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MILK-INSPECTION AND MILK-STANDARDS.

BY

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OF PHILADELPHIA;

MICROSCOPIST AND FOOD-INSPECTOR, PENNSYLVANIA STATE BOARD OF AGRICULTURE.

(*Reported from advance sheets of the forthcoming annual report of the Board.*)

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No topic in sanitary science has received greater and more careful attention in the past twenty years than the analysis of water and milk, and few topics have exhibited greater transformations as to the principles on which judgments as to sanitary value may be based. The extension of bacteriology has enabled us to identify the causes of disease and to demonstrate in many cases the methods of propagation.

In water-analysis we can still rely with much confidence on the merely analytic results, though we recognize that the figures for chlorin, ammonia, and so on, are merely indexes of pollution and not injurious in themselves. In milk-analysis, we have first been obliged

[1] At the annual (1894) meeting of the Board one session was devoted to the discussion of questions relating to "Milk-Standards and Milk-Inspection." These subjects were selected because at the preceding session of the Legislature the Senate Committee on Agriculture had requested the Secretary of the Board thus to introduce the question at one of the meetings of the Board, and obtain the opinions, *pro* and *con*, of those interested.

All parties interested were invited by advertisement and programs, and a number of persons known to hold diverse views were invited, to be present and explain their positions.

to correct our analytic methods, and, lately, to revise materially our views as to the manner in which milk affects the public health.

In the judgment of the results of a water-analysis, chemists have never been misled into attaching undue importance to the proportion of dissolved matters; but in judging of the results of milk-analysis this error has long been made, and is still being made by sanitary officers. Thus, in the early days of the agitation of the question of milk-inspection in Pennsylvania, reference was not infrequently made to the high rate of infant-mortality, and this was ascribed to the reduction of the strength of the milk-food by dilution and skimming.

At the present day we are in possession of a much wider and more exact knowledge as to the manner of the distribution of disease by milk. We now know that serious dangers arise from the contamination of the milk by microbes, and that such dangers fall practically into two classes.

The first class is that due to contamination of milk by specific micro-organisms from disease, either among the milk-yielding animals or among the persons about the farm. I do not think that it will be necessary to discuss these questions in much detail, for all are pretty familiar with the subject. Possibly, some may not fully appreciate the extent to which specific disease in dairy-cows exists, and to which it infects human beings; but I frankly say that I am a convert to the view that the production of cows' milk for human food, under the present methods of collection and use, is one of the most dangerous of human industries. As an illustration of the extent to which tuberculosis may exist in herds, I take the following articles from the *Medical Record* of January 6, 1894.

"Probably few physicians are aware of the enormous practical value in the animal industry of tuberculin, that is to say, if the position taken by the New York and

other State Boards of Health regarding it is correct. A gentleman who has a valuable herd of thoroughbred cows writes us that twice within the last six months his herd has been examined by competent veterinarians and pronounced healthy. A third examination, however, with the aid of tuberculin, caused a condemnation of over one-half of the herd. He adds:

"'The New York State Board of Health is killing by the hundreds animals condemned by diagnosis with tuberculin, and the State is paying full value for them. The veterinarian says that the autopsy shows the diagnosis to be correct in every case.' He says, also, that it is impossible for the best veterinarian to discover tuberculosis by physical examination except in extreme cases. 'My herd is apparently in splendid condition. Breeders do not know of its existence in their herds. They let a cow remain in the herd until she is unquestionably tuberculous, and then remove her, but she has then already infected the herd. A temperature of 103° F. condemns the cow.' In a herd of Jerseys, at Troy, of 80 head, he has killed 33, and will kill 20 more of them this week. Autopsies are held in the presence of physicians and veterinarians. There have been 15,000 tests with tuberculin in England. New York evidently believes in this kind of diagnosis, and will probably have to pay $500,000 to eradicate tuberculosis. The veterinarian says the State is full of it, in herds of thoroughbreds and common cows.

"We understand from other sources that the State Board of Health fully believes in the certainty of the tuberculin diagnosis. Through its means it has been discovered that some of the best-bred herds, supplying high-priced milk, cream, and butter are infected."

It is apparent from this article, which is merely one of many similar statements, that we have not fully realized the relations of milk to the prevalence of the disease which is known to be the cause of one-seventh of the

total deaths in civilized countries, and is the unsuspected cause of many more.

It is, however, not only disease in the cow which may be conveyed. The conditions of farm-life are such that milk often conveys virulent, infectious diseases from the dairyman's family to his customers. Here, again, the literature is so abundant, and the facts are so generally known, that I need not stop to detail them. Those who are interested in this phase of the question will find some valuable and recent data in the report of the State Board of Health of Massachusetts. Several epidemics of typhoid fever were traced to milk supplied from a farm on which a case of this disease existed.

We find, however, that even when milk is taken from cattle entirely healthy, and on farms in which no specific disease exists, it may become a most dangerous article of food. This is due to the decompositions which are induced in it by bacteria. Milk is a close approach to a perfect food. It is not an absolutely perfect food for human beings, because it is deficient in iron ; but it serves admirably as a medium for the growth of bacteria, many species of which produce remarkable changes in the casein, by which highly poisonous compounds are set free. Now, under the ordinary methods of milking, infection with multitudes of the common bacteria of the air, water, and even soil is certain to occur. That milk usually contains these is proved by the deposits obtained in centrifugal swimming, which show, under microscopic examination, many repulsive materials. When milk as ordinarily furnished is kept at summer temperature, the bacteria increase with great rapidity, and it is now recognized that a proportion of the infant-mortality in the warmer season is caused by this condition. In fact, the information at present in our possession shows that, unless collected under extreme precaution, raw milk, at least cow's milk, is not a suitable food for human beings. Hence the general practice of sterilization, which has resulted

so favorably in the feeding of infants. Statistics have been recently published which show that death from tuberculosis occurs in large proportion in infants, the action being due to the entrance of the tubercle-bacillus into the lacteals, thus preventing the absorption of the food and causing death by starvation.

I have endeavored so far to indicate briefly, but I hope distinctly, the idea that sanitary control of milk-supply may have little to do with the mere question of the chemic composition of milk. It is of very little moment to the consumer, except on a question of cost, whether milk contains 12, 13, or 14 per cent. of solids. The claim that milk watered or skimmed is unwholesome rests on no positive information, and within certain limits of variation, the regulation of the composition of milk is no more a matter of sanitary duty than the regulation of the proportion of fat and lean in the meat sold in our markets, or the proportion of alcohol and extract in beer and ale. Nevertheless, economic considerations will doubtless lead to the establishment of some standard for milk, and it will be sufficient to fix the minimum, not the average. The time is passed when we can claim 9.50 solids not fat for a standard, and even 9.00 per cent. is unjust. In my opinion, there should not be fixed in any legal enactment a higher figure than 8.50 per cent. of solids not fat, and 3.00 per cent. fat for whole milk. Skimmed milk should be permitted to be sold as such, and should not be required to contain any fat; that is, any one purchasing skimmed milk should assume that all the fat may have been removed. I have never been able to understand the logical process in the minds of those who desired to prohibit the sale of skimmed milk. However, when we remember that the same parties who last winter were trying to prevent the sale of skimmed milk proposed also to prohibit the sale of condensed milk containing less than twenty-five per cent. of fat, which would exclude all the standard brands in the

market, we can appreciate the impracticable views that may be advanced.

It has been the custom of some persons to designate the skimmed milk from centrifugals as "separator slop," but I am unable to see that such an article is any more of the nature of a refuse than buttermilk, whey, or cheese.

The standard of the Society of Public Analysts of England, an organization which represents, I think, the highest judgment and experience on the question, is 8.50 solids not fat and 3.00 of fat. Concerning this standard, Dr. Vieth, a dairy-chemist of large experience, recently expressed himself as follows:

"My object is by no means to raise the cry that the standard adopted by the society is too high; on the contrary, I think it is very judiciously fixed, but in upholding the standard of purity it should not be forgotten that the cows have never been asked for, nor given their assent to it, and that they will at times produce milk below standard. A bad season for hay-making is, in my experience, almost invariably followed by a particularly low depression in the quality of milk, toward the end of winter. Should the winter be of unusual severity and length, the depression will be still more marked. Long spells of cold and wet, as well as of heat and drought, during the time when cows are kept on pasture, also unfavorably influence the quality, and, I may add, quantity of milk."

Much discussion has been given to the effects of special forms of food and their relation to the wholesomeness of milk. Legislation promoted by health-boards often involves prohibition of the use of brewers' grains or distilling refuse. In regard to these matters I desire to transcribe two personal letters received from Dr. Vieth, whom I have just quoted:

"The reason that I have not acknowledged and answered your favor of August 21st ere this, is, that I desired to give you as much information as possible on the

subject of the effect of brewers' grains and similar refuse on the wholesomeness of milk.

"I suppose it is about the same in your country as it is in ours, viz.: that people are not slow in passing an opinion on the matter in question either one way or the other; but when one sets to work to follow the matter up, one finds these opinions not substantiated by facts. I was, when I received your letter, not aware of any publication on the matter in question, and have since taken much trouble to find one or collect information worthy to be transmitted to you. I am sorry to say that I have failed in my endeavors almost entirely. Hunting through the literature, I have found brewers' grains barely mentioned in connection with the question of the wholesomeness of milk—and have got the impression that no one thinks of expecting any bad effect from the use of that food. Here the question turns almost entirely about the admissibility of distillery-wash as food for milk cows. This food has a good many adversaries, but, it seems, even more defenders. It is generally admitted that, when fed in moderate quantities and in a fresh state, and other food given besides, it will do no harm. When given in large quantities—say from fifteen to twenty gallons per day—it certainly produces a very poor milk, which is said to have a bad effect on infants. This is most likely true, but I have failed to find it proved by experiments or exact observations. The best observations on the subject I have come across are made by Prof. König, and are contained in a paper which has been published in *Repertorium für Analytische Chemie*, 1881. They are also based on theoretic speculation, and not on actual experiments. Before leaving the subject I should like to mention that there is most likely a considerable difference between brewers' grains from ale and from lager beer breweries.

"When your card of the 21st ult. arrived I had just come into possession of some more evidence with regard

to feeding milch-cows with distillery-wash; that is, the refuse from the manufacture of potato-spirit. Professors König, of Munster, and Maercker, of Halle, are two eminent authorities on the subject of cattle-feeding. The former is of opinion that there is no objection to giving to cows from forty to fifty liters of fresh distillery-wash per diem, provided other suitable food is given in addition. He would rather not have the distillery-wash used in a sour condition, and objects to feeding children with milk from cows which have received it. (In the prohibition of the use of distillery-wash he would see a serious injury; but it should be demanded by law that milk thus produced should all be sold in the sterilized condition.) All the objections would be overcome by the use of distillery-wash in the dried state.

"Prof. Maercker writes that the supposition that the milk from distillery-wash fed cows is injurious to health is in no way supported. The distillery-wash is completely sterilized in its manufacture, which is not the case with any other food. If milk from distillery-wash fed cows has caused illness, the fault is that proper care had not been taken to keep the cowsheds, and more particularly the mangers, clean. Under such conditions, any food might produce similar ill-effects.

"Ohlsen and Uffelmann, of Rostock, have made an investigation into the matter and published the results in the *Jahrbuch für Kinderheilkunde*, 34, vol. 1. The results are, in short, as follows:

"The milk from cows fed with distillery-wash is of neutral, sometimes alkaline reaction. Acidity did not set in before the lapse of forty-eight hours. Provided suitable food be given in addition, the milk does not appear unsuitable for feeding infants. There is no proof that the milk produces indigestion or rachitis with infants. Microscopic and bacteriologic examination did not prove any difference from other milk.

"The work of Ohlsen and Uffelmann is the first evi-

dence on the subject, founded on exact observation, which has come to my knowledge, and as I thought it might be useful to you I wish to draw your attention to it without delay."

It appears, then, that the danger from milk, as far as the dairyman is concerned, is the introduction of specific germs through diseased cattle; and it is worthy of note that the liability to such disease is as great, if not greater, in cattle yielding rich milk than in those yielding poor milk. One of the reasons that sanitary officers have sometimes given for asking that the legal limits of milk shall be fixed above the average is that it will tend to "improve the quality of the dairy-cattle" supplying the city. Independently of the fact that it is no part of the sanitary method to develop superior types, it seems that such stimulation will lead to the worst conditions. Questions of chemic composition are trifling in proportion to the matter of the prevention of the spread of specific disease.