

## Bacteria in Cream

Our food is often shared with bacteria, fortunately without any adverse effects on us. Consumer products with a short shelf life are rarely sterile, and they frequently provide excellent conditions for bacterial growth. Dairy cream is no exception. Though in towns most of it is now pasteurized, a considerable amount of raw cream made from unheated milk is still consumed in rural areas. The risks of raw milk are well known. But how many people know whether their cream has been heat-treated?

Cream concentrates the bacteria and enzymes in milk. Fresh milk from healthy cows normally contains only small numbers of bacteria, mainly lactic streptococci, derived from the udder ducts. Extraneous bacteria such as coliform organisms, *Escherichia coli*, other enterobacteria, and spore-bearing organisms, particularly aerobes, may also be derived from the cows themselves, from the milking equipment, the environment, or from farm workers. In addition infected animals may contribute pathogens such as salmonellae, *Brucella abortus*, and *Staphylococcus aureus*, either directly or indirectly to the milk, sometimes in large numbers, as occurred in recent milk-borne outbreaks of gastroenteritis in Lancashire<sup>1</sup> and in South Devon.<sup>2</sup> As most of these organisms can multiply freely in milk, their initial numbers and the temperature at which the milk is kept before processing largely determine its keeping quality and thus that of cream prepared from it. The cleaner the milk, the more wholesome the cream. Pure cream therefore starts with clean milk, and standards of cleanliness must be maintained at the dairy, creamery, and shop throughout all the stages of production, packaging, distribution, and sale.

Processing varies considerably from one dairy to another. Cream is separated from milk and the fat content then adjusted by dilution with skimmed or whole milk to give various market creams. Some dairies separate the cream before pasteurization, others after it. Some creams are heat-treated once, others twice, and some not at all. Some are heat-treated in their retail containers, others before they are put in the containers, and some are distributed in bulk for retail packaging over the shop counter. The procedures by which heat treatment is carried out vary considerably, but if efficient and followed by rapid cooling they make the cream safe and prolong its keeping quality. Only occasionally do thermoduric bacteria and some sporing organisms survive.

Up to this stage the bacterial flora of cream is similar to that of milk, but, unlike milk, cream has many opportunities for subsequent contamination. Bottles, cartons, trays, or other containers are often filled by hand with domestic utensils—a messy job even under ideal conditions—sometimes by poorly trained or unskilled staff in packing rooms not always suited for the purpose. Nor are automatic filling machines always trouble-free or easy to dismantle, clean, sterilize, and re-assemble. The time intervals between heat treatment, packaging, and the sale of cream vary according to locality and season, but with an efficient distribution system and regular turnover of stock, cream should be no more than two or three days old when sold and preferably not more than five or six days old when consumed. But, except for creams sterilized in bottles, the ageing, the handling after heat treatment, and the time lag before consumption do provide many opportunities for bacterial contamination and subsequent growth.

Recent investigations have shown that dairy cream of excellent bacterial quality when processed may sometimes contain many millions of bacteria when consumed. This is

clear from studies in such different parts of the country as Worcestershire,<sup>3</sup> Cornwall,<sup>4</sup> London,<sup>5</sup> and Birmingham.<sup>6</sup> Indeed the situation seems to be much the same as the Public Health Laboratory Service<sup>7</sup> found in 1958, when a methylene-blue dye-reduction test was recommended for advisory purposes. The greater the number of bacteria present, the more quickly was the dye usually reduced, though interpretation was often difficult because production dates were seldom known. In all these investigations many samples also contained coliform organisms, including *Escherichia coli*. As these organisms frequently infect raw milk and therefore occur generally in dairies, their presence in processed cream implies either inadequate heat treatment or contamination afterwards. Since coliform organisms grow readily in cream, they do not therefore indicate recent faecal pollution with the same certainty as in water supplies. Nevertheless, though not actually harmful, their presence in large numbers in retail cream is unsatisfactory, especially as they should be absent in quality control tests at dairies.<sup>8</sup> The keeping quality of cream may also be affected by organisms found in milk which can grow at low temperatures, even in the refrigerator. They include enterobacteria, such as pseudomonads, and some harmless aerobic sporing bacilli which survive heat treatment. Recent work<sup>9</sup> has shown that cream correctly processed and hygienically packed should remain good if it is stored correctly.

The safety record of pasteurized cream is good despite the occasional isolation of pathogens such as *Brucella abortus*,<sup>10</sup> yet there is much room for improvement in its general bacterial quality. The standards enforced in some countries, such as Canada, would disqualify much of the cream now sold in Britain. This is a challenge which the industry should accept. But what else can be done? The sale of untreated cream is undesirable and should be discouraged, and cream in retail containers should be clearly described as untreated, pasteurized, or sterilized and bear some indication of the date of production. Milk for cream processing should be pasteurized before separation, and the controls now in force for milk should be applied to cream. Such measures were indeed introduced so long ago as 1966 in Northern Ireland,<sup>11</sup> where in addition samples from the producer must not contain any coliform organisms. No single test for retail cream is entirely satisfactory, but with evidence of adequate heat treatment, and provided pathogens are absent, there is much to be said for a semi-quantitative test for coliform organisms as an indication of hygienic production, efficient distribution, and correct storage.

<sup>1</sup> Talbot, J. C., Wauchob, D. W., Robertson, L., and Farrell, I. D., *Public Health* (London), 1967, **81**, 191.

<sup>2</sup> Wildman, J., and Elliott, F. B., *Medical Officer*, 1969, **121**, 127.

<sup>3</sup> Colenso, R., Court, G., and Henderson, R. J., *Monthly Bulletin of the Ministry of Health and the Public Health Laboratory Service*, 1966, **25**, 153.

<sup>4</sup> Barrow, G. I., and Miller, D. C., *Monthly Bulletin of the Ministry of Health and the Public Health Laboratory Service*, 1967, **26**, 254.

<sup>5</sup> Gerken, A., Coleman, J. C., and Winner, H. I., *Lancet*, 1968, **1**, 634.

<sup>6</sup> Hutchison, J. G. P., Barrow, G. I., Henderson, R. J., and Wright, A. E., *Lancet*, 1968, **2**, 99.

<sup>7</sup> Report of the Public Health Laboratory Service, *Monthly Bulletin of the Ministry of Health and the Public Health Laboratory Service*, 1958, **17**, 77.

<sup>8</sup> Crossley, E. L., *Journal of the Society of Dairy Technology*, 1967, **20**, 215.

<sup>9</sup> Davis, J. G., *Medical Officer*, 1969, **122**, 115.

<sup>10</sup> Barrow, G. I., Miller, D. C., Johnson, D. L., and Hingston, C. W. J., *British Medical Journal*, 1968, **2**, 596.

<sup>11</sup> Northern Ireland. *Marketing of Milk Products Regulations*, Belfast, H.M.S.O., 1966. Statutory Rules and Orders No. 204.