the bodies of the cows to be again used over in the process of secretion, and sowing again the seeds of decomposition for a crop of bad milk.

Again, simply as a matter of profit, we are of the opinion that sour milk can be used with more advantage as a food for hogs than for cows. Sour milk makes a good diet for swine, and in connection with grain is said to give a most excellent flavor to the meat. Indeed it is asserted that no food in connection with grain or meal is better suited for fatting hogs than milk, both for the increase of weight and quality of meat which it makes. It is undoubtedly a good, healthy food for swine, and is better adapted to the making of meat in this class of animals than the production of milk in cows.

The best food for milch cows is good, sweet grass, from upland pastures. It can be produced more cheaply than sour milk, and with the light of our experience and observation we should say that more profit can be realized by feeding such milk to swine than to cows.—*N. A. Willard, in Rural New Yorker.*

The Dairy.

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Milk.

The varied and extensive uses of milk, call for an intimate acquaintance with its composition and peculiar properties by the parties who produce, handle, and manufacture it, and also by those who consume it. Though one may learn to work by imitation, or by following rules which the experience of himself, or others, may suggest, and meet with tolerable success, yet it must be evident that a full and complete understanding of all that relates to the materials to be dealt with, would give the operator many advantages which he would not otherwise be likely to make available. This consideration would be a sufficient apology for a lengthy chapter on the properties of milk, as more light in regard to them has become a public necessity, on account of the increased commercial importance of milk and its manufactured products. The better the value of milk is understood, the more extensive will be its consumption, as well as the more perfect its production and manufacture; and hence the dairyman should labor with the double purpose of learning all he can in regard to the basis of his own vocation, and of communicating his knowledge to others. A more thorough study of milk ought especially to become more general among dairy farmers; and it is hoped that the following recital of some of the peculiarities of milk, preparatory to treating of its management, will inspire an inclination, in some of our readers at least, to investigate further.

Flesh and blood are so nearly allied to each other in chemical constituents that flesh is sometimes called "crystallized blood." Milk and blood are about as nearly alike as flesh and blood, and hence milk may with some propriety be called *white blood*. The two differ but little in their chemical elements. Their main difference is in their external appearance. Blood contains a little less water, and its albuminoids are in a little different condition from those in milk, Casein in the milk taking the place of albumen and fibrin in the blood. Milk is taken from the blood by the mammary glands with but a slight elaboration; so slight indeed that when the glands become a little enfeebled, as they often do from fever or other causes of debility, the blood globules pass through them and appear in the milk unaltered. We scarcely ever find a case of feverish or tainted milk in which blood globules do not appear. They are not always apparent to the eye, but the microscope seldom fails to reveal them even in cases where the milk is but slightly tainted. But the particles of blood being heavier than the milk, it is not uncommon to find the bottom of the pan or vessel in which tainted milk has stood 24 hours, stained with red, though the appearance of the milk gave no indication of the presence of blood. Blood is perfect nutriment, and milk which is almost perfectly identical with it in chemical constituents, is also perfect nutriment, and hence its dietetical and commercial value.

Milk when analyzed is usually separated into four different parts, besides the water it contains, each of which is a compound capable of further separation. There is no fixed or exact relations between the several parts or compounds of which milk is composed. They vary with the varying circumstances of the cow, and it is rare to find two cows which will give milk exactly alike The milk of a large number of cows mixed together, will, if of average quality, show about the following result in one hundred parts.

Casein	3 25
Butter	3 50
Sugar	5 50
Mineral	0 75
Total solids	13
" water	87

All the constituents of milk except the butter exist not only in a state of complete solution, but in chemical union with the water it contains, and the solution, if divested entirely of the butter globules, is colorless and transparent as water. The white color of milk is due to the endless reflections and refractions of light upon the innumerable butter globules that are mechanically suspended in it, just as ice becomes white when pulverized, by turning the rays of light out of their course, by repeated reflections and refractions.

The butter globules, or, as they are by some called the milk globules, are suspended in the liquid mass and float about in it freely, and whiten every part with their presence They are all round, or rather egg-shaped in form, but in size they are very unequal, varying from 1-2000 of an inch in diameter, all the way down to undistinguishable minuteness. When viewed under the microscope, freshly drawn milk has the appearance represented in the annexed figure 1.

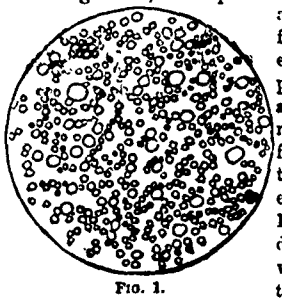

FIG. 1.

Upon the structure and treatment of these infinitesimal bodies depend the dairyman's success in butter-making; and it is important that the operator should be familiar with all that is known in regard to them. A clear knowledge of a few leading facts, and principles, in butter-making, as in everything else, will be found much more efficient in leading to desired results, than the hap-hazard labors and blind imitations of rules made by parties ignorant of the structure and properties of the things they are handling, though the operators may boast of long years of experience.

In searching for ultimate facts in regard to dairying, and especially the department of butter-making, the microscope becomes an efficient and interesting aid, and should be in the hands of every intelligent and progressive dairyman. In examining milk with a strong magnifier, we discover not only that globules of fat matter, of unequal dimensions, float mechanically in the watery mass, but that these little bodies, minute as they are, are made of a speck of several kinds of fat, and in a state of emulsion, with a little curdy matter or casein, and the whole is enclosed within a very thin sack of curd-like matter. If the reader can imagine that the little circles he sees in figure one, are sectional views of the milk globules, they being divided through the centre as one would cut an apple in halves with a knife, the black lines that indicate their circumference will represent a section of the sacks, and the interior will represent the fats it encloses. Now let him bear in mind that the little specks of fatty matter thus enclosed, are composed of white and yellow fats, and several varieties of volatile oils, all mingled together, and that the real diameter of the circles is a thousandth part of their size in the above figure, and he may have something near a correct view of the size and structure of these little globules which play such an important part in dairy husbandry, and which contribute so largely to the luxuries of the table in all the civilized countries of the world.

The envelope of these globules appears to be double, and to be composed of an outer envelope, which is made up essentially of curdy matter, and is comparatively thick, and an inner one which is more oleaginous in its composition, and is very thin and delicate. The outer envelope is what is worn off or broken off in churning, leaving the grains of butter enclosed within the more delicate sack. In one case, the large globules were found to be compound; being made up of several small globules enclosed in one common sack.

Besides the fats and oils enclosed in the globular bodies described, the liquid mass of the milk is charged with numerous oils, so light and volatile as to escape easily by exposure to the air, or by raising the temperature of the milk. These give flavor to the milk and its products, and act an important part in the digestion of the milk when used as food, and also in varying the butter and cheese made from the milk that contains them.

An examination of milk globules with a magnifying glass, serves another purpose in dairy practice which is of no small account. It enables us to distinguish between healthy and diseased milk. Referring again to the figure above, two prominent facts will strike the eye of the observer. One is the even distribution of the globules through the entire figure, and the other is the unequal size of the circles. In all the examples of diseased milk, and illustrations of diseased milk we have met with, the pellicles of the milk globules have appeared viscid and adhesive, as seen in the figure below where the circles will be seen in clusters leaving spaces between them nearly vacant.

Figure 2 represents a sample of slightly tainted milk made so by a little fever in the cow.

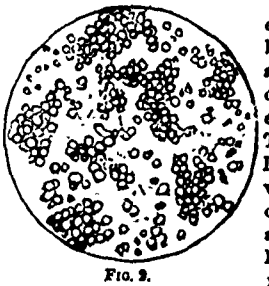

FIG. 2.

One of the very first effects of disease is to begin to decompose and soften the coats of the globules rendering them adherent. This effect will occur long before the cow will exhibit any signs of disease, at least any that would be likely to attract the notice of the ordinary observer. In more advanced stages the globules become broken down and destroyed, and assume a variety of new appearances.

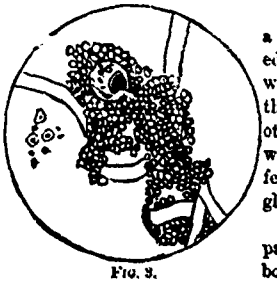

FIG. 3.

Figure 3 represents a sample of milk tainted by drinking impure water. It contained the seeds of algæ and other organic germs, which made the cows feverish and the milk globules very adhesive. The seeds of the algæ passed through the body of the cow into the milk, and after a day or two they grew, and the stems of the plants were seen in the milk well developed as in the illustration. A large germ of another kind lays bare on the adhering globules, and at the top of the figure may be seen some smaller ones of still another variety, and also a few blood cells, having a dark centre. This illustration was