pump or a small power pump having a capacity of not more than 20 gallons per minute should be located at least 50 feet from sources of contamination such as privies, septic tanks, seepage pits, open joint sewers, disposal fields, etc. Where a pumping rate of over 20 g.p.m. is required this distance should be increased to 75 feet. These isolation distances apply to suction lines as well as to the casing. Buried or unexposed sewers should be located not closer than 30 feet from a well casing or suction pipe while an exposed sewer located in a frequented place may be as close as 10 feet. All sewers located within 50 feet of a well should be constructed of cast iron soil pipe, with watertight joints.

The rate and direction of flow of the ground water is the most important single factor in determining the location of a well. Contamination will travel vertically downward until it encounters the ground water level, and then moves horizontally in a narrow path in the direction of the ground water flow. It is therefore easy to see that a well directly in the path of contamination does not have the same degree of protection as a well not in the path of contamination.

It is very difficult to determine the direction of flow of ground water but it is usually toward a near-by lake or stream. When there is no near-by body of water the direction of flow may to some extent be indicated by the general direction of the surface drainage.

III. Construction. After the site of the well has been chosen it is important that good materials and good workmanship be used in its construction.

There is a definite relationship between the depth of a well and its ability to produce safe water at all times. Shallow wells are more likely to show unsafe samples than are deep wells. The minimum depth at which safe water can be obtained will vary with different soil formations and surrounding conditions. It is recommended that all wells be 25 feet or more in depth. In no case should water be drawn from a depth of less than 10 feet if deeper water can be obtained. In cases where the well is less than 25 feet in depth, adequate protection by means of an impervious layer of soil or ample submergence of the screen is necessary. The top of the screen should be at least 5 feet below the ground water table for wells where a pumping rate of less than 20 g.p.m. is required. For wells having a higher pumping rate the distance should be increased.

In hand pump installations the well top or platform should be a water-tight reinforced concrete slab of a minimum thickness of 4 inches, extending at least 2 feet from the well casing in all directions. The slab should rest on compact earth. The surface of the slab at its outer edges should be 4 inches above the surrounding ground surface. The concrete should be sloped from the well casing to the edges of the slab.

Hand pumps should be so constructed that the spout is of the closed, downward directed type; that there is a tight connection between the pump rod and the body of the pump; that the base be of the solid one-piece recessed type cast integrally with or threaded to the pump column or stand; and that the base be of sufficient diameter to permit the well casing or pipe sleeve to extend at least one inch above the platform or pedestal on which the pump will rest. The pump should be rigidly fastened to the platform or pedestal and suitable gaskets or other means should be employed to insure a water-tight connection.

Power pumps should either be directly screwed to the casing or when placed immediately over the well casing or pipe sleeve, should have a watertight metal base to form a cover for the well. The base plate of power pumps should be so constructed that the casing or pipe sleeve will extend up into the base to a point at least one inch above the level of a 12 inch concrete pedestal. The base plate should be so constructed as to prevent the accumulation of waste water at this point. When an air-relief valve is necessary the opening into the vent line should be at least 24 inches above the pump room floor and the open end screened or protected against the possibility of contamination entering the vent. The discharge tee from power pumps should be above the pump room floor.

In power pump installations well heads, well casings, pumps, pumping machinery or suction pipes should not be located in any pit, room or space extending below ground level, or in any room or space above ground which is walled in or otherwise enclosed unless it has free drainage by gravity to the surface of the ground. Pipes to accomplish this drainage should be cast iron with leaded joints and should not be connected to a sanitary sewer or to pipes carrying sewage. These pipes may be located as close as 2 feet to a well casing, provided they discharge only to the ground surface at an elevation above the highest known flood stage. The cast iron pipe should be carried to a point at least 4 feet outside the basement or pit wells and connected to other suitable pipes which discharge at least 30 feet from any ground water supply.

In hand pump installations where a frost pit is used, it should be drained to the ground surface at an elevation above the highest known flood stage or to a gravel pocket which is above the ground water table and is removed from contact with sewage or other wastes. When it is necessary to provide an access manhole for a frost pit or underground pump room a collar at least 2 inches high should be provided to act as a "dam" around the opening and the cover should have an overlapping edge to prevent the entrance of surface water or foreign material.

While any one of the above-mentioned conditions might be the cause of a well becoming contaminated, the greatest danger is from water from the surface or from very near the surface entering the well and carrying contamination with it. Therefore, it becomes very important that the casing remains watertight, that it extends above the ground surface and is not subject to flooding, and that it is connected to the pump by a watertight connection or extends at least one inch above the platform or pedestal.

IV. Operation. The same precautions necessary to guard against post contamination of a pasteurized milk supply are also important in a water supply. It would be useless to go to a lot of trouble regarding the well site, the type of construction and the quality of the materials used in developing the supply if such things as cross connection, back-siphonage, disinfection after repair work, use of open storage reservoirs, etc., were not considered as possible factors which might affect the sanitary quality of the water supply. These factors will be classified under the heading operation.

Disinfection is an item that should never be neglected, whether it be a new well, an old one which has undergone repairs or one which has become contaminated accidentally. All that anyone needs to do is watch a well driller at work and immediately one realizes why new wells show contamination. The drills, the bailer, the rope or cable, all lie around on the ground and usually in muddy places. Storage and handling of new pipe is seldom done in a sanitary manner and little or no precaution is exercised to clean the pipe before it is installed.

After completion of a new well and following repairs on an old one disinfection by use of a chlorine solution should always be done. This safeguard to wells is just as essential as sterilizing milk utensils and pipe lines after use if bacterial contamination is to be controlled.

Mention was made under the section on construction that there should be no physical connection between a safe water supply and an unsafe supply. Whenever two supplies exist, one which is safe and the other unsafe, there is danger of two things happening. First that the unsafe supply may accidentally be used for the safe supply and second that the two supplies become cross connected by a stranger or someone unfamiliar with the piping systems during the installation or operation of equipment. By simply placing a section of hose between two faucets, one connected to the unsafe water system, the other connected to the safe supply, a cross connection could be set up which might cause disastrous results in a milk plant or creamery. When there are two water supplies available and the safe supply is not adequate in quantity at all times there is always the danger of substituting the unsafe supply for part if not all of the needs.

At times there may be a need for priming pumps and any water used for this purpose should be examined carefully. Unless a portion of the well supply is retained in a priming tank the priming water is usually obtained from some questionable source and therefore must be considered of an unsafe quality. Although it may be well water stored in a barrel or open tank for dipping or draining into the well, all such handling adds to the possibility of contaminating the supply.

In certain water systems open storage reservoirs or open surge tanks are sometimes installed. Open tanks are subject to contamination from dust and dirt and there is considerable danger of birds, animals, and insects getting into such tanks. All tanks connected to a safe water system should be covered and inspection entrances should be fitted with tight covers or doors.

Certain pieces of equipment which come in contact with contaminated materials and which are connected to sewer lines as well as the water supply may be subject to back-siphonage. This can be especially true when such equipment is located on the second floor and the water system is drained. Any toilet fixtures or pieces of equipment of a similar nature should be equipped with vacuum breakers.

Many times a person who installs a new well to replace an old one wants to retain the old well as a stand-by in cases of emergency even when the old well cannot be approved for use. Usually the old well will not function should it ever be needed and it serves only to endanger the sanitary quality of the new well. An old abandoned well could easily allow surface water to enter an underground water-bearing stratum and in cases where the two wells are about the same depth the possibility of danger to the new well is greatly increased. Old unused wells should be properly abandoned by filling in the casings with puddled clay throughout their depth. After the clay has been added the top section of the casing may be unscrewed and pulled out of the ground. The resulting opening should be filled to the ground surface with puddled clay. Plugging or capping the top of the casing, even with a threaded or welded cap, does not provide permanent protection to the ground water. Iron or steel casings in time deteriorate and develop leaks and oftentimes their locations are forgotten with the result that they become potential hazards to all producing wells in the locality.

Abandonment of a dug well should be made by removing the top four feet or more of the well wall and filling in the well with clean earth tamped in place.

Any mention of collecting water samples for bacteriological examination was left until the last since it is probably the least important factor yet considered. I like to think of a water sample as a tool to be used to make sure nothing has been, overlooked in the inspection of a properly located and constructed well. A water sample should be used as the final check to make sure that no conditions exist which cannot be determined by a thorough visual investigation.

Factors to be Considered in the Design, Construction, and Maintenance of a Sewage Disposal System*

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THERE is nothing which creates a greater problem than providing a proper method of sewage or waste disposal in certain phases of the dairy industry, especially for a large milk processing plant. Needless to say from the standpoint of the owner the most convenient method is to make connection to a public or municipal sewer system when available. In such cases the responsibility for proper treatment and disposal is usually shifted to the municipality or owner of the public system. This does not hold true in the case of discharging wastes into a county drain since an amendment to the Michigan Drain Law, which went into effect January 9, 1945, makes it unlawful to discharge or continue to discharge any sewage or waste matter capable of producing in said drain detrimental deposits, objectionable odor nuisance, injury to drainage conduits or structures, or such pollution of the waters of the State receiving the flow from said drain as to injure livestock, destroy fish life, or be injurious to public health.

Many attempts have been made to devise some means of treatment for various types of milk wastes in such a way that they will not cause nuisances, create a health hazard or be detrimental to fish life. As stated by Professor E. F. Eldridge of Michigan State College, one of the outstanding difficulties encountered in these attempts is the development of an effective process of treatment which can be applied to plants having only a small capital investment. Professor Eldridge further states that there is very little chance that one particular method will ever constitute a general method, applicable to all milk plants. Local conditions vary too widely for this to be possible and methods entirely feasible at one place might not be practical at another.

No attempt will be made at this time to outline the many factors involved regarding the various methods of disposal which have been employed for milk wastes, but it is highly important to understand that septic tanks cannot be recommended as a satisfactory method of treatment. Professor Eldridge states in his "Studies on the Treatment of Milk Products Waste" that "the use of septic tanks with a very long detention period has many disadvantages". "Any number of plants have attempted their use and have been forced to abandon them because of odors and scum troubles. The acid-producing constituents of the wastes cause a precipitation of the casein which is carried to the top of the tank and soon produces a thick scum. Gas produced by the septic action rises in the tanks and breaks up this scum which is then carried out of the tank in the effluent."

Where a private disposal system must be provided for liquid wastes from a milk house on a producer farm or from a receiving station or bottling plant of average capacity, one of two methods may be practical and feasible from an economic standpoint. The first important recommendation in either method is to prevent undue waste which can be accomplished by eliminating leaks in pipe lines, draining of milk cans and utensils before rinsing

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or washing, and avoiding the dumping of spoiled products into the disposal system. The method most widely used and one which is usually the most practical is to discharge the wastes into an underground seepage pit or tile disposal field and depend on direct absorption into the surrounding soil. When the pit or field becomes clogged a new one is constructed and in the case of a seepage pit, connection is made to the old pit rather than to by-pass it.

Another method may be used where soil conditions at the milk house or plant are not suitable for direct absorption and that is broad irrigation at some removed location where sandy ground can be found where liquids will seep away. When an area can be found sufficiently removed from dwellings to prevent an odor or fly nuisance, this method is very effective and quite economical. The main cost being the time and equipment required to haul the wastes to the disposal site. A tank mounted on a trailer and equipped with a discharge nozzle is the ideal type of equipment. It is sometimes necessary to provide a holding tank, and pump the wastes into the portable tank wagon. Caution could be exercised to see that wastes are not held for long periods since best results will be obtained if the wastes are not allowed to become acid through the natural souring process of milk products.

From a disease prevention standpoint it is probably most important to give first consideration to proper disposal of human excreta both on the milk producer farm and at the various milk processing plants. As milk sanitarians we should educate and encourage people to provide sewage disposal facilities which are convenient and desirable to use. Unless toilet facilities are so located as to be convenient to all who should use them, sanitary conditions cannot be maintained and it may be necessary to require additional facilities at more than one location. There can be no definite standards established to determine a convenient location, but where the only toilet seat is located in the house it is very probable that it will not be used by the men on a producer farm on all occasions. By observing the habits of employees, owners can determine the number and location of toilet facilities required. In order to encourage proper personal hygiene hand washing facilities should be convenient to the toilet.

The type of facility which is the most desirable and furnishes the best conveniences to the user is the flush toilet. This facility requires water under pressure and when such a system is available little difficulty is encountered in providing hand washing facilities with hot and cold running water. When a public sewer is not available a flush toilet requires some type of private disposal system for the liquid wastes produced in connection with its use.

SEPTIC TANK AND DISPOSAL FIELD OR SEEPAGE PIT

The most satisfactory sewage disposal system for household wastes both from an economic and operation standpoint is a septic tank connected to an underground tile disposal field. In certain localities a disposal field may not be practicable due to soil conditions. The porosity of the soil should be determined by percolation tests. From the results of these tests it can be determined if a disposal field may be used and the amount of tile needed per person to be served. In a very few special cases a seepage pit might be substituted in place of a disposal field. The existence of a thin layer of clay near the ground surface or the presence of many trees or a very limited available space might favor the use of a seepage pit. Since such a pit allows contamination to proceed a considerable distance below the ground surface before purification begins, it does not afford the same degree of protection to a water supply as does a disposal field. For the same reason an abandoned well must never be used for the disposal of sewage or septic tank wastes. Should such a practice ever come to your attention, the state department of health should be notified of the fact.

The capacity of the septic tank is usually designed on the basis of a 24 hour detention period or, in other words, the liquid capacity of the tank should equal the amount of liquid wastes produced in a 24 hour period. While about 30–50 gallons of liquid wastes will be produced by each person in a family, no septic tank should have less than 500 gallons liquid capacity. An easy way to remember the proportions for a septic tank is to concentrate on the number 5. 500 gallons capacity —50 inches water depth—5 feet long and since we have three 5's the width is 3 feet. The 3 and 5 feet are inside dimensions.

In planning a sewage disposal system two locations are important; that of the septic tank and that of the tile disposal field and both should be at least 50 feet from a well. Full details as to locations of sewer lines and other precautions to be considered for the protection of a water supply were outlined under a previous discussion. The tile field should be located on a level plot of ground of a sandy or gravelly nature preferably about 2 feet lower than the ground surface at the septic tank. The tile lines of the disposal field should be about 12 but not more than 20 inches below the ground surface.

Where a sufficient fall can be secured from the tank to the tile field a dosing chamber may be included in the system. The dosing chamber is provided with a bell siphon or other automatic dosing device which will distribute the tank effluent throughout the entire length of the tile lines. The capacity of the tile lines should equal one dose of the dosing chamber and there should be about 3 doses per day. Intermittent dosing allows the tile lines to become completely free from liquid thus becoming filled with air, and since oxygen is necessary to provide a high degree of treatment for the tank effluent a dosing chamber should be included whenever practical.

When the various units of the disposal system are properly located in relation to the well there is probably not too much reason to be interested in the particular materials used in their construction. A septic tank and dosing chamber are sometimes constructed of reinforced concrete, concrete block, vitrified tile, plank, steel or other metals, and little danger would result if a leak developed due to faulty construction, use of porous materials, or deterioration of materials, provided the well was far enough away. If the leak were serious enough to prevent the particular unit from functioning properly, the efficiency of treatment would be lowered and from this standpoint the type of material becomes important. We do know that the life of the ordinary commercial septic tank made of 12 to 14 gauge metal is seldom over 12 years.

The sewer extending from the house to the septic tank and from the tank to the disposal field should be not less than 4 inches in diameter, have a 1/8″ fall per foot for the 4″ size and when located within 50 feet from a well casing or suction pipe be constructed of cast iron with watertight joints. Four inch farm drain tile of vitrified clay should be used for the disposal field. These tile, in one foot lengths, should be laid level with the ends about 1/8 inch apart. The trench for these tiles should be dug about 18 inches wide and about 4 inches deeper than the tiles are to be laid and this extra depth filled with gravel of 1/4 to 1/2 inch in size. After the tiles are in place more gravel should be added to completely surround the tile with a 4 inch layer before backfilled with ordinary earth.

It is realized that the milk sanitarian will be unable to ascertain many of the factors concerning the design, construction, and maintenance of the sewage disposal system but certainly evidence of sewage or liquid wastes discharging on the ground surface would be classified as improper operation. Contrary to general belief, action in the septic tank does not kill bacteria, and disease producing organisms could well survive conditions present in the tank. A septic tank at peak efficiency may remove not over one-half of organic solids and as any one of you would readily attest to the fact that tank effluent is anything but a clear, sparkling fluid, free from odors and suitable to drink.

There are three or four questions which are often asked concerning the operation and maintenance of septic tanks.

Question 1. How often should my septic tank be cleaned?

Answer. The tank should be examined periodically (every 18 months) to determine if too much sludge or scum is accumulating. When the total thickness of the scum and sludge exceeds 2 feet the tank should be cleaned. Cleaning should take place in the spring rather than in the fall to avoid loading the tank with undigested solids during the winter months.

Question 2. Will soapy, greasy water from the sink, shower, bathtub or laundry prevent proper action in the tank?

Answer. It has been repeatedly found that when the septic tank is of the proper size and design it will handle all those wastes from the average home without trouble. For the average household a separate grease trap or interceptor is not recommended.

Question 3. Will chemicals used to clean toilet bowls injure the tank or prevent septic action?

It is probable that an unusual amount of waste of an acidic nature might interfere with the normal action in the tank but the amounts of such materials commonly used in domestic processes are too small to be the cause of trouble. The tank contents are normally alkaline enough to neutralize any acidity which would ordinarily be added.

Question 4. Should the wastes from a milk house be connected to the septic tank?

Answer. Liquid wastes containing some milk solids such as those resulting from rinsing or washing milk pails, strainers, and milking machines, will probably not be detrimental to the action of the septic tank. There is one practice which should definitely be avoided, and that is the dumping of several gallons of whole or skim milk into the septic tank.

Cesspool

A cesspool is a covered pit with open-joint side walls into which raw sewage is discharged and is sometimes substituted for a septic tank and disposal field. The liquid portion of the wastes entering a cesspool is disposed of by seepage or leaching into the surrounding porous soil, the solids or sludge being retained in the pit. With this type of system the sewage enters the ground at such a depth that little assistance can be expected from natural purifying agencies and harmful bacteria along with liquids soak into the ground, endangering nearby wells. Due to this fact the use of cesspools should be discouraged and in order to adequately protect a well an isolation distance of as much as 150–200 feet may be necessary, depending on soil conditions and the depth of the cesspool and the well under consideration.

Since the solids are not removed before sewage is emptied into a cesspool the openings in the soil tend to seal up quickly, thereby reducing the leaching area which often results in complete stoppage. This condition causes the cesspool to overflow and create a definite health hazard.

Pit Privy—Septic Toilet—Chemical Closet

Due to economic reasons or where a water pressure system is not practicable because of freezing conditions a sanitary pit privy, septic toilet, or chemical closet affords a safe sanitary method of sewage disposal.

In most states there is a definite state law and many times regulations adopted in connection therewith which definitely relate to this type of sewage disposal. In Michigan Act 273 of the P.A.1939 is in effect, but I wish to call your attention to Sec. 4 of this Act which exempts any privy located outside the corporate limits of any city or village which is more than 200 yards from a residence other than the residence the privy serves, or more than 200 yards from any other place where food, milk, or drink is served, stored, or prepared for human consumption. While no legal opinion or test case has been made regarding this section, the Michigan Department of Health has considered any privy, septic toilet, or chemical closet located on a milk producer farm to be subject to Act 273 and regulations adopted in connection therewith.

Since these regulations include details in a concise manner I believe there is no need in re-stating them in this discussion. The essential features are that privies or outhouses be fly-proof, rodent proof, and not subject to surface flooding. The location in relation to wells was outlined in a previous discussion under water supply, but since this type of sewage disposal utilizes little or no water there is probably the least chance of contamination to the source of water supply than from any other type. Caldwell in her experiments with the Field Research Laboratory of the Alabama State Dept. of Health in 1932–33 states that—from a dry pit latrine (i.e., not receiving fluid other than from excreta) located in an area of high ground water of comparatively rapid flow there was no contamination of test wells located in the path of flow 5 feet from the pit, when the water table in general was 1.5 to 2.0 feet below the pit floor and within 6 inches for a period of a month after beginning use. Even when 100 gallons of water was added to such a pit each day, colon organisms travelled 6 but not 7 feet beneath the pit and approximately 2 feet laterally, though in significant numbers only 1 foot.

The superstructure or building used as a privy or outhouse has little or nothing to do with the sanitary disposal of sewage. Psychologically it may have something to do with proper maintenance but that is all. A few years ago most specifications for a sanitary privy required the covers for the seat openings to be self-closing but it is now considered better practice to require a hinged lid which is not self-closing and depend upon the user to see that it is kept closed when not in use. Any privy that has a pit of ample capacity, a good tight floor, a well constructed riser, a hinged seat cover and a vent which is properly screened meets all of the requirements for this type of sewage disposal.

The practice of cleaning a privy has become rather general and will be hard to eliminate, but from a health protection standpoint it is very important that a pit be provided for every privy and the building moved to a new pit when material reaches a point about 1 foot below the ground elevation. Any time you give instructions to provide a pit make sure you also state that a wood crib be used to prevent cave-in which would undermine the foundation for the building and expose fecal material to flies and rodents. Educate people to furnish earth pits for privies and all material removed from septic tank type privies and chemical closets should be buried with an earth covering of at least 12 inches in thickness and in a location more than 200 feet from any domestic water supply, lake, or stream.

It is hoped that the various factors covered in the subjects on water supply and sewage have not been in too much detail, however, every milk sanitarian should be familiar with the health reason back of his recommendations. Everyone in this field of work should be able to give the reason why and the best way to become familiar with details is to actually do the work. I therefore suggest you roll up your sleeves and help with some of the manual labor when the occasion presents itself. Put on a demonstration on proper septic tank construction or personally supervise the construction of a well house and should the plumber or well driller be present, there should result three promoters of good health practices instead of one. You should remember that the plumber and well driller contact the owner last and if his views do not coincide with yours there may be a disappointment on your part of the final job. There is no real reason why various agencies do not talk the same language because there must be a fundamental reason for every fundamental recommendation in the field of sanitation and in the protection of health.

NEW ENGINEERING COURSES

Because of today's multiplicity of scientific and technical instruments and the tremendous extension of the use of instruments which came in the war years, the Polytechnic Institute of Brooklyn, as a new departure in an engineering curriculum, is offering four graduate courses dealing exclusively with instruments.

Offered as a group as a means of bringing together the fundamentals in the theory and application of instruments and instrumental controls, two of the courses will start with the fall term which opens Tuesday, October 2nd, and two will be given during the spring term.

Designed to give graduate engineers a much better start in the field of instrumentation than is possible through developing their knowledge in conjunction with a single industry, these courses will provide a study of the tools used in science and engineering as they are bound up with and used interchangeably in all of the engineering fields, such as mechanical, electrical, chemical and aeronautical. The modern hydraulic, pneumatic, electric and electronic industrial control equipment; the amplifier and thyratron circuits and vacuum-tube voltmeter of electronics; and the synchros, electronic systems, amplidynes, rot-o-trols, hydraulic motors and anti-hunt devices of servomechanisms are included in the range of instruments and instrumental controls to be covered in the courses.

According to Dr. Raymond E. Kirk, dean of the Graduate School, up to the present time specific courses have not been organized about the performance and operation of instruments as such. In the future even more will be done with instruments than in the past and, because of the growing complexity of instruments, it will be increasingly necessary for engineers to have a direct means of familiarizing themselves with the field as a whole.

The two fall courses are Principles of Electronics, which is a class and laboratory course for students who have not majored in electrical engineering; and Instrumentation, a course presenting the analysis of the static and dynamic performance of measuring and indicating instruments. The two spring courses are Industrial Application of Instruments, which is designed to familiarize the engineer with the application of measuring and indicating instruments for industrial purposes; and Servomechanisms, which will present the principles of servomechanism control systems.

New Law Covers Registration of Laboratories Examining Milk or Milk Products

FRIEND LEE MICKLE, SC.D.

Director, Bureau of Laboratories, State Department of Health Hartford, Conn.

A NEW law, Section 601h of the 1945 Supplement to the General Statutes, becomes effective October 1, 1945, in Connecticut. At a meeting on August 2, 1945, the Public Health Council of the State Department of Health amended Regulation 40-D of the Connecticut Sanitary Code, effective October 1, 1945, to carry out the provisions of the new law.

Beginning October 1, 1945, any person, firm or corporation is forbidden by Section 601h of the 1945 Supplement to the General Statutes to operate or maintain a laboratory in Connecticut in which any determination, examination or analysis is made of any sample of milk, cream, frozen dessert, milk product or milk beverage, or of any container or package used or intended to be used for holding any such product, until that laboratory has been "registered" with the State Department of Health. Registration is a simple procedure and consists of furnishing to the Department the name of the laboratory, its location, the name of the person or persons owning or operating it, and such additional information as may be required regarding the tests made and the equipment and the personnel of the laboratory. The laboratory testing of any of the products named above, no matter where carried on, is deemed by the law to constitute operating or maintaining a laboratory. Nothing other than registration is required of any laboratory so long as the results of the laboratory findings are used solely by the person, firm or corporation that operates the laboratory.

Under Section 601h of the 1945 Supplement to the General Statutes "approval" of a laboratory is required before any laboratory results or findings on any of the products mentioned above, or any interpretation thereof, may be reported for use by any person, firm or corporation other than the one maintaining the laboratory. Application to the State Department of Health for approval must be made on blanks that will be provided for the purpose. Under Regulation 40-D of the Sanitary Code as it has been revised, such laboratories as are approved will be given a certificate of approval for making specified determinations, examinations or analyses and the laboratory will then be designated as a laboratory approved for making those particular examinations. Certificates may be revoked or suspended at the discretion of the Department if at any time the standard of performance is found to be below that required of an approved laboratory. Certificates also routinely expire at the end of each calendar year.

As is specified in Regulation 40 of the Sanitary Code, as revised, the requirements and standards for approval of milk and milk products laboratories are based upon the ability and qualifications, as determined by investigation or examination, of the person in charge of the laboratory; upon adequate and suitable housing, equipment and apparatus; and upon agreement on the part of the person in charge to adhere to the standards upon which approval is based.

The provisions of Section 601h of the 1945 Supplement to the General Statutes do not apply to any laboratory established for the purpose of providing data for state or federal officials for the enforcement of dairy and pure food laws nor to any person engaged in the weighing, sampling or testing of milk or cream which is to be bought or sold on the basis of butter fat content under the provisions of Section 2464 of the General Statutes, as amended. It applies to all other laboratories and persons, and a fine of not more than $100 is provided for any person, firm or corporation who violates any provision of the law.

RESEARCH REVEALS NEW CONCEPT ABOUT BUTTER

Two years' study of the fatty acids of butter at the University of Rochester have already revealed interesting and vital information concerning butterfat. This research is entering its third year under the direction of Dr. W. R. Bloor, a renowned authority on the chemistry of fats. It is financed by the American Dairy Association, through the supervision of the National Dairy Council, as one phase of the correlated research program of the dairy industry. The project is designed to reveal clear-cut information on the chemical composition and nutritional importance of the fatty acids of butter.

These fatty acids were first extracted from butterfat and purified. They were then separated into one volatile, two liquid, and two solid fractions. Each of the resulting five fractions was mixed with a basal ration of whole wheat flour, non-fat dry milk solids, and salt. These five diets were fed to rats, and the effects on growth were compared with those observed when a diet containing whole butter was fed. Since the vitamin A was destroyed in the process of fractionating the butter, raw carrot was fed, as a dairy course of carotene (pro vitamin A) to the animals receiving the fatty acid diet. A supplement of vitamin D was given to all the animals. The animals had free access to the food and careful records of food consumption were kept.

From the results reported by Dr. Bloor it seems obvious that the fatty acids. which have special growth promoting value. are found in the liquid or unsaturated fractions. Weight gains similar to those induced by whole butterfat were observed when the liquid fatty acids were fed. The acids of the volatile group were considerably less effective in this respect.

Relationship between body growth and the vitamin A content of the liver was observed. The animals which had received the liquid fatty acids grew best and stored about twice as much vitamin A in their livers as did the animals which had received the solid fatty acids. Those which had been fed the volatile fatty acid not only made the poorest growth, but also stored the least amount of vitamin A. The entire supply of vitamin A for the animals fed on the various fatty acid fractions was derived from raw carrot, and consequently, the storage of vitamin A in the animals fed the whole butter cannot be compared with that of the animals fed the various fatty acid fractions. The storage of vitamin A induced by the butter diet was relatively great since the supply was derived from both butter and raw carrot.

This preliminary research report indicates definitely that the chemical composition of a food fat helps to determine the nutritive efficiency of other foods. It is highly probable, therefore, that some fats are more efficient than others in so far as their influence on utilization of the carotene of a mixed diet is concerned.

Much evidence in scientific literature suggests that in butterfat nature has achieved the optimal composition of a fat. This is very significant since, according to a recent Government survey, over one-half of the vitamin A potency of the average American diet is derived from vegetables—foods which are virtually fat free.

D D T—Its Possibilities and Limitations*

H. H. SCHWARDT

Cornell University, Ithaca, N. Y.

DDT which has the formidable chemical name dichloro-diphenyl-trichloroethane was brought into the United States in 1942. Limited tests of its insecticidal value were made by the U. S. Bureau of Entomology in 1943 and larger scale investigations by both state and federal agencies followed in 1944 and 1945. The general optimism with which entomologists regard this new material was well expressed in an official statement published during their national meeting in December, 1944. The statement read in part, "We feel that never in the history of entomology has a chemical been discovered that offers such promise to mankind for relief from his insect problems as DDT. There are limitations and qualifications however."

Some of the interesting possibilities which DDT offers are:

1. The eradication of the house fly in urban areas and nearly complete freedom from its annoyance and danger in rural areas.
2. The eradication of malaria from the United States.
3. The control if not the eradication of typhus and other louse borne diseases.
4. Very effective control of bedbugs, fleas, leafhoppers, Japanese beetles, flea beetles, potato bugs, thrips, forest insects, soil insects, stored grain insects, mosquitoes, black flies, related biting gnats, and many others.

On the limitation side are:

1. The possible toxicity of DDT in some forms to man and his domestic animals, and to certain plants.
2. The danger of killing bees, parasitic and predaceous insects, fish, frogs, birds, and other beneficial forms of animal life.
3. The relative ineffectiveness of DDT against certain serious pests notably the cotton boll weevil, the Mexican bean beetle, the alfalfa snout beetle, grasshoppers, and certain mites.
4. The probable difficulty of removing DDT from products which must meet residue tolerances.

Pure DDT is a white crystalline substance insoluble in water but soluble to various degrees in many organic solvents including cyclohexanone, acetone, benzene, xylene, and kerosene. Its rate of evaporation is very low, a fortunate property from the insecticidal point of view since it gives DDT its remarkable residual effects.

DDT lends itself readily to a variety of useful formulations. Mixed with pyrophyllite it can be ground to a fineness suitable for agricultural dusting operations. By the addition of a wetting agent these dusts are made water dispersable and used as sprays. Dissolved in an organic solvent such as kerosene, DDT can be sprayed on interior surfaces of buildings without leaving an objectionable white residue. Emulsions of such solutions are equally suitable for interior spraying and are also useful for louseproofing clothing and moth proofing fabrics. When small deposits of extremely fine par-

* Presented at regional conference of Dairy Sanitarians in Rochester, N. Y., September 27, 1946.

ticles are called for, DDT dissolved in an organic solvent can be dispersed in aerosol or fog form.

DDT is an inexpensive insecticide because it is effective at very low concentrations, and its long residual effects make frequent applications unnecessary in many control operations. As an example, 20 gallons of an aqueous spray containing 3 pounds of DDT to the hundred gallons will keep the average 30 cow dairy barn largely free of flies for two months. Two applications of such a spray, one in late May and one in late July will give good protection for the entire fly season in central New York. The cost of the DDT for this 40 gallons of spray is $2.40 at current prices. If an ordinary 3 to 5 gallon garden sprayer is used for applying it about two hours of labor will be required for the two applications. If a power sprayer is available less than an hour of time will be required.

During the summer of 1945 the Department of Entomology at the Cornell station sprayed about 75 dairy barns with DDT using various dosages and schedules.[1] The barns used for this work ranged from high class establishments almost fit for human habitation to poorly constructed places containing many month's accumulation of manure and with walls and ceilings covered with cobwebs. Water dispersable sprays were used and the dosages were determined in terms of actual DDT. Application was usually made with a 50 gallon orchard type sprayer which maintained a pressure of 375 pounds. While excellent results can be obtained with small garden sprayers, power equipment is desirable because of its speed, better agitation, and because greater penetration is obtainable. Penetration is important in barns heavily hung with cobwebs and their included trash. The spray was applied evenly but lightly to walls, ceilings, and support timbers. Feed troughs and drinking fountains were not covered but care was taken not to direct the spray into these receptacles. Though it probably was unnecessary, animals were removed from the barns during the spraying operation. The sprayed surfaces were completely covered but no run off allowed. The correct coverage is closely approximated when a standard orchard type spray nozzle equipped with a number 3 disc is held four feet from the wall and moved along at a fast walk. The water dispersable materials used came in the form of dry powders. Before adding the dry material to the spray tank it was mixed into a thin paste with a small amount of water. This procedure insures more uniform dispersion of the material in the spray. Counts of flies resting on various objects or areas in the barn were made before spraying and at intervals after spraying until the treatment obviously was losing effectiveness.

The results of this work indicate that three pounds of DDT in a hundred gallons of spray will give excellent protection against house flies for two months and that two applications during the season will give reasonable freedom from flies from frost to frost. The best timing for these two applications was late May and late July. These figures and dates are for central New York. Larger dosages and more frequent application will be required farther south.

It should be emphasized that frequent and proper disposal of manure is essential to good fly control even in the presence of DDT. While DDT will greatly reduce fly populations regardless of the sanitary condition of the premises, it is necessary to keep the barn and lot free from manure accumulations if highly satisfactory control is to be attained.

Some investigators report that increasing the concentration of DDT beyond 3 pounds in a hundred gallons increases the duration of its residual effect. They suggest that a dosage

[1] Most of the field work on this project was done by R. F. Pendleton, assistant in the department of entomology, Cornell University.

may be found which will give entire season protection with a single application. Our data on this point are not extensive but they suggest that increases in dosage beyond 3 pounds do not give proportionate increases in the duration of residual action. In spite of the almost negligible evaporation rate of DDT, residues on barn walls and ceilings do lose effectiveness over a period of time. This may be caused by masking of the deposit by dust or cobwebs, by cattle rubbing against the walls as they go in and out, or by brushing the walls with hay or bedding as it is brought into the mangers or stalls. If the walls are swept off, washed, or whitewashed the residue will of course be reduced. A heavy spray increases the hazard of accidental poisoning of the animals. While this danger probably is remote it should be kept in mind until more is known about the toxicity of DDT to various farm animals. In general the data at hand indicate that two sprays a season at a moderate dosage are preferable to one at a high dosage. The ease of application and low cost of the material lend additional weight to such a recommendation.

The application of DDT in combination with whitewash is an inviting procedure since it eliminates one spraying operation and would enable dairymen to use custom spraying services for DDT applications. Preliminary laboratory studies however suggest that DDT is less effective when applied along with whitewash, possibly because it is partially masked by the greater volume of the whitewash materials. In many barns whitewash is applied only once a season and the time of application usually is different from the recommended timing for DDT applications. Operators of whitewash spraying outfits should be encouraged to offer DDT spraying service to their clients but probably should be asked to apply it as a separate operation after the whitewash has dried.

Those of you who may have to advise dairymen on the use of DDT should remind them that the water dispersable formulations offered by the various companies may contain from 20 to 50 percent of actual DDT. Fifteen pounds of 20 percent material, or 6 pounds of 50 percent material are required for sprays containing 3 pounds of DDT to the hundred gallons.

The toxicity of DDT to man and animals is still not fully understood. It is known that ingestion of massive doses of DDT will seriously affect the nervous system and cause extensive lesions of internal organs especially the liver. Solutions of DDT in organic solvents are taken up rapidly through the skin and are absorbed by the digestive system more rapidly than the pure undissolved material. Operators applying kerosene solutions of DDT in spray form have sometimes suffered from throat irritation but this is believed to be due to the solvent rather than the DDT. The first symptom of DDT poisoning in experimental animals is a marked tremor of the limbs. Dusting with DDT or applying water dispersable sprays apparently involves no health hazard to the operators so far as intermittent agricultural operations are concerned. Persons whose work requires daily exposure to DDT for long periods certainly should take precautions against excessive ingestion, breathing, or absorption of the material. A residue of 7 parts per million or less in human food is considered safe.

Treatment of walls and ceilings of dairy barns with other than water dispersable sprays of DDT cannot be recommended at present. While equally effective, oil sprays are more expensive, involve a possible health hazard to operators and animals, require special equipment for economical application, and create a minor fire hazard. Oil solutions have the advantage of leaving no objectionable residues and adhere somewhat better to tile or other highly polished surfaces. Many oil base DDT sprays have come on the market recently. The labels on some of these preparations do not state the percentage of DDT. A material of unknown DDT content of course cannot be used with any reasonable expectation of success.

Many inquiries are received concerning the use of DDT for protecting cattle against horse flies, stable flies, deer flies and horn flies. Preliminary tests indicate that spraying animals with water dispersable formulations of DDT gives almost no protection against any of these pests except the horn fly. This is the small species about half the size of a house fly that clusters on the backs and sides of cattle and sometimes congregates in numbers about the bases of the horns. This insect spends most of its adult life on the animals leaving them only intermittently to deposit its eggs in freshly dropped manure. A water spray containing only 1.2 pounds of DDT in 100 gallons has given excellent protection against this species for 11 days. The other species of blood-sucking flies that attack cattle visit the animals only occasionally for feeding. DDT apparently is too slow in action to prevent these flies from biting. Stable flies spend much of their time resting on the exterior of buildings, on fence posts, and other objects about the barn lot or pasture. It is hoped that spraying of these resting sites may afford some relief from this pest. Early investigation of this possibility is planned.

It is evident that DDT is a most effective insecticide for use against the housefly. Its intelligent application should eventually free the dairyman of one of his greatest annoyances.

SALMONELLA ORANIENBURG ASSOCIATED WITH ILLNESS FOLLOWING THE HANDLING OF CHICKENS.*

Recently a strain of salmonella isolated in an approved laboratory was sent to the Division of Laboratories and Research for identification. It proved to be a strain of *Salmonella oranienburg*.

The data furnished indicated that the patient, a 4-H Club agent, on May 15 had handled about 800 chickens, crating them for shipment. He also dressed several which his wife cooked, using some for dinner and the rest for canning. On May 20, he became ill with a high temperature and diarrhea. He was hospitalized and treated with sulfasuxadine. A strain of salmonella was isolated from specimens of feces collected on May 22 and 31. He was discharged from the hospital on May 28, although he still had a high leucocyte count.

Eighteen strains of *S. oranienburg* were identified in the Division of Laboratories and Research up to January 1, 1945, and several more have been studied since then. Seligmann and his co-workers report this species in 6.8 percent of human infections with salmonella in America. Edwards and Bruner have found it in fowls and human beings, but not in other animal sources. Hinshaw and his associates report this species in ten outbreaks of infection in turkeys and three in chickens. A report has also been published by Greifinger and Silberstein on the occurrence of an outbreak among military personnel. *S. oranienburg* was isolated from fecal specimens from forty-five patients.

* *Health News, 22,* 144 (1945).

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Association News

New York State Association of Milk Sanitarians

This association has successfully completed a series of three Regional Meetings. These were held in Utica, New York City and Rochester during the latter part of September. The attendance at each of these three meetings was approximately 200.

Because the meetings were divided, new officers could not be elected and as a result the present officers hold over for another year.

W. D. TIEDEMAN,
Secretary-Treasurer.

Philadelphia Dairy Technology Society

Dr. C. D. Dahle, Professor of Dairy Manufactures at Pennsylvania State College, was the guest speaker at a dinner meeting of seventy-seven members and friends of the Philadelphia Dairy Technology Society on October 9th. The subject of his talk was "Recent Research in Ice Cream and Milk". Dr. Dahle spoke very interestingly of several projects now being carried on at Penn State: among them a new type hard cheese, to be grated as needed at home; an ice cream stabilizer developed from cellulose; and recent research on the keeping qualities of dried, whole milk.

In addition to the principal talk of the evening, Captain Moss of the U. S. Public Health Service spoke for a few minutes on the work of that Service in the Philadelphia area, and Dr. A. P. Hitchins of the Wilmington, Delaware, Dept. of Health discussed the use of D.D.T. in dairy barns.

During a short business meeting it was voted by the members present to so amend the constitution that meetings of the Society would continue to be held four times yearly, on the second Thursday of October, January, March and May. This plan was temporarily adopted during the war emergency and has been so successful that its continuance was called for, instead of the former monthly meetings.

The next meeting of the Society will be held on Thursday, January 10, 1946.

HELEN A. SUTTON,
Secretary-Treasurer.

Industrial Notes

MC NAMARA NOW SEALRIGHT SALES MANAGER

Sealright Co., Inc., manufacturers of bottle closures and food packages, announces the appointment of Reid McNamara as Sales Manager of its Chicago district. He succeeds George Jansen who earlier in the year was made the company's Western Sales Manager.

Mr. McNamara was given a leave of absence June 1944 to go with the War Production Board in Washington and since that time had served as Chief of the Paper Cup and Nested Food Container Section, and has also served as consultant to the Container Division of W. P. B. Prior to that he was the company's sales representative in North Carolina, Virginia and West Virginia.

Before coming to Sealright he was engaged in cooperative marketing and held executive secretary posts with a number of cooperatives in the South.

SEALRIGHT OPENS NEW SALES OFFICE

Opening of a sales office in Cleveland was announced recently by John L. Dolphin, Vice President of Sealright Co., Inc., manufacturers of bottle closures and food packages.

The new office, located at Terminal Tower, will be headed by Charles E. Thompson who is Sales Manager for the company's Great Lakes district. Sales personnel at the Cleveland Office consists of Robert Beckwith, John Crissman, Dave E. Flowers, R. N. Lundgren, T. J. Meagher, R. S. Murray and V. J. Silliman.

RECENT PROMOTIONS BY DIVERSEY

The Diversey Corporation, specialists in food plant sanitation, has appointed G. R. Parish to the post of Central Division Manager. Mr. Parish was formerly manager of Diversey's Cleveland Division, and will now be located in Chicago, headquarters of Diversey's Central Division.

B. M. Kaple, who has served as both field service representative and district manager, has been appointed manager of the Cleveland Division.

Mr. Kaple will make his headquarters at Diversey's Cleveland Offices in the Terminal Tower Building.

New Members

ACTIVE

Baker, G. Floyd, Chief Sanitary Officer, Bay County Health Department, Box 1228, Panama City, Fla.

Bolser, Dr. H. W., City Dairy Inspector, Health Department, Clearwater, Florida.

Bowling, S. F., Dairy and Milk Inspector, City Health Dept., Municipal Bldg., Bluefield, West Va.

Burgess, J. M., State Dairy Supervisor, Route 4, Box 348, Tallahassee, Fla.

Cameron, Hilliard Francis, Senior Sanitarian, Clay County Health Dept., c/o Health Department, Green Cove Springs, Fla.

Chester, Burke, Senior Sanitary Officer, Lake County Health Department, Tavares, Fla.

Clark, Miss Rita, Bacteriologist and Milk Inspector, Board of Health and Water Departmbents, City Hall, Brocton 22, Mass.

DeWees, Dr. Frederick M., State Dairy Supervisor, State Department of Agriculture, 1032 Marine Way, Clearwater, Fla.

Dilsaver, Warren M., Senior Sanitarian, Hillsborough County, 5903 Central Ave., Tampa 4, Fla.

Fouts, Dr. E. L., Dairy Technologist, Florida Agricultural Experiment Station, Dairy Products Laboratory, Gainesville, Fla.

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CHANGES IN ADDRESS

Barber, Dr. F. W., from San Francisco, Cal. to c/o Sealtest Research Laboratories, 1403 Eutaw Place, Baltimore 17, Md.

Bruening, F. H., from Rochester, N. Y., to 712 Traction Bldg., 434 Walnut St., Cincinnati 2, Ohio.

Burke, Chas. F., from Cambridge, Wis., to Box 173, Lancaster, Wis.

Burkhardt, Robert Chas., from Watertown, Wis., to Box 794, Huntsville, Ala.

Legrid, Lester I., from 120 W. 12th St., Ashland, Wis., to Route 3, Ashland, Wis.

Plew, Harlow N., from Pine Island, N. Y., to Borden's Farm Products, Marathon, N. Y.

Powell, Marcus P., from New York 5, N. Y., to 279 Medical Laboratories, State University of Iowa, Iowa City, Iowa.

Rogers, Jack C., from Norfolk, Va., to P. A. Sanitary Engineer, U.S.P.H.S., Charleston County Health Department, Charleston 29, South Carolina.

Taylor, John J., from 758 N. Adams St., Lancaster, Wis., to Box 173, Lancaster, Wis.

Vaill, Mrs. Eliz., from New Haven, Conn., to 35-46 74 St., Jackson Heights, N. Y.

Wilder, Orville E., from Canton, N. Y., to 228 Ringgold St., Peekskill, N. Y.

"Dr. Jones" Says—*

"Supernatural"— I wonder if we really need that word. An item I was reading recently: a plane with several people on it made a crash landing in the backwoods of one of the Pacific islands. The natives were friendly—brought 'em food and so on—but they wouldn't go near the plane—evidently thought it was something supernatural. Other places, where they've seen planes—seen men working on 'em and all that—they've probably come to recognize they're a man-made contrivance.

And I was thinking how many things there are that today, even with our limited scientific knowledge, we recognize as natural developments that, if they'd appeared suddenly a couple hundred years ago or less, everybody'd been sure they were something supernatural.

Turning a button and listening to somebody talking in Manila: that was seemingly impossible. Yet it's an accomplished fact because somebody got well enough acquainted with natural laws—electronics, sound waves and so on—to take advantage of 'em. And now this atom busting business. For better or worse, it's all come from scientific research.

I used to know a boy—his nickname was "Bugdeath": "Bug-death" Hunt. I don't know how he came by it—but who, back there, would've thought of the possibility of a bug powder like this new DDT? I was reading they've been spraying it from planes over some cities where they had polio: supposed to kill all the flies. And I see they're trying mixing it with paint: think it'll eliminate flies—places painted with it.

And these new things for getting after disease germs—penicillin, various light rays and all—it'll take time but scientific research, if we encourage and support it, they'll lick the causes of a lot of diseases just as surely as they have the Germans and the Japs.

And these natural forces—natural laws—that've been at work from the beginning of time: we've just made a start at understanding 'em. What's been discovered already: it makes me wonder if there's anything that's really supernatural: if everything "in heaven above, and in earth beneath" isn't natural, if we just understood it.

PAUL B. BROOKS, M.D.

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* *Health News*, New York State Department of Health, Sept. 17, 1945.

INDEX TO VOLUME 8

Authors

Subjects

Application for Membership

....194.......

TO THE INTERNATIONAL ASSOCIATION OF MILK SANITARIANS, INC.:

Application for ☐ Active ☐ Associate Membership

(Membership includes subscription to Journal of Milk Technology)

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JOURNAL OF MILK TECHNOLOGY

NOVEMBER-DECEMBER
1945
VOLUME 8 NUMBER 6

This issue includes the Index and completes Volume 8

Official Bimonthly Publication of:
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ASSOCIATION
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MILK SANITARIANS
(Association Organized 1911)

Designated Official Organ of:
ASSOCIATIONS OF
MILK INSPECTORS and SANITARIANS
and
DAIRY TECHNOLOGY SOCIETIES
Listed on Page 361

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(For complete Journal Information, see page 360)

Volume 8 — November–December, 1945 — Number 6

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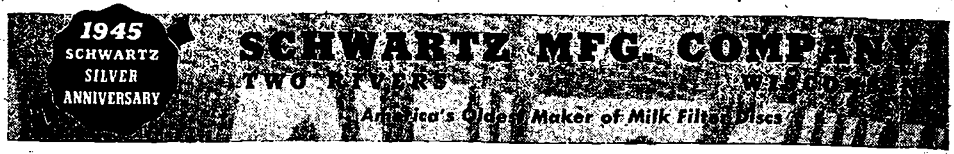

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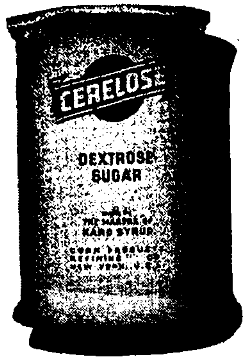

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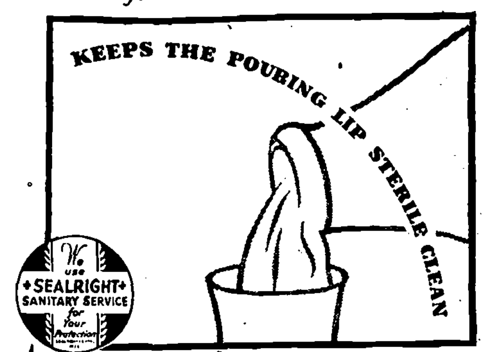

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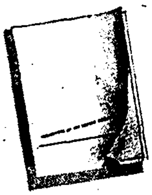

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