

## The Dairy.

### Milk and Butter.

Prof. James W. Robertson, Dominion Dairy Commissioner has just issued a bulletin in which he deals with the question of milk and butter. Prof. Robertson's reputation as an authority on dairy matters is well known and his writings are ever replete with valuable information. He says in the course of this work:

**FAT GLOBULES IN MILK.**—While her milk is being elaborated by a cow, the ends of the cells which line the inside of the milk ducts and vesicles in her udder, seem to enlarge. Each one forms a small globule, and when that is perfected it drops off into the serum of the milk. Each bud or globule, so formed, is a globule of fat; from them is made all the butter from cows' milk. These tiny buds of fat seem to grow on the surface of the cells, partly by the destruction of the cells, and partly by conversion of some of the substance of the blood into fat. They trickle down in and with the milk, and are held in suspension not in solution as are the other solids in it. They mostly come during the latter part of the milking, probably because they do not move so quickly or easily as the liquid part of the milk. The fore-milk is thinner than the strappings, because the globules of fat do not free themselves from the internal linings of the milk ducts so quickly as the liquid of milk. If one finds, sending milk to a cheese factory, a man who is of so modest and retiring a disposition that he will not keep at home for table use a quantity of the average milk given by the cow, but always and only the last quart, his modesty should not be respected or trusted too far; such modesty may not be found compatible with honesty. The condition of the cow's blood and her nervous system very largely affect the quantity of the milk she gives. Bad feeding, foul water or the absence of salt will induce in the cow a condition in which she will not yield good milk; a similar condition, with its consequent effects, may be caused by neglect, exposure, abuse, or excitement. A cow has a peculiarly delicate organisation, and must be handled with kindness, and any man who abuses a cow beats out the profit, for she will pay him back by giving less milk, and that of a poorer quality. The globules of fat, before mentioned, are so numerous that in a thimbleful of milk there will be found millions of them. It is estimated that there are at least one thousand millions of them in every cubic inch of milk. From these specks of fat the butter is made.

**CREAM SEPARATION.**—To get them out of the milk is the task of the butter-maker; they are too small to be strained out with the finest sieve; fifteen hundred of the largest of them placed side by side, like a row of marbles, would not measure more than one inch. If milk be left at rest they will rise to the top because they are lighter than the liquid in which they float. The heavier parts of the milk are

drawn down by the force of gravitation, and as the serum of the milk, composed of water, casein, sugar, albumen, etc., moves downward, it displaces the cream globules and forces them toward the top. There are two methods of separating these fat globules from the milk; a natural method and a mechanical method. In the natural method, the power of gravitation is used to pull the heavier portion of the milk down, with the effect that the lighter part, the fat globules are pushed upward. In the mechanical method, centrifugal force is applied to attain a like result. When a quantity of milk is put into a rapidly revolving vessel or cylinder, the heavier parts will be forced outward against its resisting side or inner surface with sufficient pressure to push the lighter particles, the globules of fat, towards the centre of revolution. In that way the water, casein, albumen and the other heavier constituents of milk, find their way to the outside of the quantity being treated in a revolving cylinder, while the globules of fat are collected in concentric form on the inside surface of the quantity being treated. This is the law that the cream, mainly composed of fat globules, travels in a direction opposite to that of the force exerted upon the milk, whether the force be centrifugal or centripetal.

**EFFECT OF TEMPERATURE.**—If ordinary milk in a deep setting pail be left at a temperature of 60° Fahr., it would take these small specks from three to six days to get to the top at the rate which they would move. They can be helped to move faster. The milk at a temperature between 90° and 98° is slightly enlarged in bulk, and by putting it into deep-setting pails at a higher temperature, (90° to 98°), the advantage of a falling temperature from above 90° to 40° or 45° may be gained. That treatment will expedite and facilitate the upward movement of the globules of fat. The rapid cooling of the milk is also believed to prevent the formation of a delicate mesh of lacto-filin in the milk, which would hinder the globules from rising freely.

**CREAM.**—The cream itself is only that part of the milk into which the globules of fat have been gathered in large numbers. Cream has no regular or constant per cent. of fat; the range is from 8 per cent. to 75 per cent. In one hundred pounds of cream there may be only eight pounds of butter, or there may be seventy-five pounds according to its quality of richness. The globules of fat have no skin or organic coverings distinct in constitution from their own substance. Like drops of quicksilver that have been separated from each other they have no pellicle. But sometimes the serum of the milk becomes so viscous that a quantity of it will adhere to the surface of the globules and like a coating of gum will prevent their movement upwards when the milk is set, or their movement inwards when the milk is treated in a centrifugal machine. If a quart of warm water be stirred into every pailful of milk when it reaches the dairy room from the stable, the separation of the cream will be facilitated. The water may be at a temperature anywhere between 150° and 180° Fahr., and should be warm enough to raise the temperature of the milk to above 90°.

### Feeding for Butter.

HENRY STEWART.

One by one the scientific authorities are helping to put a quietus on the misleading and injurious statement that the proportion of butter in milk can not be increased by feeding. It is strange that such a heresy should have obtained currency among those to whom dairymen look for instruction. The writer, led by long experience to differ from the prevalent belief, has singly fought the error and has sustained the opposition to it alone for some years past. And now the professors are coming to the rescue, one by one, and already a powerful influence for the good of dairymen is exerted to encourage them to feed skillfully for increasing the fat solids in the milk. First, the Wisconsin Experiment Station, in a bulletin, declared that by suitable feeding the proportion of butter fats in milk may be increased; then Prof. Phelps, of the Connecticut Station, and now Prof. Caldwell, of the New York Station follows in making the same statement. Eight or ten years ago I gave a detailed account of the effects of various foods in this direction, observed through a whole year's experimental feeding, which has been reprinted in the "American Dairymen's Manual," and which shows how various foods, rich in oil, tend to increase the proportionate quantity of the butter in milk, and how they also affect the quality. This last effect has been recently noted by the chemist of the agricultural department at Washington, and reported in a bulletin, and this is exceedingly noteworthy as showing the importance of choosing those foods whose fat will not deteriorate the quality of the butter.

This point may be worthy of some explanation. For some years past physicians have known that fats in food or in medicinal preparations, when taken into the stomach, are not digested, but are mixed with the digestive fluids in the form of an emulsion, precisely in a similar manner to the mixture of the fat globules in cream, and that this emulsion is absorbed without change by the villi of the intestines, which are very fine tubes, set so closely together