

ON SKIM MILK AND ENRICHED SKIM MILK CHEESE.

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For dairies, in which not cheese-making but the manufacture of butter is the main object, the difficulty arises to dispose of the skim milk. When the milk is "set" in order to raise the cream, and kept standing for 36 or 48 hours, or even longer, as it used to be done exclusively, the skim milk obtained is, if not already curdled, certainly more or less sour, and therefore diminished in its value to some extent, whatever the way of using it up might be. But now-a-days one is enabled by employing machines in which the centrifugal force acts upon the milk to separate the latter into cream and skim milk immediately after milking, and thereby gain a skim milk which is equal to fresh milk in every respect, except its poorness of fat. Instead of, say, 3·5 or 4 per cent. of fat, as present in fresh milk, the separated skim milk contains not more than 0·5 per cent., and in many instances less.

Investigations made on the subject have shown that the fat in milk is easier digestible and more readily assimilated than any other fat, and this cannot be astonishing considering the minutely divided state of tiny globules of microscopic size, in which the fat is present in milk, not to speak of the difference in chemical composition. Skim milk therefore is not to be considered a proper food for infants, but may be taken with the greatest advantage as a wholesome drink and addition to food by human beings—children and adults—with greater digestive powers, enabling them to make up for the deficiency in fat in some other way. It is, especially in large towns with their dense population, to the poorer part of which fresh milk is a too costly and almost unknown luxury, that skim milk ought to be made a regular article of diet. Instead of buying a quart of a watery mixture containing fermented starch sugar, alcohol, salt, and perhaps worse things besides, and called beer, two-pence would be spent much better for a quart of wholesome, nourishing and delicious sweet skim milk.

There are, however, objections to trading with skim milk, and a great deal of prejudice must be overcome, before it would sell in an honest way to any appreciable amount. But even if that could be brought about, only part of the skim milk produced could be disposed of in this way. There are some other ways for using up skim milk, viz., rearing and fattening calves and feeding pigs, and making skim milk cheese; the former will pay only under certain conditions, and skim milk cheese is not in favour with the population of this country.

It was first in America suggested and carried into practice, to sell the fat of milk in the best paying form of butter, and substitute it by a cheaper fat in order to make a rich cheese of poor skim milk. Two years ago I had the opportunity of analysing two specimens of enriched skim milk cheese manufactured in America, and published the analysis in *THE ANALYST* (Vol. VII., 1882, page 137). The cheeses had been made, the one with the addition of oleomargarine, the other with the addition of lard. These substances cannot be introduced into the curd directly, but have first to be brought into a state similar to that in which fat is present in milk, *i.e.*, the state of emulsion. An American with the name of Cooley, the inventor of other dairy machinery, has brought out a centrifugal apparatus for emulsifying fat, and judging by the products I had the opportunity of examining, this apparatus does its work very well. The machine, however, is expensive, rather complicated, and requires an unproportionately great driving power, and will for these reasons most likely not find a very extensive application.

At the Dairy Show held last year, at the Agricultural Hall, Islington, a very simple looking apparatus for the same purpose was shown by Messrs. Lawrence and Co., St. Mary Axe, and again this year exhibited in an improved form at the same place, and at the Health Exhibition, South Kensington. The apparatus is called, "Lactoleofract," and meant for making emulsions of any kind, though in the first place of those to be used in the manufacture of enriched skim milk cheese. It consists chiefly of a steam injector to which two pipes, fitted with taps, and connected with receiving vessels, are joined. The apparatus is worked as follows:—One of the receiving vessels is charged with the fat, if necessary in a melted state, the other with the liquid, with which the fat is to be emulsified. The steam injector is set to work, and the taps of the feeding pipes are opened, care being taken to run the fat in last. The steam jet breaks up the fat into minute globules, which get mixed with the liquid in a most intimate manner, and a continuous stream of a very perfect emulsion is delivered from the discharge pipe and collected; it may, however, if thought necessary, run through the apparatus over and over again. The apparatus, which is worked with a steam pressure of from 5 to 10 pounds, is very effective. A small one, looking like a toy, produces 15 gallons of emulsion, of any required percentage of fat, per hour, and a larger apparatus 80 gallons in the same space of time. I saw an emulsion made of 1 quart of skim milk and $\frac{1}{2}$ -pint of melted oleomargarine; it was done in almost no time. A sample of this emulsion, which I took with me, showed, when examined microscopically, the fat subdivided in a most thorough manner. When left at rest, the emulsion threw up a thick layer, which broke almost like tallow, but

diffused by gently shaking the bottle, after having been kept in warm water for a little while. The emulsion was of the following composition:—

ANALYSIS OF EMULSION OF OLEOMARGARINE IN SKIM MILK.

Solids	..	..	..	..	28·01	per cent.
Fat	..	..	..	..	21·16	„
Solids not fat	..	..	..	..	6·85	„

The low amount of solids not fat cannot surprise, as, of course, steam is condensed, and the water gets mixed with the emulsion.

As mentioned already, the emulsion can be made of any required degree of richness in very wide limits.

For the purpose of making enriched skim milk cheese, the emulsion is to be mixed with the skim milk, and the mixture then treated in the usual manner. A specimen of such a cheese, similar in shape, size, and appearance to the well-known Cheddar, was shown at this year's Dairy Show, and a sample of it very kindly given to me. An analysis of it gave the following results:—

ANALYSIS OF ENRICHED SKIM MILK CHEESE CONTAINING OLEOMARGARINE.

Water	..	.	..	..	34·47	per cent.
Fat (Ether extract)	..	..	..	..	18·05	„
Casein, etc.	..	..	..	..	42·96	„
Ash	..	..	..	..	4·52	„
Cl. in Ash	..	..	..	..	0·61	„
Equal to NaCl	..	..	..	..	1·01	„

In a larger quantity of fat, extracted with every precaution to obtain it as pure as possible, the insoluble fatty acids were determined and found to amount to 90·78 per cent.

I do not pretend to be a judge on English cheeses, which, I cannot help to say, I am not very fond of. But with this reserve, I must declare the cheese in question of very good quality, regarding to taste, as well as to texture. I need hardly add that the determination of the insoluble fatty acids present in the fat of such a cheese gives a ready means for detecting what it was made of.

CONCLUSION OF THE PROCEEDINGS OF THE SOCIETY.
