is avoided. If, however, milk is exposed to the air, bacteria multiply very rapidly by the hundreds and thousands, and in time, shorter in summer than in winter, increase to such proportions that fermentation occurs, lactic and butyric acids are formed, and the milk sours. Milk twenty-four hours old is an entirely different substance than when perfectly fresh. Originally not harmful, as attested in some countries where children are nursed directly from the cow, milk becomes by natural changes, if allowed to occur, a rank poison.

It has been found, by experiment, that if milk, immediately after being drawn from the cow, is cooled to 40° F., all bacteria growth is at once arrested, and remains so if the milk be kept at a low temperature. With our present manner of handling milk in the dairy, unless absolute cleanliness is observed about the barn, cow, and hands and clothing of the milker, it is impossible to get a thoroughly sterile milk. Some microbes develop very rapidly, doubling in twenty minutes, while others require a longer time. But that cooling rapidly is effective is fully proven by an experiment at the Yale Agricultural Experiment Station. Two cultures were made on gelatin plates—one of milk cooled to 40° F., and the other perfectly natural milk, with all its gases and animal heat retained. The first plate, after sufficient exposure, gave only twelve colonies, while the second contained thousands.

In experiments to determine the size of the curd of cow's milk as compared with the curd of woman's milk, it is noticed that the precipitate obtained by the addition of acid to cow's milk is tough and hard, while the curd of woman's milk is soft and flocculent, and of smaller size than cow's milk. I believe this great difference is due principally to the fact that there is an acid fermentation in cow's milk, due to the presence of bacteria which we do not find in woman's milk. The curd is, by comparison, larger in cow's milk than in woman's milk, but it does not seem possible that in its normal state, as received by the young animal, it would precipitate in the tough, hard mass seen when acid is added in a test tube.

To determine this fact, I undertook a series of experiments, and in every case it was noticed that the curd was smallest when the milk had not undergone an acid fermentation. Hydrochloric acid was added to the milk, first in a weak solution gradually, and then to a similar specimen of milk pure acid was added quickly:

No. 1.—Milk, 4 drams; water, 8 drams—representing the quantity for a child two or three weeks old. Slightly acid. Heated to 100° F. On adding acid the curd was precipitated in fine flakes.

No. 2.—Whole milk, acid. Treated in the same manner, precipitated in tough, hard masses, as when milk has soured in summer.

No. 3.—Same quantity of milk and water. Treated with a weak solution of hydrochloric acid, 0·02 per cent., as represented in normal gastric juice (Schmidt). Acid added slowly and curd fine, as in No. 1.

No. 4.—Whole milk with weak solution of acid added slowly; precipitated in small particles suspended in the milk. On separating the fluid from the curd and comparing the precipitates, it was noticed that while No. 4 gave more in quantity, the curd was composed of soft, easily broken bodies, about the size of those obtained in No. 1.

No. 5. — Pasteurised milk, diluted one-quarter and heated to 100° F. Slightly acid. Diluted and tested with strong acid; curd finer than in experiments 1, 2, 3, and 4.

No. 6. — Whole milk, with strong acid, required twice the quantity of acid used in No. 2, and the curd was finer than in experiments 1 and 2.

No. 7.—Milk diluted one-quarter. With dilute acid added slowly, the curd finest of all specimens so far examined.

No. 8.—Whole milk tested with dilute acid. Curd finer than in experiments 1 and 2. Pasteurised milk, tested with strong acid, does not give the tough curd noticed in whole raw milk. The curd resembles more that obtained in diluting ordinary milk. Aerated milk, tested eight hours after being received from delivery wagon, is very slightly acid.

No. 9.—Milk diluted one-quarter. Temperature, 100° F. Tested only with full-strength acid. Required more acid to cause precipitate than any diluted specimen examined. Curd very fine, resembling human-milk curd.

No. 10.—Whole milk, with strong acid, precipitated a curd as fine as any diluted specimen except No. 9. Required four times the quantity of acid to precipitate as did ordinary morning's milk received at the home about the same time.

(*To be continued.*)

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