BULLETIN No. 67. NOVEMBER, 1895.

ALABAMA

Agricultural Experiment Station

OF THE

AGRICULTURAL AND MECHANICAL COLLEGE,

AUBURN.

BOVINE TUBERCULOSIS.

C. A. CARY, Veterinarian.

MONTGOMERY, ALA.:
THE BROWN PRINTING COMPANY, PRINTERS.
1895.

COMMITTEE OF TRUSTEES ON EXPERIMENT STATION.

I. F. CULVER.....Union Springs.
J. G. GILCHRIST.....Hope Hull.
H. CLAY ARMSTRONG.....Auburn.

STATION COUNCIL.

WM. LEROY BROUN.....President.
A. J. BONDURANT.....Agriculturist.
B. B. ROSS.....Chemist.
P. H. MELL.....Botanist.
L. M. UNDERWOOD.....Biologist.
C. A. CARY, D. V. M.....Veterinarian.

ASSISTANTS.

J. T. ANDERSON.....First Assistant Chemist.
C. L. HARE.....Second Assistant Chemist.
R. G. WILLIAMS.....Third Assistant Chemist.
T. U. CULVER.....Superintendent of Farm.

☞The Bulletins of this Station will be sent free to any citizen of the State on application to the Agricultural Experiment Station, Auburn, Alabama.

BOVINE TUBERCULOSIS, [1]

BY

C. A. CARY.

The history of medicine informs us that Hippocrates (400 B. C.) described many of the characteristic symptoms and lesions of tuberculosis in man and animals. During the middle ages tuberculosis in animals was considered contagious and the flesh of infected carcasses was condemned by law as unfit for human food. Many of those old laws are still in force in Italy and Spain (Law).

During the first eight decades of this century the common and accepted theory was that tuberculosis was hereditary and this was its chief, and possibly only, method of transmission.

In fact, the history of tuberculosis has been checkered by numerous and various theories, because the exciting or essential cause remained unknown until 1882, when Robert Koch discovered the *bacillus tuberculosis.*

No other disease is so widely distributed geographically; it is found in all climates and in all lands. It attacks man and nearly all the domestic animals. It accompanies the progress of civilization and seems to be most active during the transitional stage from savagery or barbarism to civilization. Artificial modes of living, without intelligent and scrupulous sanitation, fosters and increases its virulency and frequency.

Tuberculosis annually claims more victims than smallpox, cholera and yellow fever. An average of 14 per cent.

(1) The term Tuberculosis embraces all forms of disease caused by the *bacillus tuberculosis*, namely: consumption (tuberculosis of the lungs), tubercular meningitis, tubercular peritonitis (pearl disease), scrofula, consumption of the bowels, lupus (tuberculosis of the skin) and, in fact, tuberculosis of any part of the body.

(one out of every seven) of all the deaths in the human family is due to tuberculosis [1]. In some of the largest cities and in some of the older and most densely populated countries the average per cent. is 25 (1 death in every 4 a result of tuberculosis).

It is said that the civilizing (?) influences, as applied to the American Indian, have increased the mortality to 50 per cent.—one-half of all the deaths result from some form of tuberculosis (Law).

In Alabama during the years 1889-90-91-92-93, the annual average number of deaths from tuberculosis was 1009; or 11.44 per cent. (1 in every 9) was due to tuberculosis (2).

The annual average among the white people is 373, or 4.23 per cent. of all the deaths; the yearly average among the blacks is 636, or 7.21 per cent. of all the deaths. This indicates that the superior intelligence of the white people with their better observance of the laws of health tends toward decreasing the ravages of this disease. The ignorance of the negro with his disregard of the laws of hygiene

(1) One authority claims that 20 per cent. of all the deaths in the United States (1 out of every five deaths) is due to tuberculosis.

2. Total No. of deaths in Alabama in 1889-90-91-92-93, was 44,096
The No. of deaths from tuberculosis during the same time, was:

Total.	Annual Average.	White.	Black.	Male.	Female.
5048	1009	1867	3181	2106	2942

These records were derived from Dr. Cochran's annual reports to the State Board of Health. Dr. Cochran informs me that these reports are accurate for the cities, but they are more or less incomplete from country districts.

It is very probable that the reports of deaths among the white people are more complete and accurate than those from the black race. It is also very probable that the number of deaths from tuberculosis among the negroes is greater than the reports show; because many deaths are not reported, that occur in localities where the inhabitants are nearly all black,

propogates tuberculosis at a frightful rate. During slavery times the negro was as free from tuberculosis as were the white people at that time.

The constant and uniform appearance of deaths from tuberculosis are accepted by the people as inevitable. This constant contact breeds a tolerance which merges into an indifferent fatalism that is more becoming to the ignorance and superstition of the heathen than the intelligent and highly civilized American or European. We legislate, quarantine and use all the methods known to expert medical men, when cholera, yellow fever or small-pox enters or threatens to enter, our country or State. Yet only a few States legally recognize tuberculosis as an infectious disease that annually destroys more lives than all of the three frightful diseases just mentioned.

"If we take the whole civilized world and compare with the tuberculous mortality all the accumulated deaths from war, famine, plague, cholera, yellow fever and small-pox, we find that the latter are comparatively insignificant. Yet tuberculosis like every other germ disease is absolutely preventable and is allowed to continue its career of death because of reprehensible ignorance and criminal indifference" (Law).

THE EXCITING OR ORIGINATING CAUSE OF TUBERCULOSIS.

Since Koch's discovery of the bacillus tuberculosis, the study of this disease has been thorough and systematic. It is now a well established fact that tuberculosis can not exist without the presence of the living tubercle bacillus. This microbe or germ is a one-celled plant, having the shape of a very delicate rod, about 1-2500 of an inch long and about 1-10 as broad as long. This rod is usually almost straight but may be slightly curved. It may appear alone, in pairs, or in irregular groups or masses. It absorbs coloring matters (stains) very slowly; but when once stained it holds the stain with great tenacity. It will hold certain stains when all or nearly all other germs become discolorized.

This enables the pathologist to distinguish it amid myriads of other germs. The bacillus tuberculosis is a plant parasite that lives in the animal body, but it may be cultivated on artificial culture media, such as: agar agar or bouillon containing 5 per cent. of glycerine, and blood serum. It develops best at 100 to 102 degrees Fah. This germ may also live and retain its vitality outside of the animal body for an indefinite time; its length of life out of the body will depend upon heat, light, moisture and the material in which it exists. Koch and other observers have found that in many instances the tubercle bacillus has retained its vitality for nine or ten months in the sputa or expectorations of tuberculous persons. However, it is very probable that this germ does not grow or multiply outside of the animal body.

Many authorities (Baumgarten, etc.,) claim that the gastric juice will not destroy the tubercle bacillus. If infected sputa be kept at a temperature of 158° Fah. for ten minutes the tubercle bacilli are destroyed. The germ in the same material is destroyed in 20 hours if 3 per cent. of carbolic acid is added; the germ perishes in five minutes in iodoform-ether; it dies in ten minutes in a mercuric chloride solution (1 to 1,000). According to Koch the tubercle bacillus perishes in a few hours in direct sunlight, and in five to seven days in diffuse daylight. This germ may remain virulent in ordinary living rooms from two to ten months, varying with the light, heat and the frequency of disinfection or cleansing of the room. An absolute heat of 158 degrees Fah. for fifteen minutes in meat and other tuberculous masses, will kill the germs. Boiling for one-half hour is always fatal to the tubercle bacilli. In springs, wells and all forms of surface water, at ordinary temperature, the tubercle bacilli may maintain their virulency indefinitely. Non-sterilized water from rivers and surface wells may be contaminated; likewise public drinking troughs. Freezing will not destroy the tubercle bacillus. Fermentation and decomposition of organic materials, in which tubercle ba-

cilli are present, will not always destroy them. Common salt liberally applied to meats is fatal to the germ in one month; but in large masses of meat, the salt may not permeate the mass evenly and many bacilli may thus escape the destructive action of the salt.

In truth, there are probably many conditions outside of the animal body in which the tubercle bacillus may live and retain its virulency that are yet unknown to pathologists. However, it is certain that poorly ventilated and dark living rooms, public halls, school rooms and churches are places where the infected sputa may be slowly dried, thus preserving its infective power indefinitely. Hence, the dust from such rooms may carry the virulent germs into the air passages, and into the alimentary canal with the food. In fact the greatest number of cases of tuberculosis in the human family are contracted by breathing tuberculous dust in living rooms, churches, school rooms and public places. The next greatest number of cases of tuberculosis are contracted by eating tuberculous food.

ACCESSORY OR PREDISPOSING CAUSES OF TUBERCULOSIS.

Predisposing causes consist of influences or factors that reduce the animal vigor and the resisting power of the leucocytes and tissues of the animal body, and of conditions which favor the introduction of the germs into the body.

(1). Heredity produces a tendency in the cell structure of the body favorable to the development of the germ and depressing more or less the body vitality or vigor. The offspring of tuberculous parents readily contracts tuberculosis, because the protecting liquids and cells of the body can not prevent the invasion of the tubercle bacilli. In rare instances the bacilli pass into the embryo or unborn fœtus. Some authorities claim that the germ may pass from a tuberculous sire in the semen, or it may be in the ovum from the dam, or pass from the mother to the fœtus by way of the fœtal membranes.

Evidently the continued breeding of tuberculous animals

produces a weak family; and weakness of body, whether of tuberculosis origin or not, predisposes the offspring to tuberculosis.

(2). The modern method of breeding the cow as a milk-producing machine is developing a constitutional weakness in many individuals of the milk-producing families. Furthermore, experience has proven that a cow which is kept in a small stall without exercise will give more milk with a given quantity of food, than one which is given plenty of exercise in a lot or field, with the same quantity of food. Of course, such close confinement reduces the vigor of the cow and predisposes her to tuberculosis. This doctrine of close, warm, continual confinement is occasionally preached and practiced by dairymen and sometimes it is taught by instructors in agricultural colleges. Dairy cows as well as beef cattle should have exercise in open air. Exercise and fresh air will not prevent all cases of tuberculosis, but they certainly help to prevent the contraction or spreading of tuberculosis.

(3). *Ventilation and Light.*—Poorly ventilated and dark stalls are, in many respects, worse than continual out-door exposure. Light is one of nature's best disinfectants, and moving air carries away foul gases and brings fresh, pure air. The drainage of stalls should be so arranged that they may be kept dry and clean.

(4). Climate, in a degree, influences the propagation and development of tuberculosis. A moist and variable climate favors the development and transmission of tuberculosis. Dry and rarified air with a uniform temperature tends to decrease its ravages.

(5). *Food and Feeding*—Too heavy or forced feeding may weaken the animal as well as a deficiency in the quantity of food. The proper quantity and the best quality of food should be given. Food should not only be nutritious and digestible, but should also be given at regular intervals in proper quantities. Too much food overtaxes the digestive

organs and decreases the vitality of the animal, and eventually produces acute or chronic indigestion.

(6). *Faulty Breeding*—In-and-in breeding or the mating of closely related individuals is always to be regarded as unsafe. It may bring out the weak or the bad points which may predominate over those that were strong and good in the sire and dam. Breeders who have developed distinct breeds recognize the fact that continued in-and-in breeding is very liable to produce an outcrop of tuberculosis.

Early and frequent breeding produce a decrease in bodily vigor and should be avoided.

Intensive breeding, or the pairing of animals from two great milking strains, may result in an offspring that is weak, poorly developed and predisposed to tuberculosis.

Animals with thin flat chests and long legs are predisposed to tuberculosis by conformation and should not be used for breeding purposes.

Animals having tuberculosis should never be bred.

(7). Disease, exposure to cold and rain and any influence which depresses the vitality or physical vigor of an animal, predisposes it to tuberculosis.

It should not be understood that any or all of these predisposing or preparing causes will produce tuberculosis without the presence of the bacillus tuberculosis. Neither should it be taken as self-evident that the absence of any or all of these predisposing causes will always prevent the spread of tuberculosis or the contraction of it. Dr. Niles of Iowa reports the appearance of tuberculosis in a herd that had been kept in the best out-door conditions.

TUBERCULOSIS AMONG THE VARIOUS SPECIES OF DOMESTIC ANIMALS AND IN MAN.

There appears to be a constant relation between the prevalence of this disease in man and in domestic animals. In a state or locality where tuberculosis is very common in the human family, it is also very frequently observed among the more susceptible of domestic animals. Cattle and swine

are more susceptible to the disease than the other domestic animals; however, sheep, horses, dogs and cats occasionally become infected. Many of the wild animals when caged succumb to this disease. Caged monkeys, lions, tigers, deer, elk, kangaroos, antelope and birds have been known to die of tuberculosis. Rats and mice are susceptible and instances have been recorded where they have contracted tuberculosis in houses that were inhabited by tuberlous persons. Guinea pigs and rabbits are very susceptible.

ITS PREVALENCE IN CATTLE.

In Europe.—According to Arloing 0.5 per cent. of the cattle of France are tuberculous; in Paris, 6 per cent.; in Baden, Germany, 0.2 per cent.; in the province of Bavaria, 0.225 per cent.; in Belgium, 0.4 per cent.; in Holland, 20 per cent.; in Leipsic 20 per cent.; in Edinburgh 26 per cent.

The above per centages (from Law's bulletin) shows how tuberculosis in cattle varies in the thickly populated cities and countries of Europe. It will be observed that the cattle of the cities are more frequently tuberculous than the cattle of the country(1). In some local herds of Europe 75 per cent. have been found to be tuberculous. According to the records in the slaughter houses of Germany cows are more frequently tuberculous than oxen or calves. In fact,

1. It is interesting to note in this connection the following valuable table prepared by Dr. Lagnaeu, showing the gradual increase of tuberculosis when the smaller cities are compared with the larger. These tables were made from the records of 662 cities in France:

95	cities with less than		5,000	inhabitants		1.81
332	cities of between	5,000	and	10,000	inhabitants	2.16
127	" "	10,000	and	20,000	"	2.71
50	" "	20,000	and	30,000	"	2.88
46	" "	30,000	and	100,000	"	3.05
11	" "	100,000	and	430,000	"	3.65
Paris with 2,224,704 inhabitants						4.91

The above table shows the number of persons who die annually from tuberculosis of the lungs (consumption) to every 1,000 inhabitants in cities of different population. The table does not take into comparison any of the other forms of tuberculosis.

almost, one-half of the cases of tuberculosis in cattle are found in cows. This is due to the fact that the cow comes in closer contact with man and has less freedom, less pure air and receives more infected food than calves or oxen.

In the Copenhagen slaughter houses from 1891 to 1893 inclusive, the following records were made:

Inspected	132,294 oxen and cows,	23,305 or 17.7 %	were	tuberculous.
"	8,292 swine,	1,272 or 15.3 %	"	"
"	185,765 calves,	369 or 0.? %	"	"
"	337,014 sheep,	1 or 1.0003 %	"	"

At the Berlin public slaughter house during 1892, the following records were made:

Inspected	142,874 oxen and cows,	21,603 or 15.1 %	were	tuberculous.
"	518,073 swine,	7,055 or 1.55 %	"	"
"	108,348 calves,	125 or 0.11 %	"	"
"	355,949 sheep,	15 or 0.004 %	"	"

In America.—The extent of tuberculosis in the United States is not definitely known. So far only one State has commenced a systematic attempt at eradicating bovine tuberculosis. Massachusetts is now working upon a large scale and during the present year has tested over 25,000 cattle for tuberculosis. In this work the diagnostic agent has been Tuberculin.

Outside of Massachusetts the tests for tuberculosis have been confined to local herds. In New York State, Law has found some herds with 98 per cent. of the animals tuberculous; while in other herds he found only 5 per cent. tuberculous. To be sure some dairy herds in country districts were found entirely free from tubuculosis.

Reports of tests in Minnesota, Wisconsin, Illinois and Iowa show that many of the herds in the favored country regions of the north-west are infected. In fact, so far as tuberculin tests have been made in every part of the United States no state has been found entirely free of this bovine pest. However, there is no doubt that the older and more densely populated states and cities are more extensively and seriously infected. A few tests have been made

in Virginia, Texas, North Carolina and Alabama, and these are sufficient to determine the fact that we have tuberculosis among our cattle.

The following reply to a letter of inquiry sent out by the department explains itself:

MOBILE, ALA., JUNE 28, 1895.

DR. C. A. CARY, Auburn, Ala.,

MY DEAR SIR:—In reply to your favor of the 25th inst., I beg to inform you that tuberculosis is prevalent among cattle here. I consider the extent alarming enough although I have no idea what the per centage is. Human tuberculosis is also quite prevalent, which is not to be wondered at, since prominent dairy herds are infected. * * * * Yours fraternally,

L. VAN ES, V. S.

The following letter from the Board of Health of the city of Mobile gives their views and present position:

MOBILE, ALA., JULY 16, 1895.

DR. C. A. CARY, Auburn, Ala.,

DEAR SIR—In reply to your favor of the 5th inst., I beg to say: No officer of this board inspects the dairy herds supplying this city with milk. If tuberculosis exists among these herds, knowledge of it is not possessed by this board. No power is possessed to make the tuberculin test, to determine the presence or absence of tuberculosis. At present we could not use the tuberculin if furnished free. It is the intention of the Board of Health to try to have the requisite laws enacted as insure a thorough inspection of milk, and if successful we may have occasion to correspond with you on the subject of tuberculosis.

Yours truly,

JAS. A. ABRAHAMS, M. D., H. O.

Dr. French, of Birmingham, Alabama, has found, by physical and post mortem examinations, tuberculosis in four different dairy herds in and around Birmingham.

By physical and post mortem examination the writer has found tuberculosis in three dairy herds in Alabama.

It is hoped that within another year the writer may have many records of tests, made with tuberculin, that will give more definite and extensive knowledge concerning the prevalence of bovine tuberculosis in Alabama.

HUMAN AND BOVINE TUBERCULOSIS CAUSED BY THE SAME GERM.

The tubercle bacilli found in man are identical in all respects with those that are found in cattle and all other animals with one possible exception—the chicken. At present it is questionable whether tuberculosis in man is identical with tuberculosis in chickens. Koch has found considerable variation in the bacilli from the two different sources. Any of the domestic animals except fowls, when inoculated with living tubercle bacilli from man contract tuberculosis Dogs and cats have become tuberculous by eating the sputa from tuberculous persons. Guinea pigs when forced to inhale air ladened with fine particles of dried tuberculous sputa, or when inoculated with the same material become tuberculous.

Numerous instances are recorded where tuberculous material from cattle has infected other animals.

Pearson, Bollinger, Ernst, Peters, Schroeder and others have produced tuberculosis in guinea pigs, by feeding them milk from tuberculous cows.

At the Experiment Station in Vermont a number of the dairy cows were found by the tuberculin test to have tuberculosis. A litter of five pigs, from healthy parents, had been fed milk from this dairy herd. The five pigs at the time of slaughter were found tuberculous. In every instance where pigs have been fed, any length of time, upon milk containing tubercle bacilli, they have contracted tuberculosis.

Since the discovery of the bacillus tuberculosis, the transmissibility or the contagious and infectious character

of tuberculosis has been proven by numerous accidental or natural and artificial cases of transmission. A few typical cases will be given illustrating the transmissibility from man to animal, from animals to man, from man to man and from animal to animal.

(1) The writer knew a family, of which nearly every member died of tuberculosis. This family's herd of milch cows nearly all died of tuberculosis. The disease first appeared in the family; later in the herd of cattle.

(2) Three Grecian physicians injected tuberculous sputa into the thigh of a fisherman whose death from another disease was inevitable. His lungs previous to the inoculation were sound and his family was free from any taint of tuberculosis. In three weeks his lungs exhibited symptons of disease and at death (38 days after the inoculation) seventeen tubercles were found in his right lung, two in his left and two in his liver.

(3) Tappiener was trying to produce tuberculosis in dogs by forcing them to breathe air, artificially infected with tubercle bacilli. His servant, disbelieving in the danger, persisted in going into the infected inhalation rooms. In fourteen weeks he died from acute tuberculosis; and at the post mortem exhibited the same pathological lesions as those found in the dogs.

(4) A servant, in removing a glass sputum cup broke it and punctured her finger with a splinter of glass. In the course of time it became necessary to amputate that finger, when it was found to be filled with small tubercles.

(5) Dr. Stang, of Amorbach, reports a case, in his practice, of a five year old boy, after an illness of a few weeks, dying of acute miliary tuberculosis. Previous to his sickness he was healthy and well developed, and entirely free from any hereditary tendency to tuberculosis. A short time previous to his death the family cow was killed and found to have a severe case of pulmonary tuberculosis.

(6) Dr. Demme, of Berne, reports that four infants, in the Child's Hospital, died of intestinal and mesenteric tuberculosis. They were free from tuberculous taint, but had been fed on unsterilized milk from tuberculous cows.

(7) Hills and Rich state that a grandson of Henry Ward Beecher died from tuberculous meningitis. The child had no hereditary predisposition. The physician suspected the cows, from which the boy was supplied with milk. The tuberculin test and the post mortem examination showed that the two cows were tuberculous.

(8) Dr. Gage, city physician of Lowell, Mass., reports the case of an infant dying of tubercular meningitis. It had no tuberculous ancestry and had never been fed on anything but unsterilized milk from one cow. This cow's milk was examined microscopically and found to contain tubercle bacilli. Guinea pigs inoculated with the milk died of tuberculosis. A second child of the same family, fed on the same cow's milk was also developing tuberculosis. At that time (1890) the cow could not be condemned and destroyed. Hence, a year later Dr. Gage found this cow furnishing infected milk to the public.

(9) Dr. Treon states that the indians of the northwest eat the uncooked livers, entrails, tallow and other parts of the poor cattle furnished them by the agents of the government. These carcasses are eaten fresh or dried and are rarely, if ever cooked. In many tribes the mortality from tuberculosis is 50 per cent. of all the deaths. At Crow Creek agency 50 out of 1200 indians die annually from tuberculosis. Another authority states that the food of the indians is the primary cause of disease among them, and when the supply of fresh beef is most abundant the death rate from consumption is the greatest.

(10) Dr. E. O. Shakespeare, of Philadelphia, a noted specialist in bacteriology and pathology, says: "It has been found that in infants and young children in some large cities the mortality from some form of tuberculosis is far greater than is generally believed, amounting, in some localities to one-fifth of the deaths in the young. The significant fact in this connection is that it is most frequently some part of the digestive tract that first become affected."

(11) From the report of the English Royal Commission of 1895, the following extract is taken: "There is reason to believe that tuberculous matter, when present in meat sold to the public, is more commonly due to the contamination of the surface of the meat with material derived from other diseased parts than the meat itself. The same matter is found in the milk of course when the udder has become invaded by tuberculous disease, and seldom or never when the udder is not diseased. Tuberculous matter in milk is exceptionally active in its operation upon animals fed either with the milk or with dairy produce derived from it. No doubt the largest part of tuberculosis which man obtains through his food is by means of milk containing tuberculous matter."

(12) The statement is frequently made by medical men and others that since the freedom of the negroes there has been a remarkable increase in the amount of tuberculosis among them. This is said to be due to the bad sanitary condition of their homes; their crowding together in filthy, unclean beds and rooms; the indiscriminate mix-

ing of the tuberculous with the healthy; eating infectious meats and milk; the great degree of looseness in social intercourse; and last, but not least, the constant "giving" and "re-giving" of tuberculous individuals in marriage.

HOW TUBERCLE BACILLI ENTER TISSUES AND ORGANS.

(1). Infection by way of the air passages and the lungs.—This is the most common method of infection. The dried sputa and dried infectious materials that float in the air are liable to be carried into the air passages and lungs. Living rooms, churches, school rooms and public halls where persons expectorate indiscriminately are not infrequently filled with air infected with tubercle bacilli. The dust-ladened air of dairy barns, where infected cattle are kept, is also infected with tubercle bacilli. The dust from handkerchiefs, clothing, beds, bed-clothing of tuberculous persons is nearly always very infectious. The reason that all animals and all men do not become infected is because the germ is a very slow growing organism, and in most instances dies before it gains admission into the tissues of a new host. Furthermore, all animals or all men are not susceptible at all times. Full vigor, great bodily vitality and good health are the strongest fortifications against the entrance of any disease-producing germ into the body.

(2). Infection by way of the Digestive Apparatus.—This mode of infection is a result of carrying the tubercle bacilli into the alimentary canal along with the food, and from there into other parts of the body by way of the lymphatics, blood vessels and possibly by the tissues. This method has been demonstrated experimentally by feeding tuberculous material to pigs, calves, cats, dogs and guinea pigs. Moreover, there have been numerous clinical observations recorded where infants, children and even grown persons have become tuberculous by consuming tuberculous milk or other infected food. Infants, children and young animals (calves and pigs) are more frequently infected by drinking tuberculous milk than in any other way. Whenever the intestines, the mesentery or any of the abdominal organs are the first and

chief seats of tuberculosis, it is evident that infection occurred by way of the alimentary canal. Occasionally the family milch cow becomes tuberculous by eating the waste slops and other materials which come from the house or rooms where tuberculous persons live. The alimentary canal may become the secondary seat of the disease by the animal or person coughing up the infectious material from the lungs to the pharynx or mouth and then swallowing it.

(3). Infection by direct inoculation.—If a terbuculous animal drops infected sputa or saliva upon a freshly abraded surface of a healthy animal infection might occur. Or a diseased animal might lick the freshly abraded surface of another and thus infection could take place. However, infection by this method is extremely rare.

(4). Intra-Ulterine Infection.—The bacilli may pass by way of the uterus and fœtal membranes, or by way of the blood vessels, from the mother to the fœtus. The fœtus or unborn embryo, by tuberculous semen from the sire, or a tuberculous ovum from the dam, may become infected. Recorded cases of infection by this method are extremely rare.

(5). It is also asserted that when the genital organs of either sire or dam are infected, the tuberculous one may transmit the bacilli to the other during copulation.

THE ACTION OF TUBERCLE BACILLI IN THE TISSUES.

After the bacilli gain admission (by any method of infection) to the tissues, they multiply at the point of lodgement and there produce the tubercle. A young tubercle is composed of a collection of cells forming a small grayish nodule and the fresh state presenting the appearance of mother of pearl. Two or more tubercles lying near one another in the lungs, liver, spleen or kidney may unite or become confluent as they continue to develop. Later in the development of the tubercle the central mass becomes "cheesy"—forming a large, soft, yellow, pus-like mass that is sometimes called a yellow tubercle. The growth of the tubercle advances by

the multiplying tubercle bacilli invading the tissues around the tubercle. As a rule extension of the disease from the primary focus takes place by way of the lymphatic vessels and glands—the lymph carrying the germs. In old and severe cases, where a large amount of tissue has been destroyed by the invading germs, the tubercle bacilli may be carried from the primary tubercle to other parts of the body by the current of blood in the blood vessels.

LOCATION OF THE TUBERCLES AS DETERMINED BY POST-MORTEM EXAMINATIONS.

No tissue or part of the body is exempt from the ravages of this disease. Some tissues and organs, by virtue of their structure, use and location, are more exposed to the action of tubercle bacilli, and consequently are more frequently the place of lodgement and growth of these germs than other parts of the body. Other organs appear to possess, by location and function, a comparative immunity and are rarely the seat of tubercles. The most frequently attacked tissues and organs will be given in regular order.

(a) The lungs are most frequently the location of tubercles. When the individual has tuberculosis of the lungs he is said to have consumption or pulmonary tuberculosis. When the lung tissue is first invaded it may be filled with small, hard nodules, which are called miliary tubercles. In exceptional cases these miliary tubercles do not increase in size. As a rule, they increase in size until those near one another unite and form large, soft, yellow, cheesy masses. Unusually a fibrous capsule develops around this mass to protect surrounding tissue and prevent its eruption into the bronchial tubes. Occasionally this yellow tuberculous mass erupts into the bronchial tubes; is coughed up and discharged into the outer world by expectoration. No one part of the lungs is more liable to be involved than the others, and the various stages in the development of tubercles may be seen in one tuberculous lung. The Bureau of Animal industry states that their records show that the large caudal lobes of the lungs were most frequently tuberculous. The

bronchial lymphatic glands that lie along the bronchi, and the mediastinal lymphatics that lie along the surface of the thoracic portion of the œsophagus are usually involved when the lungs are tuberculous.

(b). The pleura or serous membrane, lining the chest or lung cavity and reflected over the lungs, is involved next in frequency to the lungs. This membrane, when tuberculous, is covered or filled with numerous, small pearly tubercles, called by the butchers "grapes." The tubercle bacilli, as a rule, reach the pleura from the lungs, and occasionally the germs come from the abdominal organs by way of the diaphragm.

(c). The mesenteric glands or small lymph glands of the mesentery are nearly always infected when infection takes place by way of the digestive tract. When tuberculous, these glands are enlarged and they may contain cheesy masses if the disease is of long standing. Or there may be minute miliary tubercles in the mesentary. Tubercles may appear in the peritoneum, the membrane lining the abdominal cavity. Sometimes Peyers patches in the small intestines may become tuberculous and occasionally tuberculous ulcers or tubercles may develop in the stomach, and other parts of the alimentary canal.

(d). The liver is not as frequently involved as the mesentery. It is very probable that the bacilli gain admission to the liver by way of the portal circulation from the intestinal tract. In the liver the tubercles may be small grayish bodies or large, yellow cheesy masses.

(e). The spleen and kidneys are rarely involved. As a rule, they are tuberculous when the disease becomes generalized or involves many organs and is widely distributed in the body.

(f). The uterus or womb is very rarely tuberculous. When involved its walls are greatly thickened and the mucous membrane is covered with ulcers and tubercles are numerous in tisues of its walls.

(g). The udder may be tuberculous in comparatively rare instances. When tuberculous, the udder becomes

swollen, hard and knotty. The tubercles are located in the mucous membrane which lines the milk cavities and canals. Abscesses of the udder are rarely tuberculous.

It is possible to have a tuberculous abscess in the udder when the lesions are very severe and extensive. Occasionally the lymphatic glands in front and back of the udder may become enlarged and tuberculous.

(h). The bones are more frequently the seat of tuberculosis in swine than in cattle. The spongy centres of the bodies of the vertebræ of swine may exhibit yellow tubercles after the carcass has been cut into right and left halves. The articulations and bones of the limbs in cattle are sometimes involved in tuberculous alteration. The articulations are quite frequently involved in tuberculous calves.

(i). The pharyngeal (throat) glands are more frequently tuberculous than the udder or bones. These glands lie just back of the pharynix (throat); and when enlarged may sometimes be observed before the death of the animal. At first these glands are slightly enlarged and hard but later, as the disease advances, they become large and soft, owing to the extensive breaking down of tissue and the formation of large cheesy masses. In some cases the post pharyngeal glands are the only ones that are sufficiently involved by tuberculous changes as to be visible to the naked eye upon post mortem examination.

(j). The lymphatic glands at the base of the ear, the lymphatic glands on the inside of the lower jaw, the inguinal lymphatics on either side of the scrotum in the male, and on either side of the udder in the female, the lymphatic glands above and in front of the stifle and those in front of the shoulder blade may be the seat of tuberculous nodules or tubercles.

(k). The brain and spinal cord and the covering membranes of each occasionally become tuberculous.

(l). In extremely rare instances tubercles develop between the muscles. The muscle tissue proper does not present favorable canditions for the development of tubercles.

SYMPTOMS OR SIGNS OF TUBERCULOSIS AS OBSERVED IN LIVING CATTLE.

Tuberculosis may be acute or chronic; the former is rare; the latter is common and lasts for months or years. The physical signs or symptoms in the living animal are extremely variable—depending upon the location, extent and severity of the disease.

If the lungs and air passages are involved there may be, in the early stages, a harsh, dry, rough cough. Violent exertion, excitement, eating dry food or drinking cold water may cause the animal to cough. Sometimes the animal coughs at the beginning of exercise or upon rising after having lain down for some time. Striking the animal over the ribs a sharp rap with the knuckles may arouse the cough. Striking the chest with the knuckles may reveal regions or spots where the sound is muffled or dull instead of being resonant as in health. If the ear be applied to the chest, it may detect a weak, highly pitched whistling sound, made by the air rushing through some partially obstructed bronchial tube. Or, the ear may hear a sound that resembles bubbles of air passing through a thick liquid; this would indicate the presence of a liquid in the bronchial tubes. These last two tests are difficult and the trained expert is often mistaken; because there is such a limited area on the sides of the chest that can be thus inspected and because, in many instances, the area of lung tissue involved may be very small and deeply seated. A physical examination of the lungs in the living animal is satisfactory only in the advanced stages of the disease where the tuberculous animal is poor and the diseased part of the lung is very large. As the disease advances the cough may become more and more aggravated; a discharge from the nose may appear; the hair becomes rough and dry, and is not shed regularly; the skin becomes scurfy and clings closely to underlying tissues. In aggravated cases the animal may become greatly emaciated; yet, in some cases, the animal will remain in good flesh when the lungs are extensively tuberculous.

Respirations may be labored or accelerated according to the advancement and intensity of the disease. The pulse and temperature at times will rise above the normal; but will remain normal most of the time.

If the pleura is involved, the ear applied to the chest may detect friction sounds which are most distinct near the end of inspiration.

In tuberculosis of the stomach, intestines or mesentery, digestion is deranged and irregular. Young animals whose chief food is milk may have tuberculosis of the bowels or mesentery; this is manifest by indigestion, bloating and persistent diarrhœa; it may lead to general tuberculosis, involving the lungs and many other parts of the body. In older animals the appetite is capricious, digestion is impaired; the animal may bloat slightly after meals; have attacks of indigestion, and finally persistent and uncontrolable diarrhœa will appear. In some cases constipation will alternate with periods of diarrhœa or "scouring."

Tuberculosis of the peritoneum is difficult to determine in the living animal.

Tuberculosis of the uterus and ovaries is usually accompanied by sterility and long and frequent periods of heat (nymphomania).

When the udder is tuberculous it is confined usually to one quarter; yet it may involve each quarter. The diseased quarter is hard, insensitive to pressure and does not yield much milk. In rare instances the tuberculous udder may contain an abscess. Sometimes the cheesy or yellow tubercles erupt into the milk cavities and canals; thus the bacilli become mixed with the milk. Infrequently the submaxillary glands enlarge, soften, erupt and discharge a cheesy yellowish matter. This might be mistaken for actinomycosis.

The surface lymphatic glands at the base of the ear, in front of the shoulder, in front and behind the udder, in the groins, in front of, and above, the stifle, may be detected at first as hard nodular swellings; in the later stages as large soft swellings.

Bones and articulations are at first swollen and hard. Bones may later become soft, and if close to the skin, may be opened for an abscess.

When the brain, the spinal cord and their coverings are tuberculous the animal shows more or less signs of paralysis or mental derangement. In a brief time general stupidity, paralysis or convulsions may occur.

DIAGNOSIS.

How to Recognize Tuberculosis.

The physical signs or symptoms peviously mentioned may enable the veterinarian to recognize tuberculosis in well marked cases, but there are many dangerous and badly infected cases that can not be recognized by the veterinarian if he bases his diagnosis upon physical signs alone. The United States Veterinary Medical Association at their last meeting declared that tuberculosis in cattle could not, in many cases, be determined by physical examination alone. Besides the symptoms given we have the following aids to assist in making a more accurate diagnosis:

(1). Microscopical examination of the nasal discharge, of the saliva, of the milk and of the tubercles that erupt on the surface or that may be surgically removed from the skin or superficial tissues of the body.

(2). Inoculating susceptible animals with any of the liquids or materials mentioned in (1).

(3). The Tuberculin Test.

The first two of these methods are very tedious and difficult, and in many instances entirely without definite results.

The tubercle bacilli are rarely found in the milk in sufficient numbers to admit of their detection by the use of the microscope. It is only in very severe cases that the tubercle bacilli can readily be detected in the milk. Some claim that the udder or milk glands must be tuberculous before bacilli are in quantities sufficient for easy and accurate microscopic detection. Inoculating susceptible animals (guinea pigs,

rabbits, etc.,) with the milk would require twenty to thirty days for the disease to develop, and the small quantity of milk used for the inoculation might not contain tubercle bacilli. The nasal discharge and the saliva of cattle do not contain tubercle bacilli unless there be erupting tubercles in the lungs or somewhere along the air passages; furthermore, the tuberculous material, coughed up from the lungs, may be swallowed when it reaches the pharynx (throat). In all cases where the lungs and air passages are not tuberculous the nasal discharge and saliva contain no tubercle bacilli. Hence, microscopical examinations, or inoculations with these materials will be of value only in a limited number of cases.

Feeding the milk of a tuberculous cow to a pig or calf may develop tuberculosis in the latter in three to six months.

Tuberculin Test.

The Tuberculin Test comes the nearest being a perfect diagnostic agent for determining the presence or absence of tuberculosis among cattle. Tuberculin is a material that was discovered by Dr. Koch; it is a condensed filtrate that is made from sterilized bouillon cultures of tubercle bacilli. In 1890, Koch gave tuberculin to the medical world as a prospective remedy for tuberculosis. For two or three years it was extensively used as a curative agent, but it gradually grew into disuse because it did not meet with the success that was anticipated. During this extensive use of tuberculin in the human family, physicians observed that it uniformly produced a fever or an elevation of the temperature in a certain number of hours after its administration to tuberculous persons. This fact led veterinarians to try it as a diagnostic agent in detecting tuberculosis in cattle.

If a sufficient quantity of tuberculin be injected beneath the skin of a tuberculous animal, its temperature will rise one and one-half to four or more degrees Fah. above the normal in eight to eighteen hours after the injection. This rise of temperature is known as the "reaction" in the tuberculin test. Before injecting an animal its nor-

mal temperature must be determined. To obtain the normal take the temperature of the animals to be tested every two hours beginning at 6 a. m. and continuing until 6, 8 or 10 p. m. When time is important and many cases are to be tested, the temperature may be taken every three hours during the day. In no case where the temperature runs to or above 102 degrees Fah. from morning till evening should the animal be injected; since it already has fever and the characteristic reaction will not always appear. It should be remembered that the normal temperature, as a rule, reaches its maximum in the evening and only in very rare instances in the morning.

After getting the temperatures during the day, at 6, 8 or 10 p. m. the animals may be injected with tuberculin. If the tuberculin, made by the Bureau of Animal Industry, is used, 2 c. c. (one-half fluid drachm) is hypodermically injected into each animal weighing 1,000 lbs.; for bulls and animals weighing over 1,000 lbs. 3 c. c. is injected into each; for yearlings and small two-year olds use one and one-half c. c.; for calves 1 c. c. may be used. If Koch's or Pasteur's tuberculin is used, .25 c. c. is injected into each animal weighing 1,000 lbs.; this must first be diluted with a one per cent. solution of carbolic acid to a strength of ten per cent. This may be conveniently done by pouring 5 c. c. of Koch's or Pastuer's tuberculin into a perfectly clean glass vessel and adding thereto 19 drachms of a one per cent. solution of carbolic acid. (In making the one per cent. carbolic acid solution always use boiled distilled or filtered water.) Each drachm of this solution will then contain a dose for an animal weighing 1,000 lbs.; $1\frac{1}{2}$ drachms for a bull or larger animal; $\frac{3}{4}$ of a drachm for 1 and 2 year olds and $\frac{1}{2}$ drachm for calves.

The hypodermic syringe should be thoroughly disinfected and have a capacity of one to two drachms. Inject the tuberculin under the skin on the side of the neck or over the shoulder.

The morning following the injection begin to take the

temperatures at 6 o'clock and continue at regular periods of every two or three hours until six or eight in the evening.

It is important that a good thermometer be used and that it be held in the rectum, at least five minutes. The six inch Hicks'thermometer is very well adapted to this test. An eight inch thermometer would be better.

If within eight to eighteen hours after the injection of the tuberculin, the temperature rises 1½ or more degrees, Fah., above the normal, for two or more successive readings the reaction is characteristic and the animal is tuberculous. But if the temperature rises at one reading, drops to the normal at the next two readings, then rises at the next reading, this reaction ("double curve") is not characteristic—not positive that the animal is tuberculous. Such an animal should be re-tested in three to six months.

The animals should be kept in their stalls under the same conditions each day during the test; the same quantity of water and food should be given at the same time each day; abrubt changes of temperature in the barn should be avoided. The temperature of cows in heat or in the advanced stages of pregnancy are usually above the normal and they should not be tested at such times. Animals that have been greatly exhausted by excitement or by shipment on cars or boats should be kept isolated in a quiet place for, at least, one week before they are tested.

All animals that give slight or indefinite reactions should be isolated for three to six months and then retested. Sometimes the reaction is accompanied by an acceleration of pulse and respirations and may be followed by a brief attack of diarrhœa and a slight decrease in the flow of milk. But as a rule there are no bad results following the reaction.

THE ACCURACY OF THE TUBERCULIN TEST.

Out of 4,068 animals tested in various parts of the United States by different persons and by the various kinds or forms of tuberculin, 1,137 reacted and 1,118 exhibitted undoubted tuberculous lesions upon post mortem examination; in 19 of these that reacted, the naked eye failed to find any visi-

ble tubercular lesions; the microscope was not used and possibly the post mortem examinations were not as thorough and complete as they might have been. Admitting that the 19 cases were not tuberculous this would be less than one error in 500 tests. In Massachusetts, the cattle commissioners have tested over 25,000 cattle and they have found the tuberculin test to fail in one out of every 400 cases tested. No diagnostic method can show a better record, and no other method can detect 75 per cent. of the cases of tuberculosis in 25,000 cattle.

Last year the Inter-National Congress of Veterinarians adopted the following committee report:

"The committee are agreed that tuberculin is a very valuable assistant in the discovery of tuberculosis. The occasional failures for which it is responsible are without practical significance." (Nocard, Bang and Hess.)

The Massachusetts Board of Cattle Commissioners have tested more animals than the United States government and all the other States. They testify as follows:

"First. That tuberculin is a reliable agent for determining tuberculosis in cattle.

"Second. That tuberclin, properly prepared and carefully handled, can have no injurious effects upon healthy cattle.

"Third. That it is the only known means whereby a positive diagnosis can be made in the early stages of the disease."

PREVENTATIVE MEASURES THAT MAY BE ADOPTED BY THE STOCK-OWNER.

The following is taken from Dr. Law's Bulletin:

"If he will the stockowner can extirpate this disease from his herd and thereafter keep the herd from such contamination. The following are the main precautions necessary to this end:

1st. Board up the partitions of the stalls at the front so that no two cows can feed from the same manger nor lick each other.

2d. Keep each animal strictly by its own stall and manger.

3d. When any animal is suspected do not let it use a drinking trough or bucket in common with other animals.

4th. Avoid old milch cows and unthrifty ones or keep them secluded from the rest of the herd.

5th. The following conformation usually indicates a weakness of constitution and a susceptibility to tuberculosis: Head narrow between the horns, sunken eyes, thin and narrow ewe neck, chest small and lacking in both depth and breadth, hollow flanks and tendency to pot belly, a general lack of muscle so that the limbs seem loosely attached to the body, in breeds that show a variety of colors, animals of the lighter shades of brown and yellow. If, however, such animals are of high value for the dairy and can be kept free from infection, they need not be rejected. The finest conformations of short horns, Devons, Holsteins, black or red polled furnish no protection in the presence of the germ.

6th. Don't purchase from a herd in which tuberculosis has appeared, or in which cattle have died or been killed within a year or two. Resort first to tuberculin.

7th. Don't take a cow with a husky or rattling cough; wheezing, hurried breathing; discharge from the nose; fœtid breath; hard bunches under the skin; diseased udder; swollen bones or joints; unthrifty or a tendency to scour or bloat.

8th. Don't purchase from city suburban or swill stables.

9th. Don't add newly purchased cattle to your herd until you have tested them with tuberculin, especially if they are the product of in breeding.

10th. Don't admit strange cattle to house, field or yard with your own; keep them apart until tested with tuberculin.

11th. In case of disease or unthriftiness in your herd put the animal apart and have it examined by a skillful veterinarian.

12th. In case one animal in the herd shows tuberculosis, test the whole herd with tuberculin.

13th. Test in the same manner all animals on the farm

(swine, goats, sheep, horses, rabbits, cats, dogs, fowls), that co-habit with the cattle.

14th. Kill all tuberculous animals and boil, burn, dissolve with acids, or bury deeply in a place to which no animals have access.

15th. Disinfect premises thoroughly, also all products of diseased animals and all articles used by them.

16th. Let no consumptive person attend on cattle or other live stock or prepare their food.

17th. Vermin (rats, mice, sparrows) in a building, where tuberculous animals have been, should be exterminated."

HOW TO DISINFECT.

(1). Remove all loose materials from the mangers and stalls and burn such as are of no value.

(2). Thoroughly cleanse the stalls. If the floor be dirt remove at least three inches of it and replace it with fresh dirt after the disinfection.

(3). When the walls, floors, ceilings, etc., become dry, spray them with a corrosive sublimate solution (1 to 1,000), a two per cent. carbolic acid solution, or a two per cent. creolin solution. A fruit tree spray is best for this purpose.

(4). Close the windows and doors and fumigate the barn by burning two or three pounds of sulphur in kettles containing hot coals.

(5). After fumigation open the windows and doors and flood the barn with sunlight and air. It is the dry air and sunlight that disinfects pastures and other outdoor places.

DUTIES OF THE CITIES AND THE STATE.

What should our larger cities and the State do toward exterminating tuberculosis among domestic animals and prevent its extension in the human family?

The cities should pass ordinances requiring all the dairy herds that supply dairy products to the inhabitants of their respective cities to be tested with tuberculin twice annually, and forbid the use of tuberculous cows in such herds. All tuberculous animals should be destroyed and deeply buried or cremated.

The cities should also require that all animals killed for local consumption be tested with tuberculin. Furthermore, each city should have a city meat and milk inspector, whose duty shall be to test the dairy herds and all beef cattle with tuberculin and inspect all carcasses at the slaughter houses and market places.

The inspector should be a graduate veterinarian who has had special instruction in milk and meat inspection. This work could be done under the supervision of the City Board of Health.

The State laws necessary for the control and eradication of tuberculosis among domestic animals and to decrease human mortaliy from tuberculosis, are briefly suggested as follows:

1st. Alabama should provide for a State Veterinarian and several local assistant State Veterinarians. Said veterinarians should investigate all contagious and infectious diseases among domestic animals; inspect or superintend the inspection of all dairy herds and all animals slaughtered for human food not inspected by city or government inspectors. The State Veterinarian could be an *ex officio* member of the State Board of Health, or work under the supervision of that Board. Said veterinarians should receive pay for time spent in actual service for the State.

2d. Public Slaughter Houses should be established and all animals should be slaughtered at these places.

3d. The State should provide means for carrying on this work, and, also, to pay a small indemnity for animals condemned by the State.

This could be done by levying a small special tax upon all the domestic animals of the State. The protection given to both animals and man and the increase in value of the animals would more than compensate the owner of stock for the small tax.

The following are some of the suggestions made by City and State Boards of Health in various parts of the United States for the prevention and eradication of tuberculosis in the human family:

(1) Sterilize all milk, especially that given to infants and children. (See Bulletin 53).

(2) Thoroughly cook all meats before eating them.

(3) Completely sterilize all drinking water.

(4) Never employ consumptive (tuberculous) persons as cooks, house servants, or to milk or care for dairy cattle or to clerk in stores or handle eatables of any kind. Such persons better work in the open fields.

(5) Never visit improperly kept quarters or living rooms of consumptives, and in no case allow children to play with consumptives or visit their rooms.

(6) Consumptive persons should not teach school.

(7) Children or any one having consumption should not attend public schools or public gatherings in closed rooms.

(8) Consumptives should not marry.

(9) A person having consumption should occupy a room by himself; keep it as clean as possible; never use carpets or rugs; never expectorate upon the floor; always expectorate into cuspidors containing a solution of corrosive sublimate, 7 grains to one pint of water, or upon cloths that can be immediately burned.

(10) Consumptives should never kiss any one—especially children or babies. In fact, many physicians regard mouth to mouth kissing as filthy and as occasionally dangerous, because many diseases are thus communicated from the diseased to the healthy.

(11) Buildings, rooms, sleeping cars, berths and beds occupied by consumptives should be completely disinfected before being occupied by healthy persons.

(12) "Do not fail to wash thoroughly the eating utensils of a person who has consumption as soon after eating as possible, using boiling water for the purpose."

(13) A consumptive's unwashed clothing should never be kept, or washed with similar clothing of other persons. Such clothing should be boiled for at least one hour, or otherwise disinfected before being washed or during the process of washing.

(14) "The bowel discharges of consumptive persons with diarrhœa should be caught in a vessel containing corrosive sublimate seven grains to water one pint."

(15) "Do not fail to consult the family physician regarding the social relations of persons suspected of having consumption."

(16) Tuberculous parents can not be too careful lest they transmit the tubercle bacilli to their children. It is best to give sterilized cow's milk to infants having tuberculous mothers.

(17) Physicians and dentists having consumption should not practice or follow their respective professions.

(18.) Dogs and cats should not be permitted in rooms where consumptives live. If so kept, they should not be allowed to play with children or pass into other rooms or houses. Pets suspected of having consumption should be destroyed.

(19.) The State, counties or cities should provide houses for indigent tuberculous persons or public hospitals where consumptives could be isolated and treated.

The above preventative suggestions may seem to be extreme, but some of them are enforced in some of the largest cities in the United States. As soon as the people become aware of the necessity of State, city and government control of tuberculosis in all forms and conditions it is probable that many of these measures and others more severe will be enforced.

It is to be hoped that opportunity will be given this department to test dairy herds in various parts of this State. In fact, we will test a limited number of herds of cattle and attempt to furnish tuberculin free to those who will secure the services of a graduate veterinarian to make the test. Any one desiring further information upon this subject will please address the Station Veterinarian.