4. Saccharine foods, represented by the sugar of milk.

The abundant supply of this substance afforded by several domestic animals, has led to its appropriation as an article of human food from the remotest times. In this country the milk of the cow is that in general use, but that of goats is likewise employed to some extent.

When a drop of milk is examined under the microscope, it is seen to consist of a number of spherical bodies rolling freely in a clear fluid; they have dark outlines, but are transparent in the centre. These globules consist of a delicate albuminous envelope, enclosing a drop of oil (butter.) "The membrane keeps them separate, so long as it is intact; but if dissolved by means of acetic acid, or ruptured by heat or mechanical violence (as in the churn) the butter is readily separated and collected. Cream is composed of the larger of these globules, which owing to their light specific gravity float on the surface of milk when allowed to repose. The richness of milk is determined by the quantity of these globules."*

The richness of milk and the quantity secreted depend in a great measure, in fact entirely, upon a due supply of food being provided; not indeed that any special kinds of food are capable of themselves of leading directly to the production of an abundance of milk greatly beyond other kinds of the same nutritive value, but a sufficient supply of fatty matter must be provided to supply in the first instance the wants of the living animal, and secondly, to afford the milk-secretion. It has been suggested whether animals derived any portion of their fat *from the conversion of sugar* and starch into that substance, but Dumas, Boussingault, and Payen have endeavoured to show (Comptes Rendus, 13th Feb. 1843) that fatty matter is formed in plants only, that it passes already prepared into animals, and that there it may be either consumed at once for the development of the heat which the animal requires or take its place more or less modified in the tissues, to serve as a reserve for respiration.

The production of fat and milk have an intimate relation in animals. There exists the most perfect analogy between the production of milk and the fattening of animals. (Payen, Edinburgh Journal of Agriculture, Oct. 1844.) The secretion of milk seems to alternate with that of fat. "When a milch cow grows fat, her milk diminishes, the best milkers remain long thin after calving. In some of the English breeds, where the fatty cellular tissue is much developed, as for instance the Durham breed, the quantity of milk may be very great after calving, but they quickly grow fat, and the secretion of milk does not last as in the Dutch and Flemish cows. English swine, which are much more inclined to fatten than the swine of the French breed, are rarely such good nurses, that is to say, they give less milk." And daily experience affords illustrations of this balance.

If it be true, says Boussingault, as it evidently is, "that the *quantity* of milk produced depends especially upon the absolute quantity of nutritive fluid consumed, it is not so with the *quality* of the fluid. It is undeniable that the milk of spring and summer, formed upon green and succulent food, is much more palatable than that of the winter season; the butter is also much finer and better flavored. The green herbs of our pastures undoubtedly contain volatile principles which are dissipated and lost in the processes of drying and fermentation which they undergo in their conversion into hay. If chemistry be powerless in seizing such principles, it still informs us of the possibility of introducing a variety of articles into the food of cows which have the property of communicating those qualities which we prize in milk. In all grazing countries certain vegetables are pointed out as giving, in the vulgar opinion, a particular aroma to the flavour of milk." (Rural Economy, pp. 612–3.) It is certain, however, that although the *flavour* is greatly influenced (and this is the commercially important fact) by feeding plants, the chemical composition of the milk is not materially changed.

The constituents of cow's milk under ordinary feeding are as follows:—

Casein (cheesy matter)..	4.43
Butter,	3.13
Sugar of Milk,	4.77
Salts (various)	0.65
Water,	87.02
	100.00

When fed on BEET a change occurs in the milk, in an increase of sugar, viz:—

Casein,	3.75
Butter,	2.75
Sugar of Milk,	5.95
Salts,	0.68
Water,	86.87
	100.00

When fed on Carrots, the milk was found to give—

Casein,	4.20
Butter,	3.08
Sugar of Milk,	5.30
Salts,	0.75
Water,	86.67
	100.00

Carrots appear to have the effect of greatly reducing the quantity of milk from that given under mangold wurzel; the milk of carrots is also found to be poor, so much so as to serve admirably as a substitute for woman's milk, which on the average is greatly inferior in richness to that of the cow.

The largest quantity of milk is obtained from cows during the first three months after calving, the produce then being 18, 20, or 24 pints per day, whilst the mean quantity during the whole time of milking will very slightly exceed 12 pints. (Boussingault.) Long nursing also induces a gradual change in the constituents of milk, both in the case of the woman and the cow, the butter decreasing and the salts increasing. In milking, it is of great importance to milk "dry at *each meal*," *for two reasons; first, the* milk last drawn, the "strippings" and "afterings," contains three times as much cream as the first; and, secondly, when the larger vessels are regularly emptied milk is being constantly secreted by the the glandular tissues, but if an accumulation takes place, a re-absorption occurs, and the secretory action is impeded.

There are still a few points in the chemical history of milk to which we wish to refer.

Milk sugar does not undergo fermentation, so that the stomach of the infant is not liable to be extended by the production of carbonic acid gas.

In the colostrum, or milk first produced after the birth of the young animal, albumen is present, and coagulates by heat.

Milk is analyzed by drying it by evaporation, then dissolving out the butter by ether and alcohol, and afterwards the sugar and salts by water,—thus the casein remains undiminished.

When exposed to the air, the casein of milk begins to decompose, and then acts as a ferment upon the sugar, converting it into lactic acid. This acid is no sooner formed than it in turn acts upon the undecomposed casein.

The chief mineral substances in milk are potash and phosphate of lime.

The subject of manufacture of butter and cheese from milk, must be deferred till next month.

EFFECTS OF DRAINAGE.

For every inch of water drained off which would otherwise pass into the air as vapour, we are told as much heat is saved per acre as would raise 11,000 cubic feet of air one degree in temperature. The dew point is also raised, hence less mist and dampness and greater comfort. A farmer was asked the effect of some new draining. "All I know is," he replied, "that before it was drained I never could go out at night without a great coat, and now I never put one on. It just makes all the difference of a coat to me."—*Report of the Metropolitan Sanitary Commissioners.*

* Bennett's Lectures on Clinical Medicine, p. 204.