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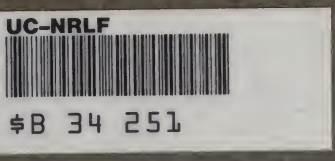

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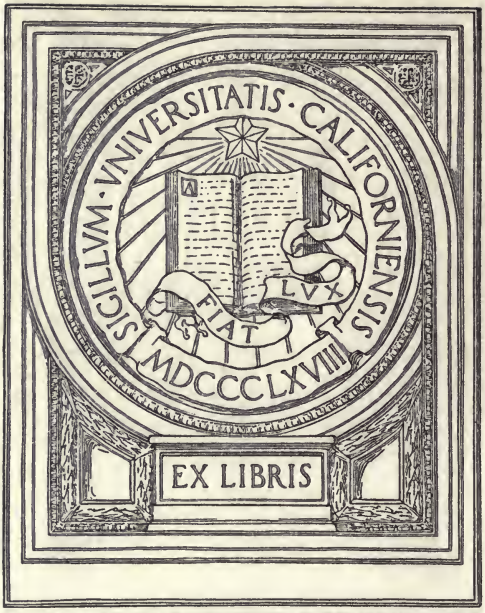
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Second Annual Meeting

OF THE

California Association OF Medical Milk Commissions

AT THE

UNIVERSITY FARM

DAVIS, CALIFORNIA

APRIL 18, 1910

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CALIFORNIA

SECOND ANNUAL MEETING OF THE CALIFORNIA ASSOCIATION OF MEDICAL MILK COMMISSIONS.

(At the University Farm, Davis, California.)

(Monday, April 18, 1910.)

A meeting of the Medical Milk Commissions of California was held at the University Farm, Davis, on April 18, 1910. This meeting was open to the public and was attended by about seventy-five persons, who were interested in the production and sale of certified milk, and who took part in the discussions. The following milk Commissions were represented:

Alameda County Medical Milk Commission.

Los Angeles County Medical Milk Commission.

Santa Barbara County Medical Milk Commission.

San Francisco County Medical Milk Commission.

Previous to the regular program an opportunity was given the visitors to go over the University Farm Dairy and Creamery and to view the work which is being done by this important department of the University.

An exhibition of certified milk was held which was contributed to by the following producers:

1—Burrough Bros., Walnut Grove Dairy, San Jose, Cal.

2—The Ideal Farms, San Anselmo, Cal.

3—The Potter Dairy, Goleta, Cal.

4—E. F. Robbins, Arden Dairy, Pasadena, Cal.

5—H. R. Timm, Dixon, Cal.

After lunch at the University Farm Dining Hall, the following program was presented:

1.—Address of Welcome, Mr. Roger Roberts.

2.—History of Certified Milk in California, Dr. Adelaide Brown.

3.—Demonstration of the Tuberculin Test in Cattle and Physical Examination of Infected Cows, Dr. C. M. Haring and Dr. Walter Bates.

4.—The Milk Production Problem, Prof. Herbert A. Hopper.

5.—Control of Bovine Tuberculosis in Certified Dairies, Prof. A. R. Ward.

6.—Use of the Score Card in Dairy Inspection, Dr. Chester Roadhouse.

7.—The Pure Milk Problem, Prof. F. D. Hawk.

8.—Results of Some Investigations Concerning Bovine Tuberculosis, Prof. C. M. Haring.

9.—Demonstration of the Organs of a Reacting Cow Previously Examined Before the Meeting, Dr. Chester Roadhouse.

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At six o'clock the delegates and visitors assembled for dinner at the University Farm Dining Hall, after which an informal discussion was held on various topics of interest to Medical Milk Commissions.

It was decided that the Medical Milk Commissions, now certifying milk in California, should form an association to be known as the Association of Medical Milk Commissions of California, for the purpose of co-operating with the Public Health Association, for holding public meetings of an instructive nature similar to this one and for furthering in every way the production and sale of certified milk.

No officers were elected.

It is proposed to hold another public meeting of this Association in September in conjunction with the meeting of the Public Health Association.

Respectfully,

LEWIS SAYRE MACE, M. D.,
ADELAIDE BROWN, M. D.,
Executive Committee.

MEETING OF THE MEDICAL MILK COMMISSIONS OF CALIFORNIA.

(The University Farm, Davis, California, Monday, April 18, 1910.)

Address of Welcome.

By Mr. Roger Roberts

Dr. Anderson deeply regrets being unable to be present to-day to welcome you in person; so do I. It is now approximately four years since the Legislature at Sacramento appropriated money for the purpose of founding this Farm and School of Agriculture thereon. The administration of the funds was in the hands of the regents of the University of California. The first steps taken in the development of this farm was the erection of buildings for the harboring of live stock. In time we were able to handle milk and milk products in a scientific, modern way. The next thing was the erection of a dormitory for the boys who are interested enough in agriculture to come here to receive what we have to give. Now buildings have been erected and the whole thing has gone forward until you see the plant that we have here to-day. Live-stock buildings and other barns are now needed; exactly where we have the administration building, grain houses are to be erected. Much good work has been done here. In Dr. Haring we have a man who is capable of the best. Three years ago he commenced operations here under very trying conditions, as there were practically no buildings and no equipment. His building is now up, although not thoroughly equipped, and the next time that you come here we hope you can approach it over a pleasing grade, and I know that you will find all corrals well ordered, operating room fitted with sinks, the carpenter work will be finished and the building in such a way as to meet the highest possible ideals of sanitation. We hope that in the future our work will be such as to meet with your approval. It is a great pleasure for us to have you here to-day and it will gratify us to take you over the grounds and through the buildings for your inspection.

HISTORY OF CERTIFIED MILK IN CALIFORNIA.

By Dr. Adelaide Brown.

The first Medical Milk Commission was established by Dr. Henry L. Coit, of Newark, New Jersey, in 1893. The general plan of this Medical Milk Commission has been followed since throughout the United States. The production of the dairy which comes up to the requirements for cleanliness as shown by the bacterial count, fat percentage and general chemical tests, and in dairy technic and the tuberculin test given every six months to the herd is certified; these being the standards of the Commission for the production of a pure and completely sanitary milk.

In 1907, as a result of the example of this first Medical Milk Commission, twenty-two milk commissioners sent their delegates to Atlantic City, and the American Association of Medical Milk Commissions was formed. This Association was addressed by the United States Department of Agriculture experts, by specialists in sanitation, etc., and resolved itself into standing committees to discuss the points of variation in the individual commissions and to construct a working standard for the use of all milk commissions. The reports of the work of these committees and the reports of the certified dairies made the program of the second meeting of the American Association of the Medical Milk Commission at Chicago in 1908. At this meeting the milk commission had increased in number from twenty-two to forty-eight, and standard requirements on the fat test and bacteriological test as recommended by the American Public Health Association were adopted. In 1909 the third annual meeting of the American Medical Milk Commissions took place at Atlantic City and reports were sent in from fifty-six commissions, representing twenty-two different States, many States having protected during the year through legislation, the term "certified milk," thus recognizing and endorsing the voluntary work of the milk commissions. The California Legislature passed such an act in January, 1909.

In California there are at present three milk commissions representing the Alameda County Medical Society, the San Francisco County Medical Society and the Los Angeles County Medical Society; and in the process of the making there is one in Sacramento and one in San Jose. The milk commissions in the bay region of California are certifying to three dairies and San Francisco is to-day consuming 2,000 quarts of certified milk, while probably about 1,500 quarts are being used in Oakland, Alameda and Berkeley. Certified milk is also procurable on the trains of the Southern Pacific and has been sent across the continent and across the Pacific numerous times.

The certified dairies of Mr. Nelson and Mr. Timm entered into the contest in Cincinnati and were high up in the honorable mention class. Though their milk was eight days old when it reached Cincinnati, the bacterial count was excellent. One sample contained "only 100 bacteria to the cubic cm. and nine of the twenty-four samples sent contained less than 1,000 bacteria to the cubic cm." (below 10,000 being required).

A most valuable demonstration of the use of certified milk has been made this year in San Francisco when the foundling infants were removed from the Asylum and the "boarding-out" system tried. Under this change alone a death rate of 40% plus was reduced to 12% in the first six months, the feeding of the child being left to the judgment of the woman with whom it was boarded. A careful investigation then showed that the children were not gaining as normal children should and in most cases were being fed condensed milk. Certified milk was then secured for these infants, and under the services of a nurse the foster-mothers were taught artificial feeding, with the result within the next six months of a death rate of less than 2%, and an absolute gain in the normal in practically all of the cases. The remarkable effect of clean milk in infant feeding can only be appreciated by the physician who is constantly in contact with the problem of artificial feeding. The bottle baby has become with this pure food product a more normal citizen. The work of the Medical Milk Commissions seems to me to express as thoroughly as does the anti-tuberculosis work of the medical profession the new and preventive methods in medical practice. Keeping the child well is far more worth while than caring for its digestive disturbances when poor grades of milk are furnished it.

THE MILK PRODUCTION PROBLEM.

By Prof. Herbert A. Hopper.

Much that will be said in this paper is already well known to those who are following the trend of modern tendencies in the production and handling of milk for direct consumption. From the financial and especially the public health point of view, it is a national problem and is absorbing the attention of thinking men and women everywhere. While most forms of food have in recent years come more or less completely under the supervision of the pure-food authorities, no one form has given them so much anxiety as has the milk supply. Certainly their efforts in controlling the sanitary features of other food supplies have met with more success than those directed toward the dairy and its product. The reasons for this are not hard to find. The problem is a complex one. Unlike some other forms of production, dairying does not yield readily to centralization. Its separate units are hard to fit into a systematic organization. The local and special demands of each farm makes its successful operation largely a problem by itself, and to this extent so far has prevented any considerable number of farms being operated in accordance with any plan or scheme of centralization. The points of view, training, methods and aims of the operators have lacked so much in uniformity that the quality of the product has been made more difficult to control. Methods of inspection and control as used in other lines have often met with uncertain results when applied to the milk supply. Further, the attitude of producers in general, and the training and personality of the inspector as well are to be considered. At best, it has been a long-range effort, associated with many serious difficulties, though much progress has been made. The subject of milk production is too large to compass in one paper. It is my

desire, therefore, to consider a few of the economic features of the business that tend to encourage or discourage the production of more acceptable grades of milk.

There are numerous organizations to promote better methods among milk producers. In order that their efforts may be most fruitful, their recommendations must point the way to greater profits for the producer. Nothing educates so effectively as an increase in price. In the butter-producing industry we are now confronted with an aggravating situation as regards appreciation for quality in cream deliveries. The competition has been so strong for cream of any quality that the respect of the producer for proper sanitary provisions has been well nigh destroyed. With the knowledge that poor stuff commands the same price as good material, he has lost interest in maintaining high standards. This emphasizes the necessity for a price recognition in order to attract and hold quality and is applicable to the improvement of the milk supply. Any effort to improve the milk supply which overlooks this fact, starts out at a disadvantage.

Milk Has Not Sold for Its Full Value.

In recent years the cost of labor and food supplies has advanced rapidly and most producers with herds of only average economic-ability have been getting the short end of profits from the sale of their product. The advancement of the selling price has not kept pace with the increase in cost, and, consequently, dairymen have often looked upon the agitation for better milk with considerable well-founded suspicion. It is said that since 1894 the cost of labor has increased 100%; the installation of new appliances and equipment for the proper handling of milk, 20%, and feed in general, 50%. The cost of sound cattle has advanced 75%. Where a few years ago, bran, a staple dairy concentrate, could be purchased at $14.00 per ton, it now costs about $30.00. With a similar advancement in other feeds, as well as in labor, it is conservative to say that these elements in the cost of production have doubled in recent years.

A further and equally important factor influencing increased cost is the rapid increase in land values, especially of those lands available for dairying. Naturally, the milk supply must be drawn from territory within a certain radius of the centers of population. Consequently, the price that is forthcoming will determine the lands that can be used and their location will affect directly and indirectly the quality, as well as the quantity of milk to be produced. With good cows and good business methods, dairying will pay on high-priced lands, if milk is paid for at a price commensurate with other food products. When the consumers refuse to pay a fair price, production is shifted to cheaper and more remote lands where it is harded to supervise and the difficulties of transportation augmented. Many a careful producer has been crowded out through the preference of consumers for a cheap, inferior grade of milk. Cases of this kind are matters of common observation. Until some substantial readjustment of cost takes place, we can expect little more in the way of care on the part of average open-minded dairymen.

It stands to reason that milk produced under proper sanitary conditions cannot be sold for the same price that is demanded by the dealer in unsanitary milk, and no sane consumer, were he to give the matter thought, would begrudge the difference in price. Who is to derive the benefit from these efforts, if not the consumer? Let him bear his share of the burden.

Producers Should Seek to Reduce the Cost.

It is not to be supposed that the bulk of dairy farmers are doing all that they can to reduce cost of production, and for this reason the consumer should not be expected to make up for the shortcomings of the former. My own study of dairy cows and dairy farm practices has shown that a considerable portion of the cows are not profitable as fed and cared for, and that those in charge of them are often not sufficiently alert to the opportunities for cutting down the cost. There is a wealth of data to establish these facts, but, in spite of them, the indifferent producer is more inclined to look for relief in a larger price than to try to reduce the cost. The establishment of herd improvement associations for the encouragement of systematic record keeping and breeding, as well as better dairy ideals and practices, will do much to narrow the gap between cost and selling price. The most careful attention to economy cannot be expected, however, to counterbalance the increased price of raw material.

Producers Should Be Consulted.

In most discussions and arguments which have led up to the adoption of new regulations, the farmer has not been consulted and his opinion has not been asked. Rules and regulations have been enacted quite arbitrarily by those who happen to be in authority, without conference or consultation, not only with the producer but with many others whose opinions and judgments would be of value in arriving at a decision which would be just and equitable to all concerned. In some cases, progress has been blocked by trying to force regulations upon an unwilling dairyman. While the enforcement of regulations is necessary, the indifferent ones are more successfully dealt with by encouragement and instruction. The bulk of dairymen are reasonable if approached in the proper way.

Best and quickest results will follow the taking of the producer into confidential relations. Give him credit for a knowledge of his own requirements and necessities. Assume that he is willing to regard the rights of others and expects to have the same courtesy extended to him. Committees on milk improvement should include leading producers who are in touch with the practical difficulties of the business. Their actions will render the actions of the committee more sane and stimulate the confidence of other producers in such measures as are enacted. Give the dairyman a hand in the formulation of regulations and you bind him to their execution without strict inspection.

Producers' Attitude Toward Sound Cows.

While the atmosphere has cleared considerably regarding the importance of sound cows, there are still some anomalous situations. Opposition to the tuberculin test has been more an economic objection than a sanitary or public health objection. On the fact of it, the compulsory disposal by slaughter of an afflicted animal without partial reimbursement is resented as contrary to economic necessities. This position has been quite generally assumed by dairymen everywhere. They have failed, however, to see an advantage in the larger economic returns of a sound herd. This is a strong argument for the voluntary weeding out of afflicted animals. It comes with especial force to the dairyman breeder who is looking for two returns from his herd. Everything that will contribute to soundness must be encouraged, but we should not stop at mere freedom from disease. The herd must pay. Certain figures have been exhibited that go to show that the continued testing of a herd for tuberculosis will eventually weed out the most profitable cows. If this is true, it strikes right at the vitals of the business.

I call to mind two herds. In one, the owner has been working for years to establish large yields by judicious breeding, feeding and care. The present condition of the cows shows that he has been remarkably successful to this end. The great, strong cows, with every evidence of marked capacity for profits, are uniformly admired. He has never made a practice of tuberculin testing, but has exercised his own form of control by removing animals at the first indication of physical decline. This herd is one of the most profitable I have ever seen, and outwardly is in the best of physical condition.

The other herd has been gathered from the four winds and represents a heterogenous mixture of common stuff without evidence of improvement. Periodic tests are made, and each time a certain percentage must go. If any of the cows happen to have eminated from communities where improved stock has been bred, these are usually the better producers and often, as well, the reacters. It is necessary to be continually buying, and, at the same time, avoid the disease if possible. The returns from the limited product may justify the methods followed, but it is a question how long they will do so. Don't understand me as opposing the test. I state the facts about these two herds as I understand them. The contrast is indeed remarkable. One is economically strong and probably not dangerous to public health; the other is evidently economically weak, but free from disease. Cannot the two ideas be harmonized to the advantage of the business?

It seems like a needless calamity that our zeal for sound cows should lead us to act contrary to established economic facts in selecting them.

Breeding Sound Dairy Cows Will Pay.

Fortunately, some breeders of dairy stock have seen the trend of conditions and requirements, and have fortified themselves against future demands. The future demand will be and is now for the sound cow and the profitable cow. These two properties should

reside in the same individual. Profitableness without soundness is dangerous and regrettable, but soundness, without profits is an aching void that cannot long maintain itself. Breeding establishments for the rearing of sound profit-producing cows should be operated in connection with certified dairies or independently as feeders for the same. If the demand for this class of milk assumes the proportions that its advocates claim for it, the fine-tooth-comb method of collecting economic outcasts to replenish these dairies will soon exhaust the supply. It should not be necessary for the buyer to feel that he must avoid improved herds. The possibilities of rearing sound stock of good breeding are so inviting that a little encouragement along that line would contribute much toward raising the standard of profits. The breeders of registered stuff are realizing the value that soundness adds to their cattle, but there is also an opportunity for the breeder of grades to meet a real need by producing the kind of cow that will make her owner profits from milk that is above suspicion. Such is the cow we seek, and with her advent in sufficient numbers will come the solution of one of the main difficulties in the milk-production problem.

Discussion of paper, "The Milk-Production Problem," Prof. Herbert A. Hopper:

Mr. F. V. Nelson: I have not much to say with regard to this paper read by Professor Hopper. He referred to the fact of there being some milk producers present, and I think they will agree that no one could have presented the facts of the case better than the professor has done.

Mr. H. R. Timm, Dixon: I can hardly believe that pure breed cattle are mostly diseased as Professor Hopper intimated, because a great many men raising pure-breed cattle are keeping them weeded out so as not to distribute the disease. I think there are many herds which should be tested and are not. I do not know whether he referred to my herd in making the comparisons. In my herd I am weeding out all those animals that are not profitable, and I will finally have a herd that I think will be an average one; I have mostly Durhams, but am adding Holsteins as fast as I can; I have a few Jerseys that I got in bands that I purchased. As Dr. Adelaide Brown has stated, they do not want rich milk, and whenever they take a test of my milk or any other milk that is certified and it runs over 5% we generally hear from them, so we have to try to get cows that test from 3.5% to 3.7%, and the Holstein seems to run the nearest to that average.

Dr. E. C. Fleischner, San Francisco: In regard to the economic question, if the production of the milk is going to prove a loss to the men who endeavor to produce it, we must get the people to pay more for it. We give the milk to the babies and patients because we think that we get better results from its use, and the people who believe as we do are willing to pay for it. It seems discouraging if we must demand this milk from the producer with a loss to him.

Dr. F. H. McNair, Berkeley: The record of a Jersey herd in New York State two or three years ago might interest you. The owner had had the band in operation for about eight years, numbering 200 registered Jerseys. While his milk product was paying

well, still he expected to sell the animals and make most of his profits by such sales. Out of five animals sold to New Zealand at $500 each, three were rejected because found by testing to be tuberculous. He immediately went to work, and by the tuberculin test began the weeding-out process, thinking that it would pay him to create a herd free from tuberculosis. When I was working on the herd he was losing four or five of his best cows every year with tuberculosis in different forms. It would doubtless have been to his financial interest to have started out with the tuberculin test in making his original purchases.

Professor Herbert A. Hopper: In answer to the question that Dr. Fleischner raised with reference to the discouraging features, I wish to say that I do not look at it as discouraging. In time the customer will have to come to pay the price that the milk is worth, but just at the present time I hope that the producers will not stand in the way of progress and ask for a higher price. These things always work out right, and we will not have a good milk supply until the people are willing to pay for it.

THE USE OF THE SCORE CARD IN DAIRY INSPECTION.

(By Chester Roadhouse, D. V. M.)

A question which is important to organizations in milk improvement work is how can the conditions under which milk is produced be best reported, and which method is the most thorough in reporting these conditions?

In the general milk improvement work by municipal boards of health which has developed in the large cities throughout the United States, it has been found that by the use of the score card a rating can be given each dairy and that with the score card the inspector can make a more perfect study of conditions at any dairy. Until the appearance of the score card little effort was made to classify the many details which have to do with the purity and wholesomeness of milk. The many items requiring attention are now listed; and, still better, they are given numerical values in the score card. By the use of the score card a competent inspector is able to designate the character of defects at the dairy, and also he can indicate the seriousness of such defects. The great advantage is that it is educational and that it shows the conditions in terms that the dairyman with little study can undersand.

Dr. Woodward, Health Officer of the District of Columbia, was the first to introduce the score-card system of reporting on dairies. A little later, in 1906, Prof. R. A. Pearson of Cornell University introduced a score card for the same purpose. The United States Department of Agriculture then took up the work with the hope of extending the use of the score card and thereby a more thorough inspection. After three years' work, scoring several thousand dairies in all parts of the country, the department adopted a score card, somewhat modified from the ones previously introduced, and which is now in use in over one hundred cities and towns in this country.

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The cities that have adopted the score-card system and are regularly following it are reporting dairy conditions constantly improving. Dealers often pay more for milk from high-scoring dairies, which encourages better work on the part of the producer. The good dairymen naturally want a high score, and by studying the points in the score card are able to improve their conditions.

The history of the production of "certified milk" shows that it was early determined that a close supervision of the dairy was necessary to insure a continued high standard. The herd and farm inspections should cover the state of health of the cow, herd hygiene, the sanitation of the buildings and premises, the care of utensils, the farm and dairy methods and practices and inquiries regarding the health of the dairymen, milkers and their families. The use of the score card is applicable for this purpose, as well as for the average dairy, and realizing this fact the Executive Committee of the American Association of Medical Milk Commissions in 1909 recommended the adoption of an official score card.

In brief, the following recommendations were made by the Executive Committee:

First—That no producer should be considered for the production of certified milk by the Medical Milk Commission unless his dairy shows a score of 90% or more.

Second—A system of scoring should be adopted under which detached statements of conditions obtained at the dairy shall be reported to one Central Committee, for the entire country, which shall reduce these reports to percentage standings.

Third—That the score cards for the dairy be prepared by a person who is acceptable to the local Commission and the dairyman.

Fourth—That similar reports be made from time to time also by a Federal or State official not interested locally.

If these recommendations are followed by all Medical Milk Commissions in the United States it means that all certified dairies will be producing milk under the same standard, which will lead to uniformity in the production of certified milk and a fairness to all dairymen, which is to be desired. So far as I have been able to learn, the official score card has not been prepared for the American Association, although the report of the Executive Committee was adopted.

It might be said that the score card used in the dairies of the East would not be applicable for the dairies in California, where the conditions are so widely different. But this is not necessarily so. If the meaning of the score card is properly interpreted it is possible and practical to adopt a uniform system of scoring for all dairies.

Personally I have scored 150 dairies which supply milk to San Francisco, using a score card modeled after the one recommended by the United States Department of Agriculture. The average score for these dairies was below 60%. Using the same score card for the two certified dairies supplying milk to San Francisco, I found them at all times to score above 90%.

Sixteen certified dairies supplying various cities in the United States were visited and scored by a representative of the United States Department of Agriculture. They showed a score varying from 79 to 99.5%.

In all cases the cows were in almost perfect condition. Averaging the scores for all conditions, one dairy was found to score below 80%, three over 80% and less than 90; two scored 99 and two 99.5%. The average score for all dairies was 93.4%. Comparing these conditions with the average of some 2,000 dairies producing ordinary market milk for city consumption, and which were also scored by the United States Department of Agriculture, we find a striking contrast, the average score for the latter being about 50%.

In conclusion, I would say as a suggestion that it would seem desirable that all Medical Milk Commissions in this State adopt the use of the official score card recommended by the American Medical Milk Commissions as soon as it is prepared; not for the purpose of reporting all inspections at the dairy, but that it be used at intervals during the year for the information of the members of the local Commissions and of other Milk Commissions.

Discussion of paper, "The Use of the Score Card in Dairy Inspection," by Chester Roadhouse, D. V. M.:

Mr. F. W. Andraesen (Secretary State Dairy Bureau), I would like to state that in April, 1905, the State Dairy Bureau of California adopted a score card, and believe that some official from the Agricultural Department at Washington assisted in preparing it. This card has been in use in this State ever since. At a later date, 1908, an excellent and very complete score card was adopted by the United States Department of Agriculture. The State Dairy Bureau, of this State, did not at that time think it advisable to change the card already in use in this State. First, because the one in use seemed well adapted to the conditions on this Coast, and the Department of Agriculture in their Circular No. 139 say, "In traveling across the country we find the dairy conditions somewhat varied, particularly in respect to climate. For example, in the New England and Central State the temperature frequently drops several degrees below zero during the winter months. This necessitates tight barns and an automatic system of ventilation, together with a reasonable amount of air space, if the animals are to be kept comfortable and healthy. On the other hand, there are sections in the South and on the Pacific Coast where the stables are simply open sheds, which afford all the protection necessary. Here sunlight, ventilation, and air space are unlimited, and these points hardly need to be included in a score card." Cows in this State are not kept in the barn more than two hours at a time, only just long enough to milk and feed them. The State Dairy Bureau has a large territory to cover, and but little money to work with, and therefore cannot go so completely into details as the United States Agricultural Department or some of the large cities in the United States. A dairy inspector employed by a city to inspect the conditions under which the milk supply for that city is produced is expected to visit every dairy supplying milk once a month, and if he has once measured and calculated the cubic feet of air space, the square feet of glass per cow, in every stable in his

district, then that part of the scoring is easy on subsequent visits. But where the State Inspector cannot visit each dairy more than once a year, and some of them only once in two years, the scoring of light and ventilation becomes a great work. Therefore, though some credit is given for good ventilation and light, in the old score card much time is not devoted to measuring actual number of feet of space per cow. The score card is of great advantage to the inspectors in that it assists him in remembering every point of importance which should be inspected and the condition of which should be recorded. It also assists him in calling the dairyman's attention to conditions where he could easily raise his score. As, for instance, if the watering troughs are dirty, or the water that the cows drink is contaminated, he could point out to the dairyman how he could better these conditions, and thereby raise his score five or six points. These score cards are filed away, and at any time the public can see which dairies are in good condition, and the inspectors can also see it, and make it a point to visit the unsanitary ones as often as possible.

Chester Roadhouse, D. V. M.: Mr. Andreasen is correct in his statement about the score card in one way, but I wish to say that there is an advantage in using a uniform system of scoring dairies throughout the United States. Mr. Weld, from the Dairy Division of the United States Department of Agriculture, recommended this when he visited this Coast a year ago. The score card recommended by the United States Department of Agriculture can be made applicable for all dairies if it is properly interpreted. To illustrate this point we may refer to the topic "ventilation" on the score card. In the cold sections of the country where dairy cows are kept in stables during the winter months we would require the King system of ventilation for a perfect score, but in California the King system of ventilation would be no more beneficial to the dairy herd than any other system, and consequently we would not require it in California for a perfect score. In California we may give a perfect score on bedding for the cows when no bedding is provided in the cow stable, but where the cows are in the stable only for milking, their bed is usually a green grass plot where they rest and sleep and where the conditions are ideal in keeping the animals clean. If cows are kept in the stable at night and are not bedded, we score off for lack of bedding. Directions for scoring may be printed on the back of the card to aid those who are not familiar with the requirements for the dairy. Following such directions, even the inexperienced individual would be able to score within three to five points of the proper score.

MILK PRODUCERS AND PURE MILK.

By Professor F. D. Hawk.

Given Before the First Annual Meeting of the Milk Commission of the San Francisco County Medical Society, University Farm, Davis, Cal., Monday, April 18, 1910.

The producer of milk is a business man, so, naturally, when he is approached on the subject of pure milk he begins to ask questions that are of vital importance to himself and not those of importance to the consumer from his view point.

First—The questions to be met are, Can I make more money by producing and marketing milk under the rules of certification than I can by going ahead with an ordinary dairy, or will the market for certified milk justify me to make the necessary expenditure to run such a plant?

Second—Will I have co-operation in my venture to raise the standard of milk? In other words, will the people who have certification in charge, and who have the health of the cities uppermost in their hearts, do as much as is in their power to get me a market for my milk as they do to bind me to my contract to produce this article of pure milk?

Third—What are the results of the tuberculin test, and how will it affect my business?

In looking into these questions I find myself puzzled about just what to say, when I stop to consider the conditions that exist in our dairies as a whole. I will admit that there are all too many of our dairymen who are producing milk under the most foul conditions that can exist, and the article produced shows the unkempt method in which it was handled in the dairy.

One need not visit these dairies in order to get a mental picture of yards covered with litter and filth; of barns cleaned but once a week and cobwebs hanging from every timber, probably never brushed down from one year's end to another; even the cow herself in a poor condition, carrying tags all over her hind quarters.

An article for human food produced under such conditions should not be allowed upon the market under any consideration. Such slovenliness cannot be excused or even tolerated on the ground that it is a cheaper way of production. In the first place, it is anything but cheap, even to the producer. Cows kept in shacks filled with manure have great obstacles to overcome—such as impure air, uncomfortable quarters and lack of kindness, all of which are necessary to cows before they can do their best.

Another source of loss comes through the disgusted visitor who tells his friend what he has seen, and in consequence customers become fewer and fewer.

Thanks to our city Boards of Health for inspecting dairies and preventing such people from sending milk to their city market.

There is another producer of the middle class from whom we seek material for the certified dairy. He is the man who has good buildings, keeps his stables moderately clean, has fairly good cows and handles his milk in the ordinary way. This is the man from whom these vital questions come. He is not in the business for his health. He is the man that knows dairying is not the easiest business he might follow, but it is the dollars that he is looking forward to, and not the cities' health.

What does pure milk mean? It means milk that is produced from healthy cows and under such conditions as shall be prescribed by the Medical Milk Commission for pure milk. You gentlemen are all familiar with the rules, and can you wonder why there are so few who contract to follow these rules at the price now paid for certified milk?

Is it more plausible to ask a dairyman to clean up his dairy than it is to ask a consumer to purchase clean milk at a reasonable price that will compensate the producer for his trouble? I think not.

If certified milk can be put on the market with greater net returns, then a part of our problems are solved. Figures that are reliable on this point will do more than any one thing towards having clean milk, provided it can be shown that it pays more than the dairy that is run under the ordinary methods. If certified milk plants cannot show favorable figures, then we can readily see why we have no more dairies of that class. Here in California the retail price is five cents per quart more for pure milk than for ordinary milk. This difference of five cents is not enough when we consider the cost of extra equipment, labor, icing and shipping, and the loss of animals discarded as a result of tuberculin testing.

Will the dairyman have co-operation in his venture to raise the standard of milk? Yes; but how much I cannot say. The Milk Commission will help to clean up his dairy and keep him fairly close to the rules. But what his fellow dairymen will do I rather think will be anything but to co-operate—they will give him a hit here and a hit there. This, of course, is not the right spirit, nevertheless it will be true. Men interested in clean milk will write long articles on the subject, telling how essential it is that we should use the clean article. He will also even tell how to keep the dairy clean. These articles appear mainly in agricultural papers, and therefore one of the main issues is lost, for the subject does not come to the notice of those it is meant to reach—the consumer.

The stimulus for clean milk is the thing that is necessary, but it must get to the vital point—the consumer. Here is where co-operation is most needed. Create a demand, and that demand, if great enough, will be satisfied.

There is another phase, of the clean-milk proposition, and that is the tuberculin test and its results. We know that it not only takes very valuable animals from the herd, which is a source of great loss to the owner, but it reduces patronage, the amount of which one seldom knows until he has had the experience. I can

relate instances where dairymen have quit testing their herds for tuberculosis because they lose so many customers when cows react and are taken from the herd. This is no more true of the ignorant class of people than it is of those well educated. These same customers immediately began taking milk from dairies where the cows are never tested and where the item of cleanliness is of no great importance. The matter of testing the herd might be kept from the general public and no more attention paid to it than other operations of cleaning up, if there was more co-operation among dairymen. But such conditions do not exist, for in every community there are dairymen waiting to get an article in the newspaper to inform patrons of what was found in this or that tested herd. The newspapers, too, grab at such material for the press, never thinking how much better the space might be used in creating a demand for clean, healthful milk.

The raising of the standard of ordinary milk is solved, to a great extent, by the Medical Milk Commissions, by inspecting dairies and keeping the milk from the market if not produced under fair conditions. This, however, will not reach the other side of the pure-milk question. I think there should be figures showing net returns from different classes of dairies so producers can compare net returns and act accordingly. If five cents more per quart is sufficient to pay for the loss of animals and the extra cost of running a pure-milk plant, with a little larger net returns, no doubt more people will go into the business.

Another point worth while, instead of wasting so much space in the agricultural papers telling consumers how vital to health is the use of pure milk, is to get it on the front pages of the daily newspapers and in magazines. This will help to create a demand that is now lacking, and this lack of demand is manifest in the cry of too high a price for milk. The way these articles should be written I am not prepared to say, but I would suggest that at regular intervals of two or three weeks articles on the value of pure milk should appear prominently in the daily papers and magazines, so that the attention of consumers may be kept on their physical welfare. Even after a demand has been created for the pure article, the dairyman will not be able to appreciate the benefits of it, for, under the ordinary run of affairs existing in our cities, the milk dealers form among themselves a kind of corporation and dictate what prices they will pay for the milk. On ordinary milk the San Francisco dealer gets half of the gross returns and more than half of the net returns. Instead of doing so much to encourage dairymen simply by taking and writing, steps should be taken to regulate affairs so the dairymen can secure just returns for his whole milk. Under present conditions it would be better for him to sell butter fat to the creameries and use the skim milk as feed for hogs and poultry.

Since such conditions do exist, what is to be done in regard to the dairyman trying to produce pure milk? Considering that the price is sufficient to pay them, we must keep the dealer on satisfactory terms; or if dealing direct with the consumer he must be kept on the purchasing list. To do this I would suggest that the dairy be located where the consumer cannot keep in touch with

the every-day run of affairs and where the local dairymen are not all striving for the same market. This will prevent patrons from being cognizant of all of the details and therefore of the unavoidable things which are bound to come up now and then, and they will only know that the Medical Milk Commission is keeping supervision over it and considers the milk of the best quality.

I have spoken of co-operation for the betterment of milk conditions, and I want to bring it before you again, for co-operation with education will be one of the greatest elements in settling the problem. Educate the producer to the point where he can see the advantage of co-operation, then—with the aid of the Milk Commission—the producer can get returns for his labor. How would I have them co-operate? By joining forces and doing something on the order of the fruit growers; put in a milk station of their own and hire a man to take charge of the milk similar to the middleman of the present time. The men that go into this can make rules for the producers to follow in marketing. Outsiders could get their milk through the milk producers' station by paying a prescribed rate.

If some such system was adopted the consumers and producers could be brought in closer contact, and in this way results can be obtained that cannot be brought about in any other way.

Discussion of paper, "Milk Producers and Pure Milk," Prof. F. D. Hawk:

Dr. J. L. Milton, Oakland: I think certified milk has come to stay. A few years ago when we first started to have certified milk it was only with great difficulty that we could get our patients to order it; now our patients suggest it themselves and want to know where they can get it for the baby. At the start we had some difficulty, too, with the certified milk itself; for a while in Oakland the milk was bad, and the people who were impressed with the idea that they must have certified milk were discouraged when the milk was delivered in a dirty manner. Sometimes it contained flies and bristles, but that has all been rectified now. As an example of the good condition of certified milk that we now get, one doctor in Oakland went away on a vacation of five days and during his absence his milk was delivered regularly, and on his return he found the milk in good condition, and this shows the value of certified milk. People are realizing that certified milk is clean, and sometimes they say there must be some preservative used, as it never gets sour. I think that certified milk has come to stay, and it is really surprising how many people have come to use it; people on small salaries are using it.

Dr. A. A. Stafford, Alameda: I feel certain that certified milk has come to stay. The question of price is not one that the consumer talks very much about; patients are constantly asking where they can get good milk for the baby. The question of price is seldom kicked about, and there are many people who do not know about certified milk, and I am sure that a little advertising among the people will help create a demand for it. As the professor said in his paper, if a half column was bought in the newspapers, or even a little square, which the producers of certified milk could

use for advertising purposes, it would doubtless increase the demand very rapidly—a little advertising helps a great deal, especially around the city.

Mr. H. R. Timm, Dixon: I would like to ask the doctors and members of the Milk Commission whether or not it would be advisable to raise the price of certified milk. The question was raised once before, but some of the dairies thought it would not be the proper thing to do.

Dr. Adelaide Brown, San Francisco: I think this is an economic question absolutely. If certified milk is a good thing I dislike having anybody deprived of having it on account of the price. Perhaps it is worth the test of raising the price. I think that a perfectly flat declaration of what the cost of production is is what we want to get. At Lake Forest, Ill., Mr. Meeker knows what every bit of the work of production costs; he can tell what the milk has cost delivered at the station, knowing the cost at every point in connection with its production. At Lake Forest Station they get 9½ cents, the rest going to distribution, etc., 12 cents per quart being the retail price in 1908. There they have everything figured out absolutely, and I think the only way to decide any such question is through accurate figuring. I think the producers should get the best return they can for their money. After two years of careful work, for the City of San Francisco by the dairies, if the increase in price is a legitimate one, the Milk Commission would not gainsay that raise. No matter what the people are paying for certified milk, they are not paying as much as they do for Malted Milk, Mellin's Food or Nestle's Food, which are very expensive. Artificial feeding is not cheap, and the use of certified milk has won the mothers' support as well as that of the Medical Societies wherever it is produced.

Mr. F. V. Nelson, San Francisco: As regards the change in the price of certified milk, I would suggest that the question be considered very carefully. The demand for milk for infant feeding alone is not sufficient to keep up the certification of a dairy; in other words, the distributor or producer has to rely on the patronage of families generally. One principal difficulty, I think, is that in infant feeding the mother as a general thing will want the milk for a few months only, and just as soon as the child is old enough the mothers conclude they have no further use for the certified milk. Hence the demand is a fluctuating one. I think that all producers have to consider a larger demand coming from family trade. Were the price raised the demand would not increase; more likely it would decline. My recollection is that statistics in the East show that there has been but a very small gain annually in the amount of business done, Chicago and New York showing not over 10% increase in the use of certified milk. The increase is to be reached only by means of education along reasonable lines.

Mr. E. C. Burroughs, San Jose: I agree with Mr. Nelson that the question of raising the price of certified milk is a serious one. If it were raised 25% it would put it up to a pretty high figure, and I think it is an important question whether or not it would be

advisable to raise it. Two years ago last February the price of certified milk was raised from 12 cents to 15 cents per quart, and I fear another raise would curtail the demand.

Dr. E. C. Fleischner, San Francisco: Some time ago the Associated Charities of San Francisco undertook to board out the babies in their care with the result that the mortality was decidedly reduced. Of course these children were fed in all sorts of ways. When one went among these individuals it was one's experience to find the types of food which these babies were being fed were primarily condensed milk, one of the patent foods or ordinary milk in some form or other. Through the efforts of the Association of Collegiate Alumnæ certified milk was furnished these children and the mortality was reduced from 12% to 2%. I really feel that it is a sufficiently definite result to call to the attention of everyone here, a sufficient result to make everybody note the results that can be obtained and ought to be obtained with certified milk in this community. This phase of the pure milk problem should surely not be overlooked in discussing the question.

Dr. H. E. Wright, Sacramento: If certified milk is such a good thing and has come to stay, as we believe it has, why not enact legislation to make all milk producers meet certification? Make the conditions so that only certified milk could be bought, and eventually all producers would have to charge the increased price to cover the cost of certification. If no one were allowed to furnish anything but certified milk it would be a perfectly even case of competition. It seems to me that this is a matter for legislation. The best for all is none to good. Why not pure food for all, in milk as in other foods?

Professor F. D. Hawk: I believe that certified milk has come to stay, but that the price has not come to stay. In the cities we can find the common milk to-day on the market for about four cents a quart and it is retailed at ten cents, the difference being for the middleman to carry on his operations, while the producer gets four cents. As far as going ahead to get pure milk through legislation, I think we better walk before we try to run. If we can get the producers together to work in unison with the city officials we can regulate some of the other things and get the price for pure milk for the producer.

THE RESULTS OF SOME BOVINE TUBERCULOSIS INVESTIGATIONS AT THE UNIVERSITY FARM, DAVIS, CALIFORNIA.

By C. M. Haring, D. V. M.

Presented at the Second Annual Meeting of the Medical Milk Commissions of California, April 18, 1910.

The results of certain investigations concerning bovine tuberculosis that have been carried on at the University of California Farm for the past three years cover several subjects which it is impossible to embody in a brief heading. They may be stated as follows:

(1) A test of von Behring's Bovovaccine.
(2) Observations on the Spread of Bovine Tuberculosis Under Outdoor Conditions.
(3) Retesting Recently Tuberculinized Cattle.
(4) A Search for Tubercle Bacilli in the Circulating Blood of Reacting Cattle.
(5) Result of the Introduction of Cultures of Virulent Tubercle Bacilli into the Circulation.

A preliminary report of this work has been given in a paper by Haring, Sawyer and Morgan[1] and in a monograph by Sawyer.[2] The present paper is intended to embody the results of the investigations previous to May 1, 1910.

A Test of von Behring's Bovovaccine.

In the spring of 1907 forty-five calves were secured for experimental purposes. Twenty-two of these were treated with bovovaccine after the manner of von Behring and twenty-three were kept as controls. Twenty-seven of the calves came from a dairy of thirty cows which were proven to be non-reacting by two tuberculin tests. Eighteen came from a dairy of eighty-four cows, sixteen of which reacted to tuberculin. Of the twenty-seven calves from the non-reacting dairy herd thirteen were treated with bovovaccine, and of the eighteen from the eighty-four cow dairy, nine were so treated.

Great care was taken to follow the method and technic prescribed by von Behring. The instrument case recommended by the Marburg Institute was secured and the technic of inoculation carefully followed. I will not take the time to describe the procedure in detail, as most of you are familiar with this and the requirements of von Berding as to age, environment, and manner of raising the calves. An assistant in the employ of the University was sent to the dairies to superintend the feeding and care of the calves. In Professor von Behring's circular of directions No. 5, as published by

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[1]Haring, C. M.; Sawyer, W. A., and Morgan, D. N., Bovine Tuberculosis Investigations. Proceedings of the American Veterinary Medical Association, Chicago, September, 1909, pp. 252-200.

[2]Sawyer, W. A., Tubercle Bacilli in the Blood. Archives of Internal Medicine, December, 1909, Vol. iv., pp. 628-638.

Bischoff & Co., it is stated: "As a rule only apparently healthy animals at the age of from two weeks to three months (for the first inoculation) are chosen. In such calves a previous tuberculin test is not necessary, even if the animals were taken from a notoriously tubercular herd." However, Bischoff & Co. wrote that the tuberculin test should be made, and accordingly it was, except in a few cases which a year afterwards proved to be non-reacting. We found the normal temperatures very variable, as would naturally be expected in such young animals. We believe that the tuberculin testing of calves less than sixteen weeks old is unreliable as an indication of tubercular infection. Nevertheless none of the calves which showed an abnormally high temperature after injection were vaccinated.

Another requirement imposed by Bischoff & Co. was that the calves be kept from possibility of tubercular infection until four months after the second vaccination. This in a measure was possible with the calves secured from the non-reacting herd, and the danger to the calves in the other herd was obviated as much as possible by weaning them at as early an age as seemed expedient. As soon as possible the calves were all removed to the University Farm, where at that time there were no tubercular cattle.

In the winter of 1908 the calves were all tested with tuberculin and none reacted. They were then subjected to infection by placing in their pasture five reacting cattle that were apparently in an advanced stage of tuberculosis. They were associated with the calves in a twenty-acre pasture and in a corral. Within six months these five cattle had all died of tuberculosis as proven by autopsy in each case. During the winter of 1909 no tubercular animals were with the young cattle. They were fed under a shed during rainy weather. Other than this they lived out-of-doors. In March, 1909, ten reacting dairy cows were placed in the corral and pasture with the young cattle. The proofs that several of these cows were affected with open tuberculosis are given later in this paper.

In July, 1909, all the young cattle were tested and the reacting ones sent to an abattoir having federal meat inspection. Special arrangements were made with the abattoir company and with the federal veterinary inspectors for their post-mortem examination. The animals were killed after all other killing was over, and a more searching inspection than usual made.

Since last July two tuberculin tests have been made on the remaining cattle, and to date (April 30, 1910) twenty-four of the experimental animals have been slaughtered and found tubercular.

OF THE TWENTY-TWO VACCINATED CATTLE TEN WERE TUBERCULAR; SIX OF THESE CAME ORIGINALLY FROM THE NON-REACTING DIARY HERD, AND FOUR FROM THE REACTING DAIRY HERD. OF THE TWENTY-THREE NON-VACCINATED CATTLE FOURTEEN WERE TUBERCULAR, SEVEN CAME FROM THE REACTING DAIRY HERD AND SEVEN CAME FROM THE NON-REACTING DAIRY HERD.

Table I.

Showing the age at vaccination and source of each tubercular animal and the extent of its lesions.

No. of the animal	Original Source of the Calf.	Age at 1st vaccination.	Date of Slaugh'r. 1909.	Location of Tubercular Lesions Found on Autopsy.
11	From a tubercular herd	10 wks.	Aug. 25	Liver and portal lymph glands
				Lungs and mediastinal glands
12	Non-tubercular herd	14 wks.	Aug. 25	Right precrural lymph glands
26	Tubercular herd	12 wks.	Aug. 25	Mesenteric lymph glands
29	Non-tubercular herd	20 wks.	Aug. 25 1910.	Mesenteric lymph glands
48	Tubercular herd	12 wks.	Jan. 29	Posterior mediastinal gland
15	Tubercular herd	16 wks.	Jan. 29	Lungs and mediastinal glands
33	Non-tubercular herd	6 wks.	Jan. 29	Lungs, bronchial and mesenteric glands
32	Non-tubercular herd	4 wks.	Jan. 29	Posterior mediastinal gland*
21	Non-tubercular herd	16 wks.	Apr. 25	Rethopharyngeal lymph gland
22	Non-tubercular herd	5 wks.	Apr. 25	Lungs, pharyngeal and mediastinal glands
17	Non-tubercular herd	not vac'd	Aug. 25	Lungs, pleura, mediastinal glands
23	Tubercular herd	not vac'd	Aug. 25	Cervical and thoracic lymph glands
27	Tubercular herd	not vac'd	Aug. 25	Cervical and mediastinal lymph glands
				Hepatic and mesenteric lymph glands
36	Non-tubercular herd	not vac'd	Aug. 25	Bronchial, mediastinal and portal glands
38	Non-tubercular herd	not vac'd	Aug. 25	Mediastinal lymph glands
43	Non-tubercular herd	not vac'd	Aug. 25	Lungs, bronchial, and mediastinal and portal glands
44	Tubercular herd	not vac'd	Aug. 25	Generalized tuberculosis
51	Non-tubercular herd	not vac'd	Aug. 25 1910.	Bronchial, mediastinal and portal glands
39	Tubercular herd	not vac'd	Jan. 29	Lungs and bronchial, mediastinal and mesenteric glands
47	Tubercular herd	not vac'd	Jan. 29	Posterior mediastinal gland
28	Tubercular herd	not vac'd	Jan. 29	Mesenteric gland
40	Non-tubercular herd	not vac'd	Jan. 29	Bronchial gland
31	Non-tubercular herd	not vac'd	Jan. 29	Bronchial gland
35*	Tubercular herd	not vac'd	Apr. 18	Lungs, liver and associated lymph glands

*This animal was the one killed as a demonstration at the meeting of the Medical Milk Commissioners of California at the University Farm.

It has been necessary, for economic reasons, to dispose of some of the fattest non-reacting vaccinated cattle. In these no tubercular lesions were found by the federal inspectors.

It would seem from these preliminary findings that von Behring's Bovovaccine fails to confer on calves a degree of immunity sufficient to absolutely protect them against infection until two and one-half years of age when associated with tubercular cattle on pasture and in corrals. However, this does not contradict evidence that bovovaccinated calves have for a time an increased power of resistance to tuberculosis.

Observations on the Spread of Tuberculosis Under Outdoor Conditions.

In at least one respect the problem of dairy sanitation is not as great in California as in many other parts of the United States. The problem of proper ventilation of stables is not a great one. The climatic conditions are such that tight barns are unnecessary. Most dairies do have barns, but the doors and windows are left open the year round. Many have no cow stables. In such cases a shed without side walls is usually available to milk under during rainy weather. In one of the certified dairies, that at El Monte, supplying milk to Pasadena and Los Angeles, the milking barn has no side walls; the cows are seldom under a roof more than four hours a day, two hours at each milking. Naturally, under such conditions it would be ridiculous to put stress on the King System or other devices for ventilation. In dairy cows kept under these conditions, tuberculosis is common. We believe that it will spread even under strictly outdoor conditions. Even in range cattle the disease seems to be increasing.[3] We have already mentioned the fact that in exposing the bovovaccinated calves and the controls to infection the association and resulting infection took place entirely in the out-of-doors. The size of the pasture was about twenty acres, the corral was about one-half an acre in size. In the corral was a watering trough, but the animals also had access to a stream and an irrigating ditch in the pasture. The first five tubercular cattle that were secured for infecting the experimental calves were stock kept under semi-range conditions. In central California are vast swamps called tule lands. Much of the year these furnish excellent green feed for cattle. The five cattle were selected from a band of about 150 cattle that had been raised in these tules.

The probabilities are that they had never been under a roof. In riding through the swamp, six animals were selected, which were emaciated or coughing. On tuberculin test five of these reacted and in May, 1908, they were taken to the University Farm. In six months all had died of advanced tuberculosis, as proven by autopsy in each case. The last of the animals died October 9, 1908, making the time they were confined with the experimental calves less than six months.

In March, 1909, nine reacting dairy cows were secured. Two of these were in full lactation, but were rapidly dried up. The others were dry. Some of them had been tuberculin tested in February, 1909, and some in March, and had been removed from a certified herd because of reactions. Most of them were in poor condition, but under their changed conditions all but one improved in appearance. In April one died. The autopsy on this animal was imperfectly performed, but the lungs were noted to be calcareous. On June 3, 1909, the nine remaining cows were tested with 3 cc. of University of California tuberculin, and none of them reacted. On

[3] Ward and Haring, Bulletin 199, Agricultural Experiment Station, Berkeley, California, August, 1908.

July 4th they were tested with 4 cc. of Bureau of Animal Industry tuberculin. Four of them showed a rise in temperature, but the curve was not typical of a tuberculin reaction. We have proven that all but one of them were tubercular, in the following manner:

Seven were autopsied, and in six of these extensive lesions were found in the lungs and associated lympathic glands; in the other the retropharyngeal glands only were involved. One was proven tubercular by infecting a guinea pig from pus from a tubercular abscess in the prepectoral region. This cow was eventually autopsied after having been inoculated in the carotid artery, as is described later in this paper. The eighth cow was proven tubercular by infecting a guinea pig with her feces. One of the interesting things to be noted is that the tuberculin test failed to give a reaction, although the animals were actively tubercular. We have observed this failure to react in an instance where about twenty reacting dairy cows were removed from a dairy, dried up and turned into a mountain pasture. When re-tested several months later most of them failed to react. These observations support us in the stand that in removing cows from dairy herds because they react to the tuberculin, no re-tests should be permitted. We believe the rule should be: Once reacted, always condemned. Outdoor life and freedom from the drain of milking may possibly cure some cows, but the cases just described show that, although they may improve in condition and cease to react to tuberculin, they may still be disseminating virulent bacilli, and that young, susceptible animals quickly contract the disease, even under an environment which acts with benefit on old and chronically tubercular dairy cows.

Re-testing Recently Tuberculinized Cattle.

Tests of Vallee's method by re-testing recently tuberculinized cattle have been made on thirty-seven reacting cows. By this method it is claimed that animals can be successfully re-tested in forty-eight hours after a previous injection. The procedure is to inject a double or triple dose and take the temperatures every two hours from the second to the eighteenth. The reaction is said to usually occur much sooner than in the original test. The results of our work as given in the following table are based on the injection of 4 cc. of tuberculin at the retest, the temperature being taken every two hours from the second to the eighteenth hour after injection.

Number of animals.	Reinjected in.	Number reacted on retest.	Hour at which the temperature rise occurred on the retest.	Hour at which the temperature rise occurred on the initial test.
3	48 hours	1	9	13
14	58 hours	7	10	12
6	3 days	1	11	9
6	5 days	1	17	12
4	45 days	4	14	12
4	2 months	4	13	14

It is interesting to note in corroboration of Vallee's observations that, in the retests made within five days, the animals reacting to the second injection usually had a rise of temperature sooner than at the first test, but the only conclusion to be drawn from this limited num-

ber of cases is that the retesting of cattle within six weeks is not satisfactory, even when a double dose is used, and the temperature taken every two hours from the time of injection until the eighteenth hour. The cases already reported of the retesting of non-lactating dairy cows, indicates that sometimes tubercular cattle will not react to tuberculin on retest even after a period of three months.

A Search for Tubercle Bacilli in the Circulating Blood of Reacting Cattle.

Considerable interest has been aroused by recent articles claiming that tuberculosis, in all its forms, is a bacteriemia. Rosenberger[4-5] claims to have found tubercle bacilli in the circulating blood of 300 people, some of which were affected with incipient tuberculosis. Petty and Mendenhall[6] and Forsythe[7] claim to have obtained positive results with Rosenberger's technic. The technic employed by Dr. Rosenberger is to draw 5 cc. of venous blood, mix it with an equal amount of 2% sodium citrate in physiological salt solution, in an ordinary test tube. This blood mixture is placed in a refrigerator for twenty-four hours, by which time a reddish sediment will have formed in the bottom of the tube. A portion of this is smeared on a slide, fixed and stained in the usual way. For decolorizing be used Papenheim's solution (1% rosolic acid in absolute alcohol).

The important bearing of Rosenberger's claims on the bovine tuberculosis problem is evident. From the standpoint of the meat inspector alone, it is of vital importance, and the necessity of verifying or refuting Rosenberger's work in so far as it applies to cattle is great. Schroeder, Cotton, and Mohler[8-9] have already published work done on fifty tubercular cattle. They failed utterly to find tubercle bacilli in the blood of these cattle. Failures to find the bacilli in the circulating blood of tubercular humans have been reported by Ravenel[10] and Smith, Burnham[11] and Lyons, and Dailey.[12] Attention has been called by Brem[13] and others to the liability of distilled water to contamination with acid-fast bacilli.

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[4] Rosenberger, Randall C. The Presence of Tubercle Bacilli in the Circulating Blood in Tuberculosis. American Journal of Medical Science, vol. 137, No. 2, pp. 267-269. Philadelphia, Feb., 1909.

[5] Rosenberger, Randall C. Presence of the Tubercle Bacillus in the Blood. New York Medical Journal, 1909, lxxxix, 1250.

[6] Petty, O. H., and Mendenhall, A. M. Tubercle Bacilli in the Blood. Journal American Medical Association, 1909, liii, 867.

[7] Forsythe, C. E. P. Occurrence of Tubercle Bacilli in the Blood. British Medical Journal, April 24, 1909.

[8] Schroeder, E. C., and Cotton, W. E. Tests Concerning Tubercle Bacilli in the Circulating Blood. U. S. Department of Agriculture; B. A. I. Bulletin 116.

[9] Schroeder, E. C., and Cotton, W. E. Tests Concerning Tubercle Bacilli in the Circulating Blood. The Archives Int. Med., 1909, iv, 133.

[10] Ravenel, M. P., and Smith, K. W. Detection of Tubercle Bacilli in the Blood. Proc. State Med. Soc. of Wisconsin, abst. in Journal American Medical Association, 1909, liii, 649.

[11] Burnham, M. P. Tuberculosis—A. Bacteriemia. Journal American Medical Association, 1909, liii, 731.

[12] Dailey, M. A. The Presence of Tubercle Bacilli in the Blood in Tuberculosis. Boston Medical and Surgical Journal, 1909, clxi, 318.

[13] Brem, W. V. Investigation of Blood for Tubercle Bacilli; Contamination of Distilled Water with Acid-fast Organisms a Source of Error. Journal American Medical Association, 1909, liii, 909.

Since the results of our work are also negative, and the length of this paper limited, I will give merely a summary of the work done.

In 167 preparations made from the blood of 49 bleedings from 21 tuberculous cattle no tubercle bacilli were found in 110.9 hours' search; 133 of the specimens, made from gravity sediments of blood-citrate mixture, were searched 88.9 hours; the remaining 34 slides, made from laked and centrifugalized blood, were searched 22 hours.

In one instance tubercle bacilli were recovered by both methods of examination from blood drawn twenty-five minutes after inoculation of the arterial blood-stream.

Guinea-pig inoculations with the blood sediments of twenty tuberculous cattle failed to produce tuberculosis.

Not less than thirty minutes was devoted to the diligent microscopical search of each slide. The findings were negative. In most instances the work was controlled by having two or more individuals examine each slide. Large numbers of acid-fast bacilli were found in one of the specimens prepared by dissolving the blood clot with pepsin. We believe this to be a contamination. Dr. Rosenberger kindly sent us a slide of blood presumably from a case of human tuberculosis. In this we found numerous acid-fast bacilli, indistinguishable from tubercle bacilli. He wrote us that we would find the organisms in our preparations if we would only search long enough; so some of our most promising specimens were diligently searched for several hours by three persons accustomed to the use of the microscope, without finding a single organism resembling a tubercle bacillus. Thirty-seven guinea pigs were inoculated with blood sediments. They were autopsied after two months, and failed to show lesions. Control pigs, inoculated with blood sediments to which small quantities of tubercular pus from one of the cows had been added, were tubercular.

Introduction of Virulent Cultures of Bovine Tubercle Bacilli Into the Circulation.

In order to make a study of the methods of detecting tubercle bacilli in the blood, it was attempted to produce artificially the tuberculous bacteriemia which we had failed to find. A cow suffering from advanced tuberculosis (No. 7) and a plump three-year-old steer (No. 18) were selected for experiment. The cow had a submaxillary abscess from which tuberculous pus and a calcareous gland had been taken. The steer had been twice inoculated when a calf with attenuated cultures of tubercle bacilli. There was no reaction to the tuberculin test. The animals received in their jugular veins quantities proportional to their weights of a suspension of live bovine tubercle bacilli in normal salt solution. No. 7 received 200 cc. and No. 18, 250 cc. The bacilli had been washed, dried, ground dry for ten minutes in a revolving Erlenmeyer flask containing glass balls, and had been rotated for several hours more after the addition of normal salt solution. About 200 mg. of tubercle bacilli were contained in 250 cc. Smears of the suspension mixed with blood permitted the rough estimate to be made that there were many more free bacilli, and as many clumps, in the suspension injected into No.

18 as there were white corpuscles in the entire circulating blood of the animal. Inasmuch as many corpuscles had been found in almost every field of most of the blood-preparations of this investigation, it was expected that many bacteria would be found in each field of the slides of the steer's blood. No. 18 was bled from the jugular vein, of the side which had not received the inoculation, at intervals of thirty minutes, five hours, eleven hours, twenty-five hours, forty-six hours and ten days from inoculation. The routine miscroscopic blood examination failed to reveal any tubercle bacilli.

Part of a mixture of the blood sediments of the first five bleedings was inoculated intraperitoneally into a guinea pig, which was allowed to live eleven weeks. Another guinea pig received the sediment of the sixth and last bleeding and was killed at the end of ten weeks. At autopsy both animals appeared to be entirely normal.

The steer's temperature rose rapidly to 105.5 after inoculation, but fell to normal the next morning. After a few days the temperature began to rise again, and four weeks after inoculation the animal died. Autopsy, performed twenty-four hours after death, showed the lungs to be crowded with miliary tubercles. The spleen contained on the average one miliary tubercle in each square centimeter of its surface. The kidneys contained a few miliary tubercles and the liver none. The mediastinal, inguinal, pelvic, and crural lymph-nodes were enlarged and soft. In the heart were a clot and some red turbid serum. The centrifugalized sediment of this serum showed many coarse bacilli and one group of three tubercle bacilli.

Cow 7 was bled one hour, five hours, eleven hours, twenty-five hours, forty-six hours and fourteen days after inoculation, and the blood was examined. One short structure resembling a tubercle bacillus was found in a smear from the top layer of the sediment drawn eleven hours after inoculation. This slide had been decolorized by the rosolic acid solution. All the other slides were unquestionably negative.

A guinea pig which received part of a mixture of the sediment from the first five of the six bleedings was killed eleven weeks after inoculation and found to be normal.

The cow's temperature rose immediately after inoculation to 107.5, and in a few hours fell almost to normal. Then the temperature rose gradually to 107.8 and subsided almost to normal. The curve of this last rise and fall suggested the course of a severe tuberculin reaction. No corresponding rise and fall had occurred in the temperature of steer 18. The cow died nine weeks after inoculation. Autopsy showed extensive chronic lesions and no acute miliary tuberculosis. The right submaxillary, bronchial, anterior mediastinal, portal and mesenteric lymph-nodes were found calcified. The left mediastinal and parotid lymph-nodes were caseous. The left submaxillary lymph-nodes had broken down and had formed a large abscess. Both lungs were extensively involved with old lesions, some connecting with the bronchi. The spleen showed a calcified nodule 2 cm. in diameter. The liver and kidneys were normal.

A third time we introduced tubercle bacilli into the circulation of the cattle and attempted to recover them from their blood. Cow 3 of Group A had advanced tuberculosis. Tubercle bacilli had been found in the pus of a large axillary abscess. The animal was put

deeply under the influence of chloral and its right carotid artery was exposed. Fifteen cc. of suspension of 180 mg. of live bovine tubercle bacilli, which had been washed, dried and ground in a revolving flask for one hour before the addition of normal salt solution, was introduced through a needle into the artery. Blood was withdrawn from the jugular vein of the same side, but from a point distant from the operation wound, twenty-five minutes, one and one-half hours, two days, and six days after the inoculation. The blood drawn twenty-five minutes after the introduction of the organisms showed tubercle bacilli as follows:

A search of seventy minutes in the specimen from the centrifugalized and laked blood showed five clumps, one group of four, one group of two, and one single bacillus.

A search of fifty-five minutes in the first preparation from the top layer (decolorized by rosolic solution) showed two clumps.

A search of sixty minutes in the second preparation from the top layer (decolorized by nitric acid) showed one clump.

Both smears from the bottom of the sediment (one decolorized by rosolic and one by nitric acid) showed no bacilli after sixty-six and seventy-two minutes' search.

No tubercle bacilli were found in specimens from the bleedings made from one and one-half hours to six days after inoculation.

Half of a mixture of the sediments drawn twenty-five minutes and an hour and a half after inoculation was inoculated intraperitoneally into a guinea pig. Ten and one-half weeks later the guinea pig was killed. Three tubercles 2 mm. in diameter were found in the spleen. No other lesions were discovered.

A guinea pig was inoculated intraperitoneally with the combined sediments of the blood specimens drawn two and six days after inoculation. The animal died six weeks after receiving the blood. Autopsy showed the presence of three full-term fetuses, but no lesions of tuberculosis. The results of the guinea-pig inoculation in this case confirmed the miscroscopic findings. The natural conclusion would be that the abundant tubercle bacilli had been rapidly filtered from the blood.

The temperature of cow 3 dropped for two hours after inoculation and then rose rapidly to 106. The temperature soon fell slightly and then slowly developed a marked daily variation. This animal had been running an irregular elevated temperature before the experiment. Death resulted five weeks after inoculation from hemorrhage from a ruptured aneurism at the point of inoculation in the carotid. Autopsy showed many hard tubercles averaging 0.5 cm. in diameter scattered throughout both lungs. One small tubercle was seen in the right kidney and one in the tissues near the aneurism. The mediastinal lymph-nodes were calcareous and the post-pharyngeal nodes were purulent. Most of the lesions appeared to have been of long duration, and autopsy gave no evidence of acute miliary tuberculosis.

The experiments just described show that artificially introduced tubercle bacilli are rapidly removed from the circulation of healthy and of tuberculous cattle. That the capillaries of the lungs are more efficient as filters than the capillaries of the peripheral circulation is suggested by the almost complete, if not entire, absence of tubercle

bacilli from blood which had necessarily passed through the pulmonary circulation, and by the presence of bacilli in blood which needed to go only from a peripheral artery to the corresponding peripheral vein. Possibly this quality of the lung capillaries may be one of the causes of the great frequency of pulmonary involvement when tubercle bacilli have entered the body at points distant from the lungs.

It will be noticed that inoculation produced in a healthy young steer a rapid and fatal miliary tuberculosis, while in Cows 3 and 7 not more than an aggravation of the existing extensive chronic tuberculosis was brought about. It would appear that long-standing chronic tuberculosis produced a much higher power of resistance against newly introduced infection than did the intravenous injection of attenuated cultures. That cattle affected with chronic tuberculosis should be somewhat resistant to acute tuberculosis from inoculation would be expected; but the great resistance shown by Nos. 3 and 7 to overpowering introductions of virulent bovine bacilli into the blood stream is interesting and suggestive.

The work on tubercle bacilli in the blood was done in conjunction with Wilbur A. Sawyer, M. D., physician at the University of California Infirmary, Berkeley.

Dr. Sawyer and I are indebted to Archibald R. Ward, B. S. A., D. V. M., Assistant Professor of Bacteriology in the University of California; to Miss Margaret Henderson, B. S., Instructor in Bacteriology in the University of California; to David N. Morgan, B. S., and to Ned D. Baker, B. S., for valuable advice and assistance.

CONCLUSIONS.

This paper is intended as a preliminary report and as more data is obtained, these conclusions may be modified somewhat. They are given merely as a summary of results thus far obtained.

(1) Bovovaccine fails to protect calves until two and one-half years old, under California conditions. Some immunity seems to be produced.

(2) Tuberculosis will sometimes spread rapidly in cattle under strictly outdoor conditions.

(3) The retesting of cattle within six weeks, even when Vallee's method is used, is unsatisfactory. Some tubercular cattle will not react to tuberculin on retesting even after three months.

(4) Numerous microscopic examinations, by Rosenberger's method, of blood sediments from twenty tuberculous cattle, failed to give evidence that tubercle bacilli existed in the circulating blood.

(5) In one instance tubercle bacilli were recovered from blood drawn twenty-five minutes after inoculation of the arterial blood-stream.

(6) Guinea- pig inoculations with the blood sediments of twenty tuberculous cattle failed to produce tuberculosis.

(7) Tubercle bacilli which have been experimentally thrown into the blood-stream are rapidly removed from the circulation. Experiment suggests that the capillaries of the lungs are more efficient in arresting bacilli than the peripheral capillaries.

(8) Judging from two instances only, cattle affected with chronic tuberculosis seem much more resistant to acute tuberculosis from inoculation than one-tubercular cattle. Chronic tuberculosis in cattle appears to produce a partial immunity against fresh inoculation with bovine tubercle bacilli.

University Farm, Davis, California.

REMARKS.

Dr. Lewis Sayre Mace, San Francisco: I believe the skin tests are largely in disfavor now, on account of their inaccuracy. The reaction may be present in a case of tuberculosis where a very small and absolutely insignificant lesion is present. It has been shown that these reactions depend upon certain conditions which follow no rule. Personally I would not place any dependence upon the Moro or the von Pirquet reaction or the ocular reaction, and I will say that I have seen negative results in early cases in which removed tissue gave a positive result in guinea-pig tests.

Dr. Stanley P. Black, Pasadena—The question of testing of cattle I think is a very important one. I am very glad that it was brought out to-day. For several years we have been retesting cattle with doubtful reactions in Pasadena. While I have not felt quite clear in my conscience in regard to it I have re-admitted two herds of cattle which have stood the second tests. Now I think that was wrong. We must adopt the sign of the Roman Coliseum for the slaughter, "Kill." However, it is not right that the dairymen should lose every penny of the money. Some of them are dishonest enough to sell cows to somebody else, cows that should be slaughtered; this I know has been and is being done all the time. When we have reacting cows in Pasadena we now brand them with a large tbc. on the jaw, so that she cannot be sold to some unsuspecting person as a good cow. This is a great help in recognizing them when they are to be separated from the herd where before the only way we had of finding them was by reading the number of the ear tag, and until we adopted this method of branding we had a hard time in finding the infected cows. The only way of solving this question, of preventing the sale of infected meat, is for the State to pay an indemnity for tubercular cattle. The public ought to pay the bill as it is the only way out of it.

Previous to the reading of the foregoing papers several tuberculous cows were examined and the various phases of the tuberculin test exemplified by Dr. C. M. Haring and Dr. Walter Bates.

A reacting cow was selected and after physical examination in the amphitheater, removed and slaughtered.

At the close of the program the tubercular lesions of the animal were demonstrated by Chester Roadhouse, D. V. M., Ex-U. S. Meat Inspector and Veterinarian of the San Francisco County Medical Milk Commission.

REPORT OF THE ALAMEDA COUNTY MEDICAL MILK COMMISSION.

Alameda, Cal., April 16, 1910.

President and Members, California Milk Commission,

Dear Sirs—A little over a year ago the Alameda County Medical Society took up the "Certified Milk" work theretofore done by the "Home Club" of Oakland. The Society appointed a milk commission consisting of five (5) members and gave this commission full power to act.

The Commission chose for its experts Dr. A. R. Ward, State Bacteriologist, and Professor M. E. Jaffa, State Chemist, who render frequent reports on the conditions of the herds and dairies; on the methods of producing and handling the milk and on the quality and purity of the milk itself.

We now issue certificates to two dairies, "Walnut Grove Dairy," of Santa Clara County, and "Timm's Dairy," of Dixon.

The expenses of the chemical bacteriological and veterinary inspections are paid for by the dairymen; while the running expenses of the Commission are covered by the receipts from the sale of certificates. These certificates are sold for $1.25 per 1,000, or one-eighth of a cent a piece.

We find this sufficient to pay all our expenses and to leave us a balance on hand of $193.

At present these two dairies are delivering daily in Alameda 36 quarts, in Berkeley 264 quarts, and in Oakland 830 quarts, a total of 1,130 quarts daily.

We have endeavored to keep our requirements for "Certified Milk" in accord with those of the Milk Commission of the San Francisco Medical Society, so that the requirements of the Commissions about the Bay of San Francisco would be uniform.

The milk situation in Alameda County is very good; but great progress can be made by a continuous campaign of education—education of the physician as well as of the consumer.

We are now issuing educational pamphlets to be distributed by the dairies and by the Women's Clubs of the county.

The Commission does not recognize "Inspected Milk or Pasteurized Milk." It recognizes "Certified Milk" only.

Yours truly,

J. K. HAMILTON,

Secretary Milk Commission, Alameda County Medical Society.
Bay Station, Alameda.

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