

estimating fairly the true worth of milk, we must take into consideration, not only the nutritive constituents as fat, solids, etc., but also the quality of these as affected by different kinds of bacteria.

Inasmuch as bacteria are alive, and therefore capable of reproduction, we are dealing with a factor that can readily assume a varying aspect, dependent upon the conditions that favor or retard growth. It therefore follows, that if milk once becomes seeded with bacteria, an increase will take place in the amount of germ life, just to the extent that conditions favor the growth of the contained forms. At ordinary temperatures, development is possible, and in increasing degree of warmth up to a certain point, favors a more rapid development.

The farmer usually believes that a "tainted" or "off" condition in his milk arises from the absorption of foul odors that come from decomposing vegetables or animal refuse, but more frequently such trouble is due to the introduction of undesirable living germs that break down certain constituents of the milk, forming by-products that produce the tainted condition. If a taint in milk was due to direct absorption of some pre-existing bad odor, it would be an easy matter to prevent milk from being polluted with the same, but when it is caused by an unseen germ that establishes itself in various ways and undergoes a development in the milk that increases the intensity of the undesirable change, then the matter of getting rid of it becomes much harder.

What every dairyman should do is to learn how milk becomes polluted, and the conditions under which such contamination may become evident, then he is able to forestall trouble by avoiding it, rather than trying to cure it after it has once established itself. The manner in which milk becomes seeded with germ life is then of prime importance.

V

SOURCES OF BACTERIA IN MILK.

Under ordinary conditions, if left to itself, milk invariably spoils, and yet in the healthy udder as it is manufactured by the cow, it is absolutely germ-free. Under ordinary conditions, however, even where precautions are taken, and the milk is allowed to flow out through a sterile milking tube, it is very difficult to get it perfectly free from all living germs. The number of organisms can be so greatly reduced in this way that it will keep sweet for hours, and even days, longer than when milked

in the ordinary manner. This is the secret of "certified" or "sanitary" milk. Such milk does not need pasteurising to destroy noxious organisms, for their introduction has been prevented.

Keeping Quality of Fore or First Milk.—One might naturally think that the minute opening in the teat would effectually keep out bacteria, that it would act as a tight valve, inasmuch as its walls are collapsed, but still there is sufficient room in the mouth of a teat for bacteria to work their way, up the milk duct for at least a short distance. Ordinarily, they do not penetrate to any considerable degree, except in the case of disease, as in garget, but in any event, the conditions are very favorable for growth. A drop of milk in the teat gives elbow room for millions, and with the necessary warmth, food and moisture, rapid growth takes place.

Other Sources of Contamination.—But this is only one source of contamination. Another, that is fraught with much more harm and danger, is the pollution that occurs from entirely external sources. Everybody knows the sequel of a rusty milk pail or can. Every dairyman ought to know why such a utensil should be rejected. Such vessels are hard to clean, and therefore they are often imperfectly cleaned. Dirt and bacteria are invariably associated, so that if the cans are dirty, they will contain large numbers of bacteria, that serve as seed to inoculate the milk as it is received. In the rusty seam and crevice, the tiny microbe lurks in safety.

Then again, the open milk pail affords ample opportunity for hair, dust and filth to fall into the milk. In a dried condition these particles are readily dislodged from the hairy coat of the animal, and every one of them serves as a vehicle for the distribution of germ life. You may think that the trouble is removed if these particles are strained out, but such is not the case. True it is, that the visible dirt is thus taken out, but the invisible germ life, the very thing that is the real cause of the mischief, easily passes through the mesh of the strainer, however fine.

An actual determination of the amount of foreign matter in milk reveals frequently very startling results. Backhaus estimates that 300 pounds of dirt and filth are actually consumed each day in the milk supply of Berlin, Germany.

The kinds of bacteria that find their way into milk from these sources are those that are the most undesirable. They are, as a class, the putrefactive organisms. Not only do they produce taints that impair the commercial value of the milk for butter and cheese, but very frequently such organisms are able to produce intestinal disturbances, such as summer diarrhoea and cholera infantum in young children and infants especially.

(To be continued)