A CONSIDERATION OF THE FACTORS OF A CITY MILK ORDINANCE.

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It has been truly said, if not artistically expressed, that "the milk problem in America today is perhaps the toughest of all of our pure food and public health problems." It is one which concerns every human being. It has furnished abundant material for periodicals in the way of cartoons and popular reading. Usually such articles claim to contain the solution to the entire problem but in most cases the writer has grasped but one strand in a complicated and extensive system. In most cases such writers can be forgiven their conceited efforts to proclaim their solution of the problem. Any one phase of the question is so far reaching and extensive as to successfully prevent any one individual from grasping the problem in its entirety.

In the "Survey" in 1910 appeared an article dealing with the milk question entitled "Put the responsibility on the right shoulders." It was very brief but was a surprise in that it did not place the responsibility on the shoulders on which it is popularly supposed to rest. The writer was one of the advance guard on the milk question and had discovered that the responsibility rested only to a slight extent upon the shoulders of the farmer but quite heavily on those of the consumer. The health departments throughout the country have been quite tardy in grasping this idea and have quite uniformly adopted milk ordinances which embody non-sensical clauses and unattainable requirements. Dr. Charles E. Marshall ably and correctly states a present day fault where he says: "We preach what we do not know, we expect ideal conditions where only

fair are possible, we advocate the things of the millenium when we are just emerging from barbarity."

It is the purpose in this article to briefly consider the factors most commonly entering into city milk ordinances. This makes possible the treatment of an immense and almost unstudied field but I wish to narrow my subject still further and consider these factors from the producer's standpoint. This side of the question has received but little attention, it seldom comes to light, and is less understood than that of the consumer. Very few facts have been compiled in regard to it, largely due, perhaps, to the lack of organization among farmers and the application of scientific, business like principles to the business of milk and cream production. A sane and conservative consideration of the milk question can never be possible until the consumer knows what the producer has to contend with, the cost of producing milk, and the steps in manipulation necessary to the securing of pure milk. This knowledge must furnish the appreciative spirit and rational interpretation of the milk question.

In a consideration of milk and milk legislation we should state definitely, at the outset, what ideas we wish to convey in the use of these terms. Every medical college, every bacteriological institute, and every health commission may adopt a different meaning for the term milk. In this paper I shall consider milk as an opaque, yellowish-white, mammalian secretion with a slightly alkaline reaction and a faintly sweetish taste. It is composed chief-

ly of water, proteids, fats, sugars, and minerals, together with coloring matters, gases, and some organic acids. The relative proportion of these constituents will not be considered here because they vary in the different breeds of dairy cattle and among the individuals in the same breed. There are several terms applied to the various grades of milk, such as, selected, inspected or guarranteed, certified milk, etc. These terms all refer to the conditions under which the milk has been produced and handled.

City milk ordinances naturally refer to ordinances, of cities of any size, which deal with dairy and food products resulting therefrom. The ordinances are made up of rulings of the boards of health of the respective cities which are to control the production, care, and handling, of milk shipped into those cities. Furthermore, in most cases, they have gradually come to include the health of the cows, the treatment of the milk by the consumer, especially if kept for a time, and the health of all persons concerned in its handling.

It is not the purpose in this paper to pick flaws, primarily, in any particular city ordinance, or to find fault with any particular board of health, but to present an orderly, unprejudiced study of the so-called "milk question" from the producer's standpoint. I shall endeavor to find if the average ordinances are constructed with the purpose of serving the producer as well as the consumer; to find if there really exists a strained relation between the producer and consumer, and if such a relation does exist, to find its causes and its cure; and lastly, to briefly glance at the problem

of producing a cleaner dairy product at a less cost, or, at least, with a very slight increase in price. I take up this subject from the standpoint of the producer, both from a natural inclination to that point of view, and because I believe the farmer has been unjustly ignored in this subject in which he is most vitally concerned

There can be no question raised but that milk legislation is absolutely necessary. Every branch of industry is governed by appropriate laws because the need of some control is necessary to protect and encourage both producer and consumer. In general the producer of dairy products is the farmer, the world's largest laboring class. We find among them men who may be classified according to the quality of milk which they produce. Some produce an almost ideal milk: some only a ready-selling grade; others an article which is not fit to sell and is positively dangerous to use; while a few, although they may produce a good clean milk, employ one or many ways of adulterating it before placing it on the market. The last two classes named are a menace to society in general and must be ruled by the law. They also injure the reputation of the better classes of producers and cheapen their product. Legal control justifies its existence in being a corrective and a preventitive agent over the cheater, and a protection to him who combines quantity and quality inhis product.

When we consider the consumers, they who consume the milk but in nowise aid in its production, we also find various classes. One class is composed of a few individuals who recognize and appreciate good milk; another comprises those who are ignorant of everything pertaining to milk; through this ignorance they allow the

milk to spoil, very many times, and place the blame on the producer; a third class is of those who do not know good milk and couldn't or wouldn't buy it if they did. This last class presents another phase of the milk question, but one which is entirely without the scope of this paper. The ordinances are almost wholly designed to protect the consumer, regardless of the class to which he belongs, but they do not place any restrictions on them governing their relations with the farmer. Milk ordinances should offer some protection to the producer as well as to the consumer.

Finally milk legislation is necessary to improve the dairy industry. In 1893, Dr. Henry L. Coit, of Newark, N. J., recognized the inadequacy of state and municipal methods of dealing with the milk problem. He and his associates organized a professional organization known as the Medical Milk Commission of Essex County, New Jersey. The objects and scope of the commission were defined as follows:

> "The objects of this commission are to establish correct clinical standards of purity for cows' milk; to become responsible for a periodical inspection of the dairies under its patronage; provide for chemical and bacteriological examinations of the product, and the frequent scrutiny of the stock by competent veterinarians; to promote only professional and public interests."

This movement spread slowly because the question of milk improvement was not broadly understood by the medical profession, and because, when an organization of a milk commission was decided up-

on, it was difficult to arrive at the most acceptable plan of organization and detail of working methods. Usually the procedure followed was to correspond with one of the older commissions, which would relate its individual experience of handling the problem. Usually all the commissions would be written to for information. After a time it proved burdensome to the operating organizations, and, very often, unsatisfactory to the organizing commission. As a result there became visible a lack of uniformity as to organization, working methods, supervision of dairies, chemical and bacteriological standards, etc. A conference of milk commissions was held to decide upon the most acceptable standards and working factors. From this grew the permanent organization of the American Association of Medical Milk Commissions. The original purposes of the association are best defined by Article 11 of its constitution:

> " The purpose of this Association shall be to federate and bring into one compact association the Medical Milk Commissions of the United States; to exchange views and to adopt uniform methods of procedure in the work of the Medical Milk Commissions; to fix chemical and bacteriologic standards; to determine the scope of medical and veterinary inspections, and to foster and encourage the establishment of Medical Milk Commissions in other cities."

This is in brief the history of milk legislation to date. The purposes of all organizations wererightly intended and were in the right direction, but in no case has the aim been broad enough, or the method of procedure been such as to include the producer in the construction of the legislation or to make it worth his time and

labor to live up to the imposed rulings. Milk legislation has developed, therefore, in a narrow and one-sided way, successful to a degree, it is true, but the problem is as much a problem today as in 1893, and will continue thus until milk legislation is produced by all concerned.

Up until the present time the various boards of health have maintained that in every city a license must be obtained before the privilege to sell milk is granted. This arbitrary demand has never been questioned by the producer and he has always procured the desired license. The producer admits the need of uniform standards for all dairy products, for he possesses enough common sense to see that they are necessary for the protection of the consuming public. Moreover, he himself enjoys a protection under these same standards, and also makes a financial profit because of them. Further, he admits the need of inspection, the advantages arising from it, both to himself and consumer, and in nearly every case is perfectly willing to allow an inspection of his buildings and premises. Lastly this same individual, or class of individuals, agrees with the general public that there must be an enforcement of the law. From this it would seem that the farmer has met the health commissioner and consumer half way, yet he is not allowed a representation in any city council to present his side of the milk question and to share in regulating his own business.

We are then face to face with one phase of the problem, namely, the so-called milk question is the result of certain groups of professional men taking the stand that the farmers, as a class, are in-

competent for consultation as to how to improve their own business. The consumer does not come under the control of the ordinances and the producer is at his mercy. There is no incentive for the farmer to improve the quality of his milk. In the main the health commissions purpose to benefit the farmer with suggestions, but he resents their attempts and with reason. In most cases the attempt to improve the milk supply through the ordinance is characterized as a "fight for pure milk" and as such has been received by the farmers. It is not an unwillingness on their part to improve their product but rather a just resentment of the tactless, overbearing attitude of health officers and inspectors, and of being compelled to meet requirements of doubtless value and without proportionate compensation.

We will study the milk legislation which has been produced by the boards of health, principally of the cities of Michigan with perhaps one or two exceptions, under the impetus and influence of the American Association of Medical Milk Commissions. We will endeavor to find wherein this legislation is beneficial and where not. And finally we will glance briefly at a new system of milk inspection and methods for securing improvement of the milk.

Practically every city milk ordinance demands that a license be procured from the city clerk before permission shall be granted to any person to engage in the sale, delivery or distribution, of milk or cream. As provisions to be complied with before the license is granted, the applicant must pay a license fee; give his full name and address; the name and address of all from whom he may obtain milk

or cream, together with the number of cows in his herd, as well as of those from whom he buys; he must also state the manner in which he proposes to dispose of his product. Thus far most ordinances agree, in content if not in form, but these are only details of little importance.

The first important factor considered by boards of health is generally approached in the following way;

> "No person, firm or corporation, shall keep, offer or expose for sale, or sell or deliver for sale or consumption within the city of whether licensed under this ordinance or not, any unclean, impure, unhealthy, unwholesome, or adulterated milk or cream."

They then proceed to state under what conditions will milk be considered by them to be "unclean, impure, unhealthy, unwholesome, or adulterated." Suppose, for simplicity and clearness that we consider some of these points as taken from some typical ordinance, in which they may supposedly be arranged in a logical order.

> "Milk or cream under the terms of this ordinance shall be held to be unclean, impure, unhealthy, unwholesome or adulterated, when:
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> (1) Milk or cream is produced in filthy, foul smelling or poorly ventilated stables, or when placed, kept or stored in unclean utensils, cans, or bottles."

This section is acceptable in every way. Any one who is at all acquainted with the nature of milk knows that it cannot be clean, chemically or biologically, or free from foul taints or odors, if it is produced under filthy conditions. Then, too, unclean utensils,

whatever their nature, mean unclean milk, for bacteria are always present in unclean utensils, and they multiply readily in milk because it is a perfect natural media. It matters little whether the milk in such vessels is "placed, kept, or stored," in them, contamination takes place instantly and multiplication begins at a very rapid rate.

(2) "When the milk or cream at any place between the point of production and the place where it leaves the control or possession of the licensee, shall be placed, kept or stored in any utensil, bottle or vessel of any description that has not been sterilized in a manner or method approved by the said board of health." The point intended to be em phasized in this section is well taken but hardly seems of sufficient force. An acquaintence with the ordinance of which this section was a part, and a limited acquaintence with the board of health which formed this section, fails to show that the expression "sterilized in a manner or method approved by the said board of health" has not been elsewhere explained or more definitely stated. It is immaterial in what manner or method the thermal death point of bacteria is reached, so long as that method gives effective results, but many other ordinances state the desired principle in the following, definite terms:

"All cans, bottles, or vessels of any sort used in the sale, delivery or distribution of milk or cream to the consumer must be cleaned and sterilized (boiled, baked, scalded or steamed) by the milk dealer before they are used again for the same purpose."

(3)"When the milk is drawn from a cow that has not first been properly cleaned, or when milking is done with hands that are not clean and dry."

This is a just requirement but which will only be met willingly and voluntarily by the intelligent dairyman. Different men have different ideals of what constitute clean cows, and consequently a cow which one man would consider quite clean, others would consider positively filthy. Some men may milk cows which have manure plastered thickly to their hips and sides but they never think of them as being dirty. Cows may even have their udders more or less covered with manure, and even then some men would only consider them a little dirty. In such cases the only care taken is to prevent the manure from falling off into the milk, but even this is thought by some to be removed by the strainer.

Added to this filthy condition is that of moist milking. The hands may be clean, though more often they are not, and the milker will first milk into his hands and likewise wets the teats. If the udder and teats are filthy moist milking dissolves the filth and it cannot be strained out of the milk, once it falls in. There are ways in which moist milking is carried on which are infinitely more filthy than when the moisture is from milk. At best it is a very filthy practice and is unfortunately too difficult of detection. Milk produced in such a way deserves all the words used in this section to classify it properly.

(4) "When the milk is not immediately removed from the stable after milking and cooled to a temperature of 60 degrees or less, and thereafter continuously kept at a temperature of not to exceed 60 degrees Fahrenheit until delivered to the consumer."

It would be an approach to the ideal way of handling milk if this

section were carried out in full. In most cases the farmer must be educated on the points connected with the production of milk. This section enumerates two of those points, namely, contamination of milk due to exposure to impure air, and the effect of temperature on the germ content of milk. When the farmer realizes the extent of the contamination possible through exposure to air then he will begin to reorganize his ideas regarding his business, and he will endeavor to learn new facts concerning it.

Such a realization, however, has come to but a few farmers. We seldom meet the ideal but the absence of it, otherwise our milk problem would likely be short lived. The farmer does not as a rule understand the possibilities of contamination and so sanitary measures are useless. Besides being uninformed he usually has his barns all built and they have been good enough, previously, and ought to be satisfactory now. If he doesn't live by the rule "what I've got is good enough," then the cost of rebuilding will prevent many improvements. Many farmers have suitable barns but think they can't afford to give up any space for a milkroom, or they keep the horses in the same barn with the cows and a milk room separate from the barn will be necessary. Whatever improvements might have to be made most farmers would feel that the cost would exceed the resulting benefit.

In order to secure the required temperature it would be necessary to have ice. It seems to most people that it would be an easy matter to have ice in the country and they are justified in thinking

so, but more city homes will be found supplied with ice in summer than will country homes. The reason is easily apparent. In the city some man or firm makes it a business to store up large quantities of ice, then in the summer he sells it out at a price which pays him for his work and property invested. It costs the farmer just as much to fill an ice house as it does the city man, and he must have a similar equipment, but he doesn't get sufficient remuneration for his work. The cost of securing an ice supply, the building of an ice house, and supplying other facilities necessary to cool milk and keep it cooled, raises the cost of production per quart on milk, but the consumer won't pay more for it. The needed reform in this case is opposed by the consumer not the producer. It so often happens that the farmer refuses to build an ice house, put in ice, and furnish an arrator, that the consuming public has come to think that the farmer is too ignorant to see that he is cutting off his own nose. The farmers are not organized and as a result no one individual can effectively raise the price of his milk and so pay for modern improvements.

(5) "When the owner or owners of the milk or cows refuse to allow the proper agents or inspectors of the board of health to make inspection and investigation as provided by this ordinance." Most farmers admit the need of inspection and most of them are willing to have their milk, cows, or barns inspected. Some farmers, it is true, are opposed to inspection at first but in most case that opposition has arisen from treatment received at the hands of inspectors. The boards of health are themselves at fault in this point for they seem to think any man whom they authorize to go out

as an inspector is competent to inspect. The public knows of too many cases where inspectors secured their jobs through political pulls. Progress can never be made through inspection so long as farmers know that their dairies are being scored by a man who does not know enough about the business to judge fairly. An inspector should understand that his presence on the farm is a mutual courtesy and that his duty is to observe and record conditions as they exist. If he is beyond the limits of the municipality he is entirely without authority to issue orders, and his assumption of authority, which the farmer knows he does not possess, is a common and fertile source of friction. When the health commissions learn to consider this in authorizing their representatives to act as inspectors, and when inspectors bear in mind their relation to the board of health and the farmers, there will be no trouble encountered against inspection.

(6) "When milk is drawn from any cow less than twenty days before or within five days after calving."

It is seldom that a cow will continue in a flow of milk right up to the time of calving, and as a rule, the flow has ceased, naturally, six or eight weeks before that time. It is considered advisable to discontinue milking about that long previous to calving in order that the cow may be allowed to rest and devote all her energies to the development of the foetus. The time limit, therefore, preceding parturition is of about the right length. The milk produced at this time is called colostrum, and differs in the percentage of its constituents from that of regular milk. It sometimes has an unattractive appearance eventhough it is perfectly clean. It is by nature a

perfectly balanced ration and is primarily intended for the young calf because it is a laxative and is highly important for cleansing the alimentary tract and properly starting the work of digestion. Very many health ordinances place this limit at ten days but it is generally considered unnecessary.

(7) "When the milk is drawn from any cow suffering from any disease, or disease or injury of the udder or teats, or the milker is afflicted with any communicable disease, or within twenty four hours prior to the milking has been in contact or caring for anyone afflicted with a communicable disease."

Cows, like human beings, may be troubled with a disease which may exist unnoticed for an indefinite time. Also, cows may be possessed of various different diseases without impairing the quality of the milk as a food, and apparently without affecting their health as shown by appearance, condition, or action. The first clause of this section is based on the erroneous belief that microorganisms have access to the milk ducts and cisterns through the interior walls of the udder, but such is not the case in a healthy udder, regardless of most any disease affecting another part of the cow's body. There are three conditions under which pathogenic organisms can gain access to the udder; viz; (1) through the orifice at the end of the teat when it comes in contact with any contaminated surface; (2) through the tissues of the udder when the cow is suffering from some disease localized within the udder, or within or upon the tissues

of the udder; (3) through the tissues of the udder when the cow is suffering from some generalized disease.

In the first case we have found that there is no practical way of preventing contamination but nature has a way of holding it in check. The milk, while still contained in the udder, seems to possess some characteristic germicidal property which prohibits the growth and life of microorganisms. Organisms have been injected into the udder but they were found to have perished in a short time. Therefore, in addition to the difficulty encountered by organisms in gaining an access to the udder, their sojourn there is usually short. Some organisms can maintain themselves there, however, but develop very slowly. After they are excreted with the milk, a low temperature prohibits their growth, but they are not a type which produce any marked changes in the milk.

A disease which is generalized, or which is localized in the udder, would produce the same results so far as the contamination of the milk is concerned. In either case there must first exist a pathogenic change in the tissue of the udder. When this condition maintains, pus is usually given off. Pus is generally a virulent mass of streptococci and is more or less dangerous to human beings. Conn believes that where they exist in the single coccus form they are harmless. His theory, however, has not been substantiated by experimental proof. However, under a diseased condition of the udder the streptococcus forms are apt to be very numerous and the milk to become a dangerous carrier of disease. Legislation, then, against milk produced from a diseased udder is a step in the right direction.

It ought not to be necessary to have to include in a milk ordinance a section to prohibit a man from selling milk when he is afflicted with a communicable disease, or when he has recently been an attendant upon a person so afflicted. However, we know that people exist who would continue to deliver their milk under almost any circumstances until compelled to stop by legal authority. Fortunately such people are not in the majority and undoubtedly very many persist in such a practise because of ignorance of the suffering which they may cause. There are many phases of the milk question which are dependent for their final solution upon the education of the public, and this can be included among them.

(8) "When the milk is drawn from cows fed wholly or in part upon the waste of distilleries or breweries, or brewers' grains in a fermented condition, or upon any other food or drink that is known to produce tainted, impure or unwholesome milk."

There is a wealth of evidence to support this section. Its purpose really is, or should be, educative as very many farmers may innocently taint their milk by feeding something which they supposed to be a good, healthful feed. *Dr. Henry writes on the subject as follows "Owing to their volume, their watery nature, and their perishable character, wet brewers' grains are usually fed near the brewery. In the hands of greedy persons, cows have often been crowded into dark, illy-ventilated sheds and fed almost exclusively upon wet brewers' grains. Sometimes the grains have partially rotted before being fed, and the drippings getting under feed boxes and floors have on fermenting produced sickening odors. Under such circumstances it is not surprising that boards of health have been led to prohibit the sale of milk from such dairies. There is nothing, however, in fresh

*Henry „Feeds and Feeding."

brewers' grains which is necessarily deleterious to milk. Supplied in reasonable quantity, and fed while fresh in clean, water-tight boxes and along with nutritious hay and other roughage, there is no better food for dairy cows than wet brewers' grains. So great is the temptation to abuse, however, that wet grains should never be fed to dairy cows unless under the strict supervision of competent officials. If this cannot be done, their use should be prohibited."

In regard to other foods, drink, or drugs, Leblanc writes:* " It is well known that certain drugs are eliminated by the mammae, their presence being detected in the milk, communicating to it their taste and properties. Guinard has detected certain bitter and purgative agents: Baum, tatar emitic; Klingemann, alcohol; Fubine and Bonani, atropine; Gunther and Harms, camphor, ether, turpentine, assafoetida, and chloroform; Hertwig and Spinola, aloes and arsenic; Fubine, strychnine, salicylic acid, carbolic acid, lead salts, mercury, iodine and the alkaloids of opium. The milk of animals fed on certain plants, especially garlic and turnips, is tainted with the characteristic smell, also that of goats in certain localities in which wild thyme abounds. Cows fed on the refuse pulp from beet-root sugar factories give milk of a mawkish, unpleasant taste."

(9) "When any milk or cream contains any substance not a natural or normal constituent of milk or cream."

This section is far more inclusive than it is probably generally considered to be, or perhaps than it was originally intended to be. It undoubtedly refers to the presence of water, in particular as that is most commonly used for purposes of adulteration, or to

* "Diseases of the Mammary Glands of Domestic Animals" Leblanc.

form alum, or other preservatives. Adulterated milk should be discountenanced severely, and preservatives in milk are entirely unnecessary even though they might not be injurious. However, as now worded, this section includes dirt and filth of any kind as well as bacterial contamination. As is well known milk can not be produced, commercially, perfectly free from bacteria, and only under the best of care can dirt be kept from it, but that doesn't mean that legislation should not aim toward securing such a product. Legislation can only be one of many contributing factors in guarding against adulteration or in securing pure milk in other ways, but as such it should be welcome.

(10) "When any milk contains more than 88 percent of water fluid, or less than 12 percent of total milk solids, or less than 3 per cent butter fat, or when any cream contains less than 18 per cent butter fat."

Each state adopts standards of its own for the percentages of the constituents of milk and cream, and most cities adopt these standards for their milk ordinances. This particular ordinance, which I am quoting, would receive milk which might be seized by state inspectors as watered milk, as the Michigan State Law will not allow milk "by weight to contain more than eighty-seven and fifty one hundreds percentum of watery fluid." This section would also violate the Michigan State Law in that the law specifies that milk is not "to contain less than twelve and fifty one hundredths of milk solids per centum." Most of the cities of Michigan copy the state standards in their ordinances or make the requirements more stringent. The state standards as quoted above, together with the requirement that

there must not be "less fat than three per centum," are about the average percentages for ordinary milk. Such a standard, therefore, is no hardship to the producer, but is, rather, a protection against the practices of the unscrupulous milkman.

(11) "When milk or cream shall contain more than 200,000 bacteria per cubic centimeter if milk and 500,000 per cubic centimeter if cream, on two successive counts from samples collected by some member of the board of health, or a duly authorized representative thereof."

This section has become of so great importance to members of nearly every board of health that they have one and all been led far astray. That which should only be taken as an indication of cleanliness has been adopted as an absolute standard. The method of counting is inaccurate at best and besides we should not be so much concerned with the number as with the kind of bacteria found in milk.

"*In the interpretation of the results of the numerical determination of bacteria in milk, it must be constantly borne in mind that the results indicate only conditions at the moment the sample was taken. We are not dealing with the quantitative estimate of a milk constituent like fat, which is present in the same proportion in a given sample at all times. It must be remembered that a bacterial count is a measure of the progress of multiplication of a complex mixture of micro-organisms, controlled by an equally complex series of factors. The results at any given time depend in part upon initial numbers, species, characteristics of the milk,

*Ward: "Pure Milk and The Public Health."

its age, the temperature at which it has been kept, and the method of making the determination. Wrong conclusions will be reached, if emphasis is laid upon mere numbers without a consideration of the other factors.

A numerical determination taken by itself without full consideration of all the factors involved has no value. Persons not familiar with the circumstances are apt to attempt to make comparisons where such are inadmissable. The results of the work of two laboratories cannot be compared, unless there has been uniformity in every detail that would affect results. Every bacteriologist doing much milk work has had embarrassing experiences along this line. The man who has had the longest experience with numerical determinations of bacteria in milk in connection with milk commission work believes that no good end is served by stating results publicly in numerical terms, and acts in accordance therewith.

The bacterial count is undoubtedly the instrument by which the effectiveness of good dairy methods is measured, and has been a prominent factor in the development of those methods. It reveals facts regarding the operation of high grade dairies that no inspection could disclose. A count of certified milk is better evidence of observance of certain features of cleanliness in handling the milk than a visit to the dairy."

* " While the germ content may be regarded as a general index to the care the milk has received, it may not at all indicate its wholesomeness. A high count may be the result of the rapid growth of

* Marshall: " Micro-Biology."

the lactic bacteria, in which case the milk may be perfectly safe and wholesome. On the other hand the count may be quite small but contain pathogenic species. The bacterial count is valuable as showing the sanitary conditions of production and handling, but much care should be used in the interpretation of such results. In some ways a direct microscopic examination of the milk sediment is much more satisfactory. The skilled analyst can recognize certain types and species which may indicate the sanitary quality of the milk. With sufficient experience one can recognize streptococci, B. subtilis, organisms of the B. coli type and some of the putrefactive species and leucocytes. The presence and abundance of one or more of these groups may indicate the nature of the original contamination and the existence of diseases in the udders of cows. If rightly interpretated the information thus obtained is of much value. The weakness of this method lies in the fact that it is not always possible to recognize the above types of organisms. In a smear preparation it is not possible to differentiate between pathogenic and non-pathogenic streptococci or between B. coli and certain other types. The presence of unusual numbers of streptococci and pu cells may indicate the existence of disease in the cows and when this condition is found in the city milk it is possible to trace it back to the farm and locate the diseased cow and prevent her milk from being used for human consumption."

Slack has observed that, in connection with his method for the study of milk sediments, the number of bacteria may also be roughly estimated. By a long series of comparative tests, it has also been

found possible to tell from the number of bacteria in the smear whether or not plate cultures would show above or below 500,000 colonies per.cc. An error of less than 1% was made in this regard. He uses the test to eliminate those samples of milk that are well within the limit, and thus saves the trouble of plating them.

The committee of the American Public Health Association in its 1908 report makes the following comment. Several laboratories are now making this examination as a routine procedure. One worker (Conn) , who has done considerable experimentation along this li during the past year, sums up his results in attempts to actually approximate plate counts as follows:

" 'The method seems to be fairly satisfactory for milk, the bacterial content of which is not too low or too high. When the numbers are down below ten thousand the method seems to be quite inaccurate, and when the numbers run up into the millions, I find also the numbers are not very reliable. Within the limits of from thirty thousand to three hundred thousand, however, the method seems to be fairly good. I have, however, had the experience of occasionally finding samples of milk which, when tested by direct microscopic methods, gave results very different from those by the plate method. My general feeling is that a direct microscopic method might give an idea as to whether the sample is very good or very bad, but would not replace the plate method of examination in determining actual numbers and would be of no use for the examination of samples of milk whose number of bacteria is quite low.

" Another (Campbell), who has done much work with this method, finds it chiefly useful as a preliminary test, not plating samples

which are shown by the microscope to contain less bacteria than the city regulation permits, in those samples which are plated it serves as a guide for the proper dilutions. He finds it possible with this examination to correctly state in nearly every instance when a milk contains less than 50,000 bacteria to a cubic centimeter, or when it contains over a million bacteria to the cc. On actual estimates within 50,000 of the plate count his average is 66% correct on counts between 50,000 and 500,000, and 50% correct on counts between 500,000 and 1,000,000."

The quotations from Ward and Marshall reveal fairly the attitude of fair minded bacteriologists toward the accuracy and value of bacterial counts in milk. The reader can readily see that it is not a method of mathematical accuracy and it is not of definite value. The comment quoted from the 1908 report of the committee of the American Public Health Association should show the reader that the methods of counting are still in the experimental stage. The plate method of course is the old method and is completely developed but it is cumbersome, takes a great deal of time, and, if truth is told, is far from accurate.

To one, therefore, who holds this attitude, the standards for bacterial counts in milk do not mean much. A little study will show that the health commissions of different cities disagree on the numbers of bacteria which can be safely allowed. Indeed, a little study will show a wide variation in the bacterial count allowed by any one city at different times. This would seemingly indicate that the bacterial count is not a matter of life and death to the extent

which some health commissions would have us believe; The experience of some cities has shown, too, that it is not a matter of economic consideration as to whether the count is high or low. The kind of bacteria in milk is equally as important as the number. The tendency is beginning to prevail in some cities of combining the quantitative and qualitative analysis, and the results thus obtained in the hands of the careful worker are of much practical value in controlling the quality of the city's milk supply.

(12) "When milk or cream is kept in any place not screened from flies or protected from fowls or animals."

It would require but very little expense for one to fit his milk room to meet this requirement. The satisfaction resulting should be ample reward, while in addition it would mean increased protection against disease to the producer's family. Probably few men who realize the value of a milkroom are so short sighted as to leave it unprotected from fowls or animals. Screening against flies, however, is an entirely different matter. A great many people think that the cool temperature of the milk room will keep out flies, and it will to some extent, but occasionally the temperature rises or a threatening storm drives them in. Once in they bring a thousand troubles in, too. They may have just left the manure pile in the barn, the edge of the cess pool, or the carcass of some dead and decaying animal. If so the sticky pads on their feet are covered with millions of filth and disease germs. Their feet come in contact with the milk as they go to drink and these germs are released in countless numbers to develop rapidly and unchecked, because of the low temperature in the milk.

Primarily the screening against flies is a caution for observance by the producer. It goes still farther, in reality, and includes the consumer. The fly which enters the city home is just as much of a nuisance and is just as filthy and dangerous as the country fly. He may have just left the garbage can, the city sewer, or something even worse. He can pick up typhoid germs in the city and deposit them in the milk just as easily as elsewhere. In this case an investigation would prove more difficult but if once made could reveal the truth. Suspicion, however, would be thrown upon the milkman. The milk supply is always the first suspected source of typhoid but not rightly so.

(13) "When milk or cream is bloody or stringy."
Bloody milk is usually the result of a physical injury of the udder or teat and is not dangerous for consumption, but if detected the milk naturally becomes an unpleasant food. Stringy or ropy cream is due to an organism, B. lactis viscosus, which grows with great difficulty at blood temperature and is, therefore, not a pathogenic germ. *"These organisms grow most freely in the presence of an abundant supply of oxygen and for this reason the cream usually becomes slimy before any changes become apparent in the underlying layers of milk. Representatives of this group are quite resistant to heat and frequently pass uninjured through the methods of cleansing and scalding used under ordinary creamery conditions. Because of this, dairy utensils once infested become a constant source of infection. "Neither bloody or stringy milk or cream, therefore, is injurious, and, though it is quite difficult to avoid, it is reasonable to legislate against it.

*W.A.Stockin in Marshall's "MicroBiol

(14) "When the room in which the milk is cooled or stored is immediately connected with a stable in which animals are kept or confined."

An ideal milkroom should at least be separated from the barn, but ideal conditions cannot be expected on every farm. In very many cases a milkroom is a part of the dairy barn but is partitioned off from the rest of the barn. Undoubtedly such would be suitable in most barns if sufficient care would enter into the work and material in building the partitions, Even with ordinary partitioning, I think, the attached milkroom is satisfactory. If the feeding is not done until the milking is finished, and if the stables are kept clean, then the contamination must largely result right near the cow while she is being milked. By using the covered small top pail contamination cannot readily occur in carrying the milk from the cow to the milkroom. Within the milkroom the air can be kept in circulation, and will then be fresh, and this in connection with a low temperature will make any milkroom suitable. Under such conditions, and with the door connecting with the stable always kept closed, no inspector's edict, based on any of these conditions, can render milk "unclean, impure, unhealthy, unwholesome and adulterated

Other factors generally included in the milk ordinances and which denote a trend in the right direction are as follows:

" The milk or cream furnished by every hotel-keeper, restaurant keeper or boarding house keeper, to his, her, or their guests, shall be in all respects up to the standard herein specified, otherwise such hotel keeper, restaurant keeper or boarding house keeper shall be liable to the pains and penalties of this ordinance."

Any dealer or producer in milk or cream who sends his, her, its, or their product to the city of _____ for consumption in any form, and receives compensation therefor according to the percent of butter fat as shown by a test or tests made by such producer or dealer, is hereby required to make such test or tests accurately and correctly, and to accurately report such to the consumer."

Skimmed milk or sour milk may be handled or sold if kept in utensils plainly marked. Skimmed milk shall conform to the standards of purity and temperature required of sweet milk.

A license must be obtained before buttermilk can be sold in the city of _____. All buttermilk shall be manufactured from pure cream or milk, and shall be kept, handled and sold in accordance with the provisions hereof made for keeping and handling milk or cream.

All milk, cream, buttermilk or skimmed milk sold or offered for sale in bottles must be bottled at the dairy house, creamery or milk depot, and must not be put in bottles while on the road. The handling of milk cans, bottles or other vessels in which milk, cream, buttermilk or skimmed milk shall be delivered to or from the place of delivery, in wagons used for handling manure or swill or any other unclean vehicle, is expressly prohibited. Bottles used as milk, cream, buttermilk or skimmed milk containers must not be used for other purposes.

It shall be the duty of the inspector of milk to file a complete record in writing of his proceedings as inspector, giving a full and accurate account of all inspections made, and of samples

collected.

No ticket in exchange for milk or cream shall be used a second time, except metallic tickets which may be used continuously provided they are sterilized before passing out for use a second time.

No person, firm or corporation, shall sell or offer for sale, expose for sale, or keep with the intention of selling, any milk or cream at retail unless the same shall be kept in a tightly covered receptacle or sold in bottles.

The milk or dairy inspector, the health officer or any other person authorized by the Board of Health, may examine all dairy herds, utensils for handling milk, of all dairymen or other persons engaged in selling or shipping for sale milk or cream. These inspectors shall have power to open any can, vessel or package containing milk or cream, whether sealed (locked) or otherwise, and take samples of the milk or cream for testing or analysis; and if, upon inspection, the milk or cream is found to be filthy, or the cans or other containers are in an unclean condition, the said inspector may then and there condemn the milk or cream as deemed by him to be filthy and pour the contents of such bottles, vessels or package upon the ground forthwith, and he shall, if done in good faith, be held harmless in damages therefor, in any suit or demand made.

It has been charged by many producers in a number of sections contiguous to Detroit that often times these inspections were unfai and were made by incompetent men. As a measure of mutual protectio

local organizations of dairymen in different sections of contiguous territory sprang up. A general organization was later consumated, and after a time this was reorganized and made to include practically all of the local organizations. This was known as the Mutual Dairymen's Association of Detroit. It numbered over eight hundred members and represented between nine and ten thousand dairy cows, the milk from which contributed to the Detroit city milk supply.

There has existed since this organization considerable friction between the association, the local board of health, and the milk dealers of the city of Detroit. As a result the Association has presented a bill to the State Legislature which has a strong bearing on the sentiment of the last section quoted above, and reads as follows.

Section 1. Any city board of health or its agents or inspectors shall have the right at any time to inspect the barns, milk rooms, milk pails, and other utensils, also the cattle of any person or persons, firm or company producing milk or cream for city consumption, and also all milk depots, shipping stations and appliances connected therewith.

Sec. 2. Any producer or shipper refusing to allow such inspectors to inspect their premises, barns, cattle and utensils shall be debarred from shipping milk to said city, also any owner of milk depot or creamery refusing to allow inspection shall be debarred from shipping milk to such city.

Sec. 3. All agents or inspectors appointed by city boards of health to inspect the buildings, cattle or premises and utensils of producers shall have had at least two years experience in

managing or working on a dairy farm after having reached his majority, but any city health board who shall have inspectors doing such inspection when this bill goes into effect shall replace such inspectors by inspectors of the above qualification as follow: One inspector inside of ninety days after this act goes into effect and one additional inspector each six months thereafter until all such inspectors are qualified as above.

"The Michigan Farmer" said in part in discussing this act; "It is said upon good authority that the board of health is preparing to make a strenuous fight against the enactment of this proposed legislation. As a matter of fact, to one who has observed this contention from the outside, it would appear that there are just ground for dissatisfaction among the dairymen. There seems to be plenty of evidence of incompetence on the part of some of the inspectors, at least, although it is stated upon reasonably good authority that the board of health has sought to make an improvment in this direction. Also, there is no doubt that those who have this matter in charge in the city health department are less able to give competent inspection that would be a class of inspectors coming up to the qualifications advocated by the dairymen."

This act, namely, the Downing Bill, and the criticism called forth by it in the "Michigan Farmer" are in the right direction. Inspection is all right but it must be done by competent men. The Mutual Dairymen's Association of Detroit by their action plainly say as much. An inspector may have the right to pour out milk which he sees fit to condemn and he may escape damage for it, but he will

never win the cooperation of the producers for a progressive movement. If a man possesses the qualifications demanded of an inspector by the Downing Bill he will likely possess the good will of most dairymen and to have tact, judgment and sense.

This is in brief an enumeration of the more important factors of a city milk ordinance and a hasty consideration of each from the standpoint of the producer. There is one factor, however, which is particularly concerned in present day milk legislation but which is not likely to be solved until some distant date. That factor is tuberculosis. Before its importance and far reaching effects were realized, it was enumerated among the ordinary chance diseases of the dairy cow. Now emminent scientists believe bovine and human tuberculosis to be identical, or at least that the bovine type is transmissable to man, and it has become a question of world wide consideration.

The cities of Michigan which have awakened to a realization of the local importance of the milk question were not at all behind in facing this new and growing phase of the question. Whether their method of dealing with it may be right or wrong is a question for future solution. In a proposed ordinance which was under consideration early in August 1912, the Board of Health of Lansing, Michigan, sought to deal with the question in the following manner:

"Milk or cream------shall be held to be unclean, impure, unhealthy, unwholesome or adulterated------When milk is drawn from any cow that shall not within one year last past have been inspected and tested to ascertain whether such animal is affected with tuberculosis or other contagious or infectious disease.

The inspection and test named in this subdivision shall be held complied with if the owner or owners of such cow shall within one year from the going into effect of this ordinance file in the office of the board of health a certificate of a duly licensed veterinary surgeon, or any other person given authority by the livestock sanitary commission to make tuberculin tests, on blanks to be furnished by the board of health, stating that such cow has been tested with tuberculin and examined and found free from tuberculosis or other contagious disease."

The ordinance, of which this preceding paragraph was a part of a sub-section, was not passed by the city council because of the dissatisfaction found with this specific section. Another ordinance was drawn up and proposed to take effect Jan. 1, 1913. In this ordinance the subject of tuberculosis was studiously avoided but it, too, was rejected by the city council. The council felt the need of adequate legislation on the subject of tuberculosis but felt that they should proceed cautiously and guard against measures either too radical or so conservative as to effectively impede progress.

Grand Rapids, Michigan, attempted to deal with the subject of tuberculosis and drew up an ordinance containing a subsection relative to tuberculosis which was identical with that quoted from the Lansing ordinance. The city of Flint, Michigan, adopted a subsection in their ordinance which read as follows:

"It shall be the duty of the Board of Health to ascertain that the cows from which the applicant proposes to obtain milk for sale or distribution are free from tuberculosis and other in-

fectious or contageous diseases. No cow shall be considered free from tuberculosis except after showing no response to the tuberculin test, as applied by a duly licensed veterinarian. The cows from which the applicant proposes to obtain milk for sale and distribution shall be examined by a licensed veterinary before the City Clerk shall issue a license, and an examination of the cows in the herd from which milk is obtained for sale or distribution shall be made at least once a year thereafter, and each animal tagged in a manner to afford a permanent record of the examination, and no license shall be granted to any applicant until the cows from which he proposes to obtain milk for sale or distribution are shown to be free from tuberculosis and other infectious and contagious diseases. No milk or cream shall be sold or offered for sale within the corporate limits of the City of Flint from any cow added to a herd until such cow has been examined by a licensed veterinarian, and upon such examination found free from tuberculosis and other infectious and contagious diseases and such an examination shall have taken place within six months from the time it is proposed to add such cow to the herd from which any milk dealer or vendor obtains milk sold or offered for sale within the corporate limits of the city of Flint. In all cases the expense of the veterinary shall be paid by the owner of the cow or cows."

The City of Detroit, Michigan, rules that no milk shall be sold in Detroit

"Which is produced from cows which are kept or stabled under unhealthful conditions, or which may be diseased; nor shall any milk be sold or delivered in said city, which is procured from any

farm or dairy where any contagious or infectious or communicable disease may exist."

The City of Battle Creek, Michigan, seeks to protect itself by a subsection in the very same words. Traverse City, Michigan, words its ordinance in part in the following way:

"It shall be the duty of the Milk Inspector when ordered to do so by the council or board of health to inspect or cause to be inspected the dairy or dairy herd of any such person so applying for such a permit or who has obtained such a permit, or the dairy and dairy herds from which the applicant obtains milk or cream without any unnecessary delay and to examine each and every animal producing milk for sale or consumption in said city, belonging to or controlled by any person having such permit, or the person from whom such dealer obtains milk or cream, for the purpose of ascertaining the presence or absence of tuberculosis or any other contagious or infectious disease and in making such inspections and examinations the inspector is hereby authorized to use what is known as a tuberculin test, a diagnostic agent for the detection of tuberculosis in such animals. After such examination and inspection of the dairy and dairy herds as in hereinbefore provided, he shall at the request of the owner of said herds tag each and every animal so examined, which tags shall state the result of the examination as regards the presence or absence of any contagious or infectious disease, and the said inspector shall file a report of the examination and inspection as herein provided with the City Clerk, which report shall state what disposition, if any,

has been made by such dealer or the person from whom such dealer obtains milk or cream, of the cows which were found to be infected with any contagious or infectious disease and whether or not any such diseased animals are used for the production of milk or cream for sale and consumption in said city."

Such has been the legislation produced in the State of Michigan concerning tuberculosis. It has not definitely been proven whether bovine and human tuberculosis is the same disease; but experiments seem to indicate that they are. There will always be some ground for discussion on thisquestion as there are scientists of note who maintain that the two diseases are produced by different types of organisms, and they can give strong arguments in support of their contention. As the question cannot be argued here I will simply quote the most important findings from the Final Report of the Royal Commission on Tuberculosis. This report is quite generally accepted as the "last word" on the subject and is the unprejudiced findings of several years of work by the best scientists of Great Britain. The report reads as follows in parts, not quoted entire or necessarily consecutively:

"The only difference in respect of cultural characteristics between the two types is that the human type exhibits a greater luxuriance on all the different media we have employed in making comparisons, and that although this difference is not maintained with absolute constancy, we have not in our cultural experiments observed any case in which the mode of growth of the one type became so far modified as to be indistinguishable from the mode of growth usually exhibited by the other. But the point must be emphasized that the

bacilli which we have referred to as the bovine type vary considerably among themselves in respect of luxuriance of growth, and that the gap that separates those of them that grow most abundantly from bacilli of the human type is not a wide one."

"Chief among the differences between bovine and human tubercle bacilli is, of course, difference of virulence towards certain animals."

"There would therefore remain only slight cultural differences on which to found the conclusion that the human and bovine types represent two distinct organisms. We prefer to regard these two types as varieties of the same bacillus, and the lesions which they produce, whether in man or other mammals, as manifestations of the same disease."

"Whether one prefers to regard bovine tuberculosis and the cases of tuberculosis in man which are caused by the human type of bacilli as varieties of the same disease or as independent diseases, there can be no question that human tuberculosis is in part identical with bovine tuberculosis. Our researches have proved that in a considerable proportion of cases of the human disease the lesions contain, and are caused by, bacilli which are in every respect indistinguishable from the bacilli which are the cause of tuberculosis in cattle. In all such cases the disease, therefore, is the same disease as bovine tuberculosis."

"By subcutaneous inoculation the human type has been found transmissable in some degree to many different species of animals, but for most of them transmission has been effected only by the employment of large doses. In strong contrast to this small liability of

certain of the lower animals to tuberculosis of the human type is the susceptibility of animals generally to infection by the bacillus of the bovine type (whatever the sourse, lower animals or man, of such bacillus)."

"In cattle suffering from tuberculous disease acquired other than by experimental means, we have in no single instance detected any but the bovine bacillus. We have conclusively shown that many cases of fatal tuberculosis in the human subject have been produced by the bacillus known to cause the disease in cattle, and the possibility of such infection cannot be denied."

"Only rarely has a pulmonary lesion in adult man yielded the bovine bacillus. Our experience of abdominal tuberculosis in the human subject has been very different, especially as regards children. Of young children dying of primary abdominal tuberculosis, the fatal lesions could in nearly one half the cases be referred to the bovine bacillus, and to that type alone. In children, too, and often also in adolescents suffering from cervical gland tuberculosis a large proportion of the cases examined by us could be referred to the bovine tubercle bacillus."

"The evidence which we have accumulated goes to demonstrate that a considerable amount of the tuberculosis of childhood is to be ascribed to infection with bacilli of the bovine type transmitted to children in meals consisting largely of the milk of the cow."

"Though of the fifty five cases of adolescent and adult tuberculosis which came under our scrutiny no more than five yielded bacilli of the bovine type, we cannot say that this figure adequately represents the proportion of like cases obtaining among the tuberculous population generally."

From this report, therefore, we readily gain that tuberculosis in cows endangers the use of milk as a food, and particularly so as an infant food. Some sort of legislation is necessary consequently, for the protection of human life against this disease. Likewise some sort of protection is necessary for the farmer against the fanatic or crank on the tuberculosis question who would have every suspected cow killed and burned regardless of the rights of the owner. When the farmer has been educated to the prevalence of tuberculosis, its effect on human life, and how readily it can be checked and completely eliminated, then he will cooperate in the anti-tuberculosis crusade.

What has been accomplished by this great agitation of the milk question? What have been the results of these various ordinances throughout the state and country? Some are mere words; some are conservative in their requirements; others very radical; while a good many are ridiculously unjust. In the first place the public conscience has been awakened and the milk question has become the health question. The time was when farmers thought a certain amount of filth was a necessary constituent of milk and it can't be denied but that some farmers still entertain the same ideas. The time was, also, that the consumer thought he must take milk as it came to him or else keep a cow in his backyard. Constant agitation has done a good deal toward removing those ideas but hasn't gone much beyond that.

A large business was now opened up, namely that of milk inspection. Health authorities stated facts to show that inspection was necessary. The consumer was to receive the benefits of this inspec-

tion at a very slight, if any, increase in the price of milk, so he accepted the statements without further proofs. The burden of these reforms were to rest on the farmer and he, therefore, naturally called for proofs of the necessity of these reforms. The proofs have really never been furnished him. Lecturers have graced and disgraced Institute and Grange platforms, each and every one reiterating the way of increasing the milk supply, the necessity of rigid inspection, but giving always a too superficial consideration of the milk question to answer the "why" on any phase of the question. As a result the farmer knows the threadbare old story but has never seen it proved. What do the majority know about bacilli, cocci, streptococci, etc., until they have actually seen them? What does "clean up" mean when its actual significance in relation to contamination of milk is unknown? What does the farmer know about bacterial count when a drop of milk looks the same whether it possesses ten thousand or ten million bacteria? The farmer may have a good many things to answer for some day but more responsibility will rest on the educated man who has seen and who knows but hasn't attempted to impart his information.

In spite of the fact that the farmer has not been satisfied on the justice of the demands of the health department, he has taken the authorities at their word, though often with little grace, and has made improvements. Better stabling conditions exist in most barns; feeding time in relation to milking is now considered to prevent contamination of the milk by unnecessary dust; milk houses have been built; milk has been drawn under more sanitary conditions and has been cooled properly; more attention has been paid to the chemic

composition of milk and this has led to more rigid selection and judicious breeding of dairy cows, coupled with scientific methods of feeding; and, lastly, much good has been accomplished in the insistence on bacterial count.

Now that clean milk is becoming more readily available each year what is the attitude of the consumer? Some of them appreciate the advantages they can now enjoy and are maintaining an interest in the milk question and in the production and care which the milk receives. Others are not appreciative and are just as much a dead weight on the milk question as is a careless, unprogressive farmer. It is not possible to discuss the mental attitude of consumer toward the producer, and vice versa, but it is, nevertheless, a significant fact that the consumer, who does understand and appreciate the farmer's side of the question, and who performs his part in looking after the care of the milk and of the bottles while in his possession, arouses a mutual interest which results beneficially for all concern. For such customers the farmer is willing to produce a better quality of milk and deliver it in better condition.

Those who are a stumbling block in the milk problem do not recognize the total loss to the farmer each year for which they themselves are responsible. When their milk is delivered in the early hours of the summer morning it is put in a shady spot. It is very often left, however, until it has long been exposed to the sunlight and heat; as a result it sours readily. Very often it may be left so exposed in an open dish and many organisms including pathogenic germs may enter. These things all count against the farmer for the true cause of the trouble is seldom set forth. Then in very many

cases the consumers are careless about the milk bottles; they are used for household purposes, are given to the children to play with, or are carelessly thrown into the garbage barrel.

These are an injustice to the producer and he should receive protection from them through the ordinance. Such conditions are bound to create false relations between the producer and the consumer. The consumer often thinks he is being cheated because it could be done and he couldn't detect it; the producer knows he is being treated unjustly because he knows his milk will withstand souring for a certain length of time under fair conditions, and because he can reckon his loss daily in missing milk bottles.

It is reasonable to expect that laws which are partial to certain classes of individuals would not tend to develop industries maintained by the individuals they oppress and such is the case in actual practise. The farmer naturally will always ask, previous to making any improvements, "Will it pay?" In every case reasonable improvements in the dairy business won't pay for the consumer will not pay a sufficient price for superior quality of milk. This is not always the case, as it depends largely on geographical location and the nature of the available markets, but it is so often the case as to effectively retard the developement of the dairy industry. The farmer must be assured that he shall not be obliged to sustain losses incurred by the carelessness of others or by their flagrant disregard of his rights. He must have the assurance of protection from the acts of unscrupulous and incompetent inspectors; and, finally, to uplift the dairy business, the dairy man must be given reason to think that his work is a work of dignity and importance. Suc

a condition can never be brought about until the general public changes its opinion about the farmer; until he is given a voice in the formation of milk ordinances, and until a milk ordinance means justice, protection, and encouragement, for him as well as for the consumer.

There is an old word which is now rapidly coming into general use, and that word is "cooperation." We have seen in almost every kind of industry what can be accomplished by cooperative effort, and we know that the farmers, although slow to grasp the opportunity, are beginning to organize and cooperate. We hear of cooperation among the fruit growers, among the wheat growers, and among stock men. It is but a small step from cooperation among live stock men, many of whom are dairymen, to cooperation among milk producers. Such cooperation is necessary but what will be the result? If the ordinances of a city are injurious to the interests of its local milk producers, instead of turning cooperative effort toward reducing the cost of production, toward increasing their efficiency as agricultural business men, and toward improving the dairy business in general, the milkmen will be able to successfully boycott the city and effectively cut off its milk supply. The argument won't hold that such a boycott is impossible because the city can bring in its milk supply from territory hundreds of miles beyond the vicinity of the cooperating farmers. If the physical characteristics of milk do not put a limit on long shipments, economic considerations will, and in addition, any cooperative system can be directly proportional in extent and effectiveness to the determination of the cooperators.

Cooperation among farmers is coming very slowly but surely, and the direction of its effectiveness and mission will be determined largely by health commissions. A farmer cannot dictate to the makers of an ordinance, if at all, only as a citizen within the city limits, but he can make suggestions for the framing of the ordinance. To accept suggestions, if they are practical and worthy of consideration, is a step in the right direction. A health commission should go even farther and should include among its number one or more progressive farmers, or representatives chosen by the farmers affected by the local ordinance. Such should give rise to a spirit of satisfaction and then a cooperative spirit for improvement would necessarily result.

On studying the milk question, and in particular, considering milk ordinances from the producer's standpoint, I have concluded that the following factors should receive recognition in the ordinary milk ordinance governing milk and cream:

1. Condition of stables in which it is produced.
2. Condition of places and receptacles in which stored.
3. Method of cleaning the utensils used.
4. Condition of cows and of milkers at and during milking.
5. Temperature of milk while in milk house and until delivered to the consumer.
6. Stage of lactation during which the milk is produced.
7. General health of herd and of each individual cow.
8. Health of all persons, engaged in the production and subsequent handling of milk, and of their respective families.
9. Nature and quality of feed fed to producing animals.

10. Quality of milk.

11. Bacterial content with special emphasis on types present.

12. Care of milk and cream by consumer.

13. Loss of bottles by consumers.

14. Qualifications of inspectors.

15. Score cards used by inspectors.

There are other minor factors which we do not think worthy of discussion here. The methods of keeping the list of city milk dealers, their licenses, etc., and other related details, are matters of routine work to be cared for by a City Clerk as he sees fit. These are included in many ordinances though not in all cases, as they have no bearing on the milk question.

In considering the kind of score card used by inspectors I would recommend the one known as the Cornell University Dairy Score Card. Its superiority over other score cards are: (1) Its questions will bring out the actual conditions of the dairy; (2) The answers made by inspectors are compiled in the form of score by an expert, and the wide variations of individual judgment are thereby eliminated. The questions are as follows:

Dairyman Date

P. O. Location

No. cows milking In herd Qts. Milk Cans or Bottles

Milk sold to License No.

Report by At milking time? Hour

1. Health of the herd and its protection?

Do all cows appear healthy?

Are udders sound and free from signs of disease?

Are cows tuberculin tested?

Date of last test By whom

Is the stable well built to protect from the weather?

Are cows brought in during bad storms?

How many hours are the cows out daily?

Width of stall Length

Is the stall comfortable? How are the cows tied?

Kind and quality of bedding

Where are cows kept when sick and at calving time?

Is the stable well located?

Number and size of windows.

Size of the stable, length width heighth

How ventilated

Kinds of feeds used

Are they of good quality and proportions?

Source of water for cows

Method of watering.

11. Cleanliness of the cows and their surroundings.

Are the cows clean? How are they cleaned?

Is the hair clipped about the udder?

Is the udder cleaned before milking? How? When?

Is the stable free from accumulation of cobwebs, dirt, and dust?

Is the stable white-washed?

Kinds and number of other animals, if any, in same room with c

Same, adjacent rooms What openings between?

Is the stable protected from such sources of contamination as

privy, etc.?

How often is the manure removed from the stable?

Is the barnyard free from manure pile? And mud-holes?

Is the pasture clean and free from injurious plants?

And mud-holes?

Is the stable provided with dust-tight ceiling?

And partitions?

Is feeding done before or after milking?

Is the air free from dust and odors?

III. Construction and care of the utensils.

Are all utensils such that they can be thoroughly cleaned?

Method of washing utensils?

How are the utensils sterilized?

Is the water used for washing utensils pure? How do you know?

What is its source?

Is the source protected against contamination?

How are utensils cared for after cleaning?

Is a small-top pail used for milking?

If so, what style and size of opening?

IV. Health of employees and manner of milking.

What evidence is there of absence of contagious disease and of exposure of family and employees to disease?

Are the milkers clean personally?

Do the milkers wear clean over-all suits? How often are the over-alls washed?

Do the milkers wash their hands just before milking? Where?

Do milkers have wet hands when milking?

Are milkers careful not to dislodge hair and dirt from the cow while milking?

Is the foremilk discarded?

V. Handling the milk.

How is the milk cooled?

How soon after milking is the milk cooled?

To what temperature?

Is the milk handled in a room detached from the stable?

What kind of floor?

Is the milk room used exclusively for milk, and is it free from dirt and odors?

At what temperature is the milk kept after cooling?

How is milk cared for during transportation to market?

This comprises the list of questions for the inspector to answer. It is readily observed that personal opinions cannot affect the answers to the questions at all and that the farmer has the benefit of having his dairy accurately and honestly scored every time. The answers, when turned in at the office, are compiled in accordance with the following score:

City of Detroit

Score Card For Production of Sanitary Milk

Date Dairy of P. O.

		Perfect Score	Cuts
1. Health of the herd and its	Health and comforts of the cows and their isolation when sick or at calving time		

protec-	Location, lighting and ventila-		
tion	tion of the stable		35
	Food and water		20
		Total	100
2. Cleanli-	Cows		30
ness of	Stables		20
the cows	Barnyard and pasture		20
and their	Stable air (freedom from dust and		
surround-	odors)		30
ings.		Total	100
3. Construc-	Construction of utensils and		
tion and	their cleaning and sterilizing		40
care of	Water supply for cleaning and lo-		
utensils	cation and protection of its		
	source.		25
	Care of utensils after cleaning		20
	Use of small top milking pail		15
		Total	100
4. Health of	Health of employees		45
employees	Clean over-all milking suits and		
and manner	milking with clean, dry hands		30
of milking	Quiet milking, attention to cleanli-		
	ness of the udder		25
		Total	100

5. Handling the milk	Prompt and efficient cooling	35
	Handling milk in a sanitary room and holding it at a low temperature	35
	Protection during transportation to market.	30
	Total	100
	Total of all scores	500

If the total of all scores is	And each division is	The sanitary conditions are
480 or above	90 or above	Excellent
450 or above	80 or above	Good
400 or above	60 or above	Medium
Below 400	Or any division is below 60	Poor

The sanitary conditions are

Scored by

In useing the Cornell University Dairy Score Card a farmer can get a copy of both parts, learn what constitutes perfect under each heading, and can then keep an accurate record of his own dairy for the purposes of detecting possible errors on the part of the inspector and use it as a guide for making improvements. The score card put out by the Dairy Division of the Bureau of Animal Industry

at Washington covers all points under consideration in a thorough inspection but it fails to furnish an inspector with any guidance whatsoever, and, whether he may be honest or not, the farmer may be under scored because of the wide variation in individual judgment allowed the inspector.

The application of an ordinance to be the most effective must be so accomplished that it can gain the good will and cooperative efforts of the producers to the cause of sanitary milk production. In this phase of the problem lies the solution of offering something to the producer as a compensation for his extra labor and necessary improvements. Such a plan is already in working order in the city of Geneva, N. Y. It was instituted in 1907 and has completely changed the milk supply of that city. Although the New York State Agricultural Experiment Station is located in the same city, it was not connected directly or officially with the new plan.

The new plan consisted in grading the milk and selling it on a basis of quality. Four grades were recognized and defined briefly as follows.

(1) "Excellent"-- milk drawn in clean barns, from reasonably clean, tuberculin-tested cows, by clean milkers, into sanitary pails, and promptly cooled.

(2) "Good"-- from dairies providing a reasonably clean, well cooled, but not, ordinarily, a tuberculin-tested product.

(3) "Medium"--in the main, dirty milk.

(4) "Poor"--essentially filthy milk.

In addition to the system of grading was the admirable feature of publicity. This feature was, of course, introduced in successive

steps but in its final form it protected the health authorities from legal responsibility for financial losses resulting from the publication of facts, and it made accessible and intelligible to the largest possible number of people the results of the dairy inspection. The best protection against legal action is to conduct th inspection in such an evidently impartial manner as to obtain the support of all parties. The plan has been further explained as follows:

**"The Inspector reported to the Dairy Products Committee. This committee reported to the Board of Health, the report being accepted and entered in the minutes. This portion of the minutes was publish ed by the press as a part of the proceedings of the Board."

"In the matter of publicity the three classes, the producers, the retailers, and the consumers, were considered separately. Each producer was furnished with a carbon copy of his official score card Each retailer was given the numerical score of the producer whose product he was handling. The consumers were reached by the quarterly publication of the standing of each producer, with the name of the retailer who was distributing the milk. The official score card for each dairy was placed on file with the clerk of the Board, where it could be easily consulted by any one who was interested."

This plan was introduced with a complete notification of the all the farmers one year before it was to go into effect. This gave them an opportunity to put their dairies in shape and raise their score before it should be published. The first published inspection gave the following summarized results:

*Bulletin 337, N. Y. Agricultural Experiment Station, page 61.

Grading	No. Dairies
Excellent	None
Good	7
Medium	28
Poor	3
Total	38

Three years later the published report showed a decidedly improved change:

Excellent	5
Good	34
Total	39

In making their annual contracts with the producers, a dairying company which had been formed for handling the milk supply, included a clause whereby any producer would receive three cents per quart so long as his dairy scored "medium," three and one half cents when it scored "good," and four cents when it scored "excellent." The official score of the dairy for each quarter was to be taken as the basis for making settlements. The dairies whose product was handled by this company made a marked improvement, while dairies, whose product was cared for by a company paying at a flat price, fell in their scores. The improvement seemed to indicate that it was more profitable to produce clean milk, and that the farmers made an effort to produce such milk when method of payment depended upon the quality of product. Ultimately, however, the success or failure of this plan of improving a milk supply must turn on the extent to which the

purchasing public transfers its custom in accord with the official standard of quality.

The first part of this paper tended to show that the milk ordinances are not very much at fault except that in some instances they are extremely radical. The views which I have expressed as being from the standpoint of the producer, would undoubtedly be repudiated by most farmers. Then how can these views have any claim to expressing the farmer's viewpoint? Simply in this respect; the vast majority of the farmer class are still asleep to the solution of the milk question, to a full understanding of its present day extensiveness and effectiveness, and to the wonderful opportunities in its future when a master hand shall solve the question and reorganize the system. Some milk producers are wide awake and are far better acquainted with the milk question than are the majority of health commissioners and inspectors, but they are comparatively few. It is one phase of the milk question from their standpoint which I have tried to express.

A book entitled "The Milk Question" by M. J. Rosenau has just been issued by the press. The author is a member of the faculty of the Harvard Medical College and has formerly been employed in the United States Public Health and Marine Service. He is well qualified to discuss the milk question, at least from the scientific viewpoint, and has done so in a very capable manner in his recent publication. He has stated the facts both in pictures and print and has shown justice to all concerned, the farmer, the milk peddler, the creamery man, the health officer, inspector, and consumer. But the very last sentence of his work falls short of the standard main-

tained in the rest of the book, and it falls short in its final analysis and solution of the milk question. He says: "A milk supply, therefore, that is both supervised and pasteurized is the only satisfactory solution of the problem." Professor Rosenau has fallen far short of wording the solution of the milk problem in this one brief sentence.

In a recent number of the American edition of the "World's Work" is a lengthy article entitled "The Bacteria of Bad Business." It deals with a quite thorough investigation of the milk supply of Rochester, N. Y., by the author, Dr. John R. Williams. He writes that "two inevitable conclusions arose clearly from the mass of detail gained in his investigation:

(1) The fundamental cause of impure milk on the farm is the uneconomic method of production.

(2) The fundamental cause of impure milk in the city is the uneconomic method of distribution." He then concludes; "The solution of the milk problem lies, therefore, in the better economic control of production and distribution." Dr. Williams has correctly solved one phase of the milk question but has badly advanced it as the solution of the whole problem.

The American Associations of Medical Milk Commissions thought they saw the solution of the milk question in the ineffective, unorganized, city milk ordinances. Accordingly they proceeded to solve the problem by enacting stringent legislation to control the producer in the production and distribution of milk. The colleges of agriculture have indirectly attempted to solve the question by

teaching the farmers to lower the cost of production by economic, scientific methods of feeding and caring for their cows, and to increase their productivity by scientific principles of breeding. These three methods are good and all in the right direction but they haven't solved the problem.

Bacteriologists have discovered some very valuable things concerning milk, its chemical constituents, its bacterial flora, and its physical properties. Upon these findings the health commissions have based their rules for sanitary improvements. They issued their demands to farmers in terms either too scientific or too indefinite to be understood. As a result, improvements have not been made, the farmers have suffered fines, unjust criticism, and public abuse, for their excusable ignorance, and the consumers have come to consider themselves the would-be victims of a plot to sell them filthy, disease-laden, adulterated milk. Evidently bacteriologists have not succeeded in solving the question.

The way looks dark and dangerous, therefore, for any new theory for the solution of this difficult question. However, each of the examples cited have been in the right direction and have contributed some progress toward the solution of the milk problem. Common sense would then prompt the combining of all these methods, together with any other factors which have proved to have an influence on the question. A new theory would then call the consumer to realize and share his part of the burden of the milk question by observing the rights of the producer and paying a just price for milk; would then emphasize economic control of production and distribution; would emphasize the teachings of the agricultural colleges; would urge health commis-

sions to teach and show the farmers the "why" of legislation and sanitary principles; would wake the farmer to realize his position, take advantage of his opportunities, and bring his business up where it belongs, namely in the lead of all industries.

John Spargo has worded the problem and its solution aptly: "Parents cannot accomplish the task alone and unaided; physicians cannot do it; farmers and milk dealers cannot do it; it cannot be done by the governing bodies of our cities and states, or of the nation itself. But all these forces combined, earnestly and sincerely working together, can do it, and so bring about ____the ____ triumph of life over death, of health over disease."