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MUNICIPAL HYGIENE—PART II—MILK.

BY C. O. BATES.

It is the purpose of this paper to help popularize the scientific facts that have been discovered by the national research laboratories which are controlled and fostered by our national government and individual States of the Union, and by the laboratories of the denominational institutions of higher education. Vast sums of money are spent each year to maintain such work. No one can question their efficiency or practical value. Such knowledge is not prized as highly as it should be, nor are the discoveries as thoroughly known as they should be. The bulletins that are issued from the various stations are within the reach of everyone, they are absolutely free. Like streams that have their origin in the ice fields of remote mountains, they come in gentle cascades to satisfy the thirsty and revive life, and give hope for better and higher life. "Doth not Wisdom cry? and Understanding put forth her voice?" "She crieth at the gates, at the entry, at the coming, at the doors."

Legislation is not what is needed so much as education. The people have to understand and appreciate great truths before they will accept and apply them. A people cannot be brought up from Egypt to Palestine in a single day as legislators would sometimes have us believe. The food that first sustains our bodies, which is at once the most delicate and perfect food, and for which there is no substitute, demands the most serious and searching investigation that Science can give it. Statistics show that more than one-fourth of the human race die in infancy. The cause of this frightful mortality is largely due to the impure quality of milk.

Such things ought not to be. Surely the voice of Wisdom in our land today cries, "They are a people that know not my ways."

Next to water is milk in its importance to a municipality. The question of a pure milk supply during the last few years has received a great deal of consideration, due, in a large measure, to a feeling of alarm in the minds of those who have made thorough and scientific investigations.

Practically every city in the United States having a population of over 50,000 is beginning to have some sort of supervision of its milk supply, while nearly all of the smaller cities are falling into line with this movement.

Pure milk has a bland, sweet taste and is slightly alkaline in its reaction. Its color with yellow tinge is due to an emulsion of about sixteen different kinds of oils which constitute the butter fat. Pure milk is slightly heavier than pure water, its specific gravity being 1.03. The average composition of cows milk is as follows:

Water	87.2
Proteines	3.5
Fat	3.5
Sugar	4.9
Minerals7

It is thus shown by its chemical constituents to be a perfect food. It contains all the four classes of nutriments—minerals for building up and repairing bone tissue; proteines for nerve, sinew and muscle; fat for reserve energy; sugar for heat. The ingredients are found in the right proportion for a complete food.

There are many reasons why milk should receive special consideration. In a large sense there is no food so absolutely essential to our well-being as a people. It is the most readily assimilated of all foods. It is nature's food for the young of all mammals. It is the most easily adulterated food, and the adulteration is frequently the most difficult to detect. It is one of the greatest absorbents of disagreeable and poisonous gases and odors.

If not properly cared for it soon deteriorates and under certain conditions tox-albumens are formed which render it dangerous. It is a veritable paradise for bacteria. Every drop of water that touches the milk furnishes its quota; every time that warm milk is exposed to the air, new micro-organisms find their home in the milk, and multiply with a rapidity that discounts the most incredible fairy story.

When once pathogenic germs get into milk an epidemic is started so quickly that we are scarcely able to cope with it. In case of typhoid epidemics, experts first direct their attention to the milk supply. This evil, as is the spreading of all other infectious diseases, is due to negligence, ignorance and carelessness, and a lack of proper supervision. The magnitude of this crime is appalling when we think of the number of very young children whose health is permanently injured, and the number whose lives are evidently lost by such adulterated food.

No one knows how much misery is produced, nor how many lives are lost when adulterated milk is administered to the sick.

The infants of today are the men and women of tomorrow. Our forefathers were stronger and hardier than we. One reason for this was certainly because they drank purer milk and purer water and breathed purer air.

The man who mixes glucose worth two cents a pound with honey worth twelve cents a pound practices deception and fraud, but there is no physical injury done the customer. The glucose is just as wholesome as the honey. But the man who puts formaldehyde or any other preservative that injures its digestibility into the milk destroys the vitality of the nation.

Since milk is the most delicate food and fills such a large and important place in the basic demands for the sustenance and growth of our bodies, it of necessity requires a corresponding delicate care in handling in order to accomplish the expected results. In fact, the care of milk demands more than a passing consideration. It is the place to emphasize skill in manipulation, to use exquisite methods of cleanliness, and to focus all the knowledge that science has given us.

The average farmer spends a great deal of time each day in washing and grooming his fine horses, and he is to be commended for it. At the same time his cows receive little or no attention of this kind, while their bodies reek with the accumulation of dust, dirt and filth. This is wrong. The health and happiness of thousands are dependent upon the well groomed cow, the well kept barnyard, the clean barn, well lighted and ventilated, and supplied with an abundance of pure water.

The progress and intelligence of the twentieth century will not permit this evil to exist. Let us look at things just as they are and measure them according to their value. When a square deal is in effect with those things that have to do with the essential elements of our civilization and our well-being as free moral agents, the science of preparing pure milk

will be more highly esteemed than it is at the present time. Latin, Greek and the higher mathematics will be none the less valued, but the art of preparing pure food will be advanced many points. If the sages of the last century had given as much attention to micro-organisms as they did to the "final perseverance of the saints" and to "total depravity" we would certainly have been drinking purer milk at this time.

The sources of contamination of milk are many. Frequently some of them are evasive and baffle the skill of our present day scientists, while again other sources of contamination are so obvious as to offend our sense of common decency; especially it is true when we observe in the bottom of our glass or pitcher of milk dirt in its hideous forms. If each person is to eat his conventional "peck of dirt", let him avoid it in milk, because of the extreme danger of its being associated with malignant disease.

While the care of the body of the cow and the care of the barnyard is perhaps the most important matter for the consideration in the effort to obtain pure milk, the next most important consideration is the personal cleanliness of the milker. Many cases of contagious diseases have been traced to the home of milkmen. Impure water has been used in washing the milk cans or the utensils have not been sufficiently sterilized with boiling water. Pure milk from a healthy cow contains few bacteria, while milk that is taken from a slovenly kept cow in a foul, dark barn will have millions per cubic centimeter.

The crusade for pure milk which began some years ago, had its origin in the United States and in Switzerland with the milkmen themselves. This fact is both significant and hopeful.

If consumers would give more attention to pure milk than to cheap milk, the great cause would be helped immensely.

Common sense and decency tells us that all food products should be prepared clean and kept clean. It requires no scientific demonstration to show that dirt and filth should be banished, but just how to fight and overcome such common foes demands the best skill of our boasted civilization. A child knows that fire will burn his hand, though he cannot understand the principles of combustion, much less comprehend the scientific meaning of heat. It is a well known fact to every housekeeper that milk will not keep as well as other foods. It will sour, curdle and decompose while all other foods retain their sweetness and purity. This fact has been known for ages, but the real cause was not understood until within the last two decades.

While all foods should be handled with care, extreme care is absolutely essential in the handling of milk. Science has demonstrated in the last few years that all the troublesome changes in milk are due to the presence of bacteria.

Success in handling milk depends upon two things:

First, the ability to keep bacteria from getting into the milk.

Second, the ability to control the bacteria that may have unavoidably gotten into the milk.

The science of dairying is based primarily upon the science of bacteriology. Bacteria are microscopic plants and perhaps are as numerous in genera and species as the visible vegetable kingdom. It is said that

the method of preparing Roquefort cheese was, like some other great discoveries, accidental. A lad in Switzerland was in the habit of taking his noon lunch with him while tending his father's herds. By chance one day he left his lunch in a cave. He was surprised some days later to find his lunch, and was especially pleased with the new flavor which the cheese had acquired. From that date to this Roquefort cheeses have been made in that cave by the inhabitants of that province.

This species of bacteria has also been grown in many other places wherever the dairymen wished to make this particular kind of cheese, just as Indian corn though originally found in America has been grown successfully in many parts of the world.

Bacteria are bought and sold in the market. They are used to ripen the cream, for making butter. They give a desirable flavor to the butter when the right species are used in the right way. Like weeds in the garden, pathogenic and troublesome bacteria seem to thrive where we do not want them. Warm temperature, moisture and food supply are the conditions that favor the wonderfully rapid growth of bacteria. The first step in the care of the milk is to cool it to a temperature of at least 50 degrees Fahrenheit or below, and keep it as cool as possible until it is ready to be used.

Since every cubic inch of air in a barnyard contains hundreds of bacteria, every particle of dust and every fiber are alive with these minute organisms, it is absolutely necessary to keep the milk carefully covered. It becomes easy to see, from the standpoint of bacteriology, that the milk should have special care. It is not necessary for every milkman to become an expert bacteriologist in order to furnish a pure supply of milk, but it would be extremely to his advantage to get the view point of the bacteriologist, and to keep posted on the progress of the science as developed by our various state experimental stations and our national bureau of chemistry. Pamphlets of the greatest value are issued from these stations at various times giving the most valuable and reliable information that can be obtained. Such documents are issued and designed primarily for those who are engaged in the dairy industry.

The following is the result of some bacteriological counts in the city milk of Cedar Rapids.

Date.	Milk Sample No.	No. of bacteria per cu. centim.
June 23, 1906	1.	475,000
" " "	2.	365,400
" " "	3.	150,000
" " "	4.	730,000
" " "	5.	145,600
" " "	6.	283,000
" " "	7.	232,000
" " "	8.	534,000
" " "	9.	440,000
" " "	10.	266,000
July 2, "	11.	800,000
" " "	12.	130,000
" " "	13.	484,000
" " "	14.	208,000

CREAM.

Date.	Milk Sample No.	No. of bacteria per cu. centim.
June 23, 1906	1.	465,500
" " "	2.	351,000
July 2, 1906	3.	421,000
" " "	4.	656,000
" " "	5.	630,000