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MILK, BUTTER AND CHEESE.

Second Article.

CHEMICAL CONSTITUENTS OF MILK.

We found that milk consisted of water, casein, oil, sugar, and certain salts. It is on account of the presence of water (to the extent of 86 per cent.) that milk is a fluid; it is the casein that enables it to be made into cheese, the oil that forms the butter, the sugar that gives it a slightly sweet taste, and the salts that perfect it as a complete food, capable of yielding bone material as well as flesh and fat to the young animal.

FERMENTATION, COAGULATION AND OTHER CHANGES OF THE MILK CONSTITUENTS.

The sugar of milk is different from ordinary cane sugar, and likewise from the sugar of grapes. Grape sugar and cane sugar more slowly, ferment and yield alcohol, and then, in weak solutions exposed to air, the alcohol becomes oxidized into vinegar. But milk sugar is not prone to ferment, although it may be made to do so, and in fact an alcoholic beverage is prepared in some countries from mare's milk. The more usual change of milk sugar is not into alcohol, but directly into

lactic acid. When milk is allowed to stand for some time, the casein acts upon the sugar, leading to its change into lactic acid, which is readily known by the sour taste of the milk. This acid is no sooner formed than it in turn acts upon the casein, causing it to coagulate and become solid. This coagulated or solid casein is the material which forms CHEESE. Instead of allowing the milk to stand until the casein coagulates spontaneously in this way, the change may be brought about immediately by adding almost any acid; even common vinegar will form a curd very rapidly. But the agent most commonly employed for this purpose in the dairy is rennet, the strained liquor in which the salted stomach of a calf has been soaked. This substance coagulates the casein without exercising any decomposing action upon it, or upon the other constituents of the milk, as acids are apt to do.

CHEMICAL PRINCIPLES OF THE CHEESE MANUFACTURE.

Cheese is more variable in quality than any other product of the farm. It consists not only of the casein of the milk, but also of a portion, or the whole of the oil or cream, together with volatile flavoring oils in minute quantity. If we com-

pare the cheese to a cake, the casein may be looked upon as the flour, the essential element that forms the basis, whilst the cream and any added ingredients are the fruit and flavorings. The richness of a cheese then depends upon its poorness in casein, just as the richness of a cake depends upon its poorness in flour and the corresponding abundance of the richer materials. If the cream be taken off the milk before it is made into cheese, the proportion of casein will be increased, and the cheese made poorer; and on the other hand, if we not only retain the cream (or new milk) but add thereto the cream from other milk, and fatty matter from any other source, we thereby increase the richness of the cheese. It is impossible to make good cheese out of poor materials, poor milk; but as the process requires great care, it is quite possible to make bad cheese out of the very best materials. The reason why Dunlop, Cheshire and Annapolis cheeses have acquired a fame in the world is not that there is anything peculiar in the pastures, or that the cows that yield the milk are more meritorious, but simply that the Ayrshire, Cheshire, and Annapolis dairy-women have attended to their business better than the dairy-women of other regions. The necessity of care,