

Market Homogenized Milk in Philadelphia

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THE processing of homogenized milk introduces into the milk plant new machinery which adds new complications to the usual task of producing a pasteurized milk of high sanitary standard.

For a judgment of the general standard of the market homogenized milk in Philadelphia and vicinity, such milk was submitted to a thorough examination in this laboratory once a month during a period of 8 months, covering the most difficult time of the year, the summer months. The specimens were purchased from the distributing platforms of the milk plants and the investigation of the milk samples included the following tests: 1. Bacterial count, 2. Babcock fat test, 3. Curd tension test and 4. pH determinations.

By courtesy of the city's Department of Public Health it was possible to calculate each individual dairy's percentile part of the total distributed homogenized milk.

DISCUSSION OF THE RESULTS

The results of the investigation are tabulated in Table 1 in thirteen columns for both A and B milks.

The butterfat content of A milks averaged 4.09 percent and that of B milks averaged 3.72 percent fat (columns 3 and 9). A single dairy No. XXVII showed the low average figures of 3.27 percent and 3.25 percent respectively for A and B milk.

Columns 4 and 10 show the pH determination with an average of 6.72 and 6.73 or practically identical values for A and B milks. This pH figure is quite normal for milk. Milk from two small dairies, No. XIX and

XXIII (representing about 3 percent of total consumption) showed abnormal average pH values close to or even slightly over 7. It must be noticed that the pH values were registered in the last 6 months of the investigation and not in the two winter months—December and February. The abnormal pH values were associated with very low titer values as determined by titration with N/10 sodium hydroxide. Checking on the milk from the same dairies showed later normal values as soon as the cooler weather arrived in the fall. It is worth while to notice that the bacterial counts were satisfactory so that these adulterated milks would have escaped detection if only routine tests had been applied.

Columns 5 and 11 give the curd tension values. Average curd tension is slightly higher for A milk than for B milk with relative curd tension of 11.6 and 11.2 grams. Although in some parts of the country a milk with curd tension up to 20 grams is recognized as a soft curd milk, a well processed homogenized milk should have a curd tension at least below 15 grams. An average curd tension as is found in milk from dairies No. XXI (18.4) and XXVI (18.1) must be regarded as slightly too high, as the curd size of curds from such milk will easily turn out to be too large.

The bacterial counts are registered in columns 6 and 12. The dairies have been arranged in the table according to increasing bacterial content in A milks. From a sanitary point of view the counts on the majority of both grade A and B milks were very satisfactory. This can be seen by

TABLE 1
HOMOGENIZED MILK IN PHILADELPHIA

Averages from December, 1940, February, April, May, June, July, August, September, 1941

	A Milk						B Milk					
	1	2	3	4	5	6	7	8	9	10	11	12	13
Dairy	No. of tests	Butter fat	pH	Curd tension	Bacteria count	Percent of total milk consumed	No. of tests	Butter fat	pH	Curd tension	Bacteria count	Percent of total milk consumed
I	2	4.20	6.69	13.2	115	..	2	3.98	6.69	12.8	225	..
II	8	4.22	6.67	10.3	290	4	8	3.73	6.69	11.4	536	3
III	8	3.95	6.69	11.5	300	..	..	..	..	..	..	..
IV	8	3.95	6.71	13.3	310	2	8	3.55	6.76	14.3	823	under 1
V	8	4.15	6.71	10.8	365	under 1	8	3.60	6.73	10.4	1,324	"
VI	6	4.20	6.70	14.9	395	..	6	3.69	6.71	12.7	983	..
VII	8	4.15	6.68	14.1	516	15	8	3.72	6.70	12.2	870	15
VIII	8	3.78	6.67	12.4	612	..	..	..	..	..	..	..
IX	8	4.00	6.68	6.9	723	under 1	8	3.57	6.71	6.9	1,065	1
X	8	4.04	6.71	10.4	760	"	8	3.53	6.72	9.6	1,655	under 1
XI	8	4.40	6.72	9.0	911	15	8	3.91	6.71	9.2	2,265	18
XII	8	4.17	6.72	12.1	928	11	8	3.69	6.73	12.4	3,702	5
XIII	8	4.12	6.70	9.8	1,134	9	8	3.74	6.70	9.7	1,355	9
XIV	..	..	..	..	..	..	8	4.44	6.71	15.9	1,152	5
XV	8	4.10	6.72	10.6	1,236	3	8	3.75	6.71	9.9	1,655	3
XVI	8	4.38	6.72	15.1	1,300	23	8	3.97	6.72	13.3	1,381	18
XVII	8	4.08	6.72	12.8	1,335	3	8	3.61	6.72	11.9	3,663	3
XVIII	8	4.10	6.70	12.1	1,816	2	8	3.68	6.71	9.6	3,450	3
XIX	8	3.98	7.07	5.3	2,979	under 1	8	3.63	7.11	4.6	965	under 1
XX	8	4.08	6.72	12.3	3,513	3	8	3.69	6.72	12.4	4,575	5
XXI	8	4.13	6.67	18.4	4,018	under 1	8	3.70	6.68	16.4	18,200	under 1
XXII	7	4.14	6.69	12.2	4,704	"	7	4.03	6.69	11.7	6,031	"
XXIII	8	4.12	7.01	8.0	5,623	3	8	3.53	6.97	10.6	4,279	3
XXIV	8	4.20	6.71	11.3	5,725	under 1	8	3.64	6.72	10.5	11,063	2
XXV	3	3.91	6.72	14.3	6,537	..	2	3.67	..	15.0	2,590	..
XXVI	8	4.43	6.70	18.1	7,231	under 1	8	3.69	6.70	14.3	10,191	under 1
XXVII	8	3.27	6.74	11.9	14,875	"	8	3.25	6.70	10.9	17,625	"
XXVIII	8	4.15	6.70	10.6	15,338	"	8	3.53	6.69	9.5	11,681	"
XXIX	2	4.50	6.69	6.7	17,150	"	2	3.75	6.70	8.5	22,900	"
XXX	4	4.17	6.69	12.5	17,175	"	4	3.58	6.72	8.4	36,850	"
XXXI	5	4.14	6.71	9.4	21,530	"	5	3.80	6.71	9.5	21,400	"
XXXII	8	3.95	6.70	10.1	29,988	"	8	3.60	6.75	9.8	37,613	"
XXXIII	8	4.09	6.69	12.3	30,738	"	8	3.85	6.70	10.9	18,238	"
XXXIV	8	4.08	6.69	10.6	48,475	"	8	3.88	6.70	12.5	55,575	"
XXXV	..	..	..	..	..	..	7	3.64	6.72	11.8	144,571	"
XXXVI	..	..	..	..	..	..	8	4.15	6.70	14.6	947	under 1
Averages		4.09	6.70	11.6				3.72	6.71	11.2		

looking at the figures in columns 7 and 13. A line drawn below dairy XVIII in the A milks separates all A milks with bacterial counts below 2000 per cubic centimeter. These fine results represent 88 percent of the milk consumed on the market or by far the most milk consumed at all. For the B milks, 85 percent of the milks consumed showed bacterial counts below 4000 per cubic centimeter. The conclusion is that the greater part of homogenized milk is

distributed by dairies with fine sanitation records.

Table 2 shows the milk consumed according to the bacterial count. The result is very good—one would almost say amazingly good. Only for the B milks we have a few exceptions with really high average bacterial counts, but these milks represent a very small part of the total consumption.

A question often raised in connection with homogenized milk is whether pasteurization before homogenization

TABLE 2
 PERCENTAGE OF TOTAL HOMOGENIZED MILK CONSUMED,
 ARRANGED ACCORDING TO BACTERIA CONTENT IN THE MILK
 Averages from April to September 1941 Inclusive

A Milk		B Milk	
Bacteria	Percent milk consumed	Bacteria	Percent milk consumed
Between 100-1,000	49	Between 100-1,000	30
" 1,000-2,000	40	" 1,000-2,000	39
" 2,000-8,000	7	" 2,000-8,000	20
" 8,000-30,000	3.8	" 8,000-30,000	7
" 30,000-50,000	0.2	" 30,000-60,000	3.9
		" 60,000-150,000	0.1

is to be preferred to pasteurization after homogenization. As the homogenizing process is flavor-correcting (1)—meaning that the process tends to conceal the slightly cooked flavor brought about by higher pasteurizing temperatures—dairies like to homogenize later. Another reason for homogenizing last is that heating of milk counteracts the result achieved by the homogenization, in bringing together again some of the fat globules just divided and broken down into smaller units. This often produces fat plugs on top of the milk bottle. The argument against using homogenization as the final process is a sanitary one. It is believed by some sanitarians that the possibility of bacterial contamination in the homogenizer is a danger to the production of a bacterially safe milk. This point of view has been supported by observation of early models of the homogenizer which were difficult to clean. Since then improvements in simplicity of construction have made it much easier to keep homogenizers clean. This in connection with increased feeling of responsibility displayed by the dairy plant operators has practically eliminated any objection against homogenizing as the final operation before the bottling of the milk.

It was known that dairies No. I, II, VIII, IX, X, XII, XIII, XIV, XV, XIX, XXI and XXXVI pasteurized before homogenization while dairies No. VII, XVI and XXVIII were

known to pasteurize after homogenizing. It is interesting to note that of these mentioned dairies, No. XXVIII, belonging to the homogenization-pasteurization group had the highest bacterial counts and that the lowest bacterial counts were found in No. I and II, belonging to the pasteurization-homogenization category. This indicates that the question of getting milk low in bacterial content is dependent more upon sanitary conditions in the dairy plant than upon the order of the processes, pasteurization and homogenization, and furthermore that these sanitary conditions are actually produced in plants distributing most of the homogenized milk consumed in Philadelphia.

SUMMARY

A review of market homogenized milk in Philadelphia during eight months covering the summer months of 1941 showed satisfactory sanitary conditions, measured by bacterial counts, in 96 percent of A milks and 89 percent of B milks, consumed. Exceptionally high standard was found in 89 percent of A milks and 65 percent of B milks consumed.

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REFERENCES

1. Spur, Bernhard. The Relationship Between the Temperature of Pasteurization (holding method) and the Appearance of Cooked Flavor in Homogenized Milk. *J. Milk Tech.*, 6, No. 2, March-April, 1943.