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Texas or Acclimation Fever.

By C. A CARY.

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P. H. MELL, *Director.*

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TEXAS OR ACCLIMATION FEVER,

By C. A. Cary.

INTRODUCTION.

The cattle breeding industry of the South has been held in check by the fact that Northern-bred and imported cattle could not be brought into the South without running great and unprofitable risks. In fact, the danger of losing such cattle was so great as to prevent or prohibit bringing fresh and imported strains of breeding animals into the infected regions of the South. As a result of this natural barrier, few beef-bred cattle came to improve the scrub stock or to improve the animals that had a tinge of Jersey blood in them. Possibly Jersey blood is more widely scattered among the native scrub cattle of the South than that of any other breed. Consequently, with a well-bred Jersey bull to head a herd, one could soon develop a respectable and profitable herd of grade Jerseys by using such a bull upon selected native Southern-bred cows. But none of the native Southern cattle have beef tendencies. Most of them do not mature until six or seven years old, and when mature they are too small for profitable beef animals—especially for shipping to distant markets. Beef animals must mature before they are three years old or they are not profitable.

The necessity for animal industry, especially cattle raising—is fast dawning upon the farmer of the South. It leads to diversified farming; it decreases the demand for commercial fertilizers by supplying larger quantities of manurial fertilizers that can be made upon the farm

and are far better than commercial fertilizers, because they are cheaper, and more permanently improve soil, both in mechanical condition and in available plant food. Feeding animals upon the farm and saving the liquid and solid manures gives the farmer a double use of the feed stuffs produced on the farm; because the manurial products contain from 60 to 90 per cent. of all the fertilizing materials that were found in the feeds that were fed the animals. For example: Cotton seed hulls and cotton seed meal lose but very little of their value as fertilizers by feeding them to cattle, providing the the liquid and solid manures coming from the animal are properly saved and utilized. The cattle industry does not mean that we shall not raise cotton, but that we can raise as much or more cotton than we do now upon less acreage and with less work and less expense for fertilizers.

During the past three years more beef-bred animals have been brought into the State of Alabama than during any previous time in its history. Unfortunately, some of them have been lost by acclimation or Texas fever; but the larger number of them have been saved by careful handling. Methods of acclimating or immunizing Northern-bred or foreign-bred cattle have been developed so that the dangers of acclimation have been reduced to the minimum—so that it is no longer unprofitable to bring into the South highly-bred breeding animals.

The chief object of this bulletin is to describe the methods of immunizing susceptible cattle to Texas fever, and give the records that have been made at this station and others by using the improved methods of immunizing Northern and foreign-bred cattle.

WHAT IS TEXAS FEVER?

In various parts of the country this disease is known by different names; it has been called Texas fever, acclimating fever, Southern fever, tick fever, Spanish fever, red water, hæmaturia, black water, murrain, dry murrain, yellow murrain, bloody murrain, hollow-horn and hollow-tail.

Texas fever is caused by a very small animal parasite (*Pyrosoma bigeminum,* Smith) which was discovered by Theobald Smith in 1889. Its chief place of living is in the red blood cells of cattle. In some condition it lives in the cattle tick and is carried from immune cattle or cattle sick with Texas fever, to non-immune or susceptible cattle by the tick. In this transmission of the microparasite from the diseased to the healthy animals, it passes through two generations of ticks. The female tick abstracts blood from its host; falls to the ground, deposits a large number of eggs that hatch in 14 to 45 days, and the young seed ticks get upon susceptible cattle and inoculate them. In many cases the fever appears in the cattle about the time the young ticks molt the second time; then the young ticks are about one-eighth of an inch long, and the careless observer may declare there are no ticks on the animal sick with Texas fever. It may be here stated that this micro-parasite has two hosts (cattle and ticks of two generations) and possibly can not live anywhere outside these two hosts. At least its existence in other hosts or places have not been discovered. In some respects it resembles the malerial parasite of man, but its stages of development, are not as well known as those of the malerial miscro-parasite. Yet some things are known of its form and life history in the red blood cells of cattle, and in the plasma of the blood. In mild cases of

Texas fever the micro-parasite appears as a single round body in the red cell near the preriphery or the outer border. Sometimes there may be two of these round bodies in a single red cell of the blood. Occasionally the small round bodies may appear singly or in pairs in the plasma of the blood. In severe cases that usually occur in hot weather and when the temperature of the animal is high, there may be two spindle or pear-shaped bodies in one red cell of the blood. According to Smith, 5 to 50 per cent. of the red cells of the blood may contain these micro-parasites—the number of red cells infected will vary with the type (mild or acute) of the fever. The number of red cells infected will also vary with the different organs from which the boold is taken for microscopic examination. Blood from the capillaries of the liver, heart-muscle, and kidneys, contain from 20 to 90 per cent. of infected red blood cells; while the blood from the capillaries of skeletal or voluntary muscles and the skin may contain very few (10 per cent. or less) infected red blood cells.

Fresh or dried smears of blood may be examined under the microscope. For fresh smears collect a small amount of blood with platinum loop; place it in the center of a clean cover glass; drop the cover glass, blood side down, upon a clean slide and surround the cover glass with vaseline or paraffine; the mount is now ready for examination under the microscope. In making dried smears, take two clean square cover glasses; place a small drop of blood (picked up with the platinum loop) on one of the clean squares a little to one side of the center, and with another clean square spread the droplet of blood over the lower cover glass by attempting to scrape off the droplet with one edge of the upper cover glass, holding the upper one in the right hand inclined at an angle of about 20 degrees, with the lower one that

is held between the thumb and finger of the left hand. Dry the smears immediately after making them, and place them in the hot air oven, keeping them there for one and one-half to two hours, at a temperature 110 to 120 degrees C. Stain the smears with Lœffler's alkaline methyl blue from one to one and one-half minutes; wash in water and dip for an instant into a one-third per cent. acetic acid solution to remove excess of diffuse stain in the red blood cells; wash in water and mount in water or dry and mount in xyol balsam. Examine with a high power objective. (Smith's method.)

The **CHANGES** that **OCCUR IN THE BLOOD** are very characteristic in a case of Texas fever. Red blood cells in great numbers are destroyed by the micro-parasite. This is determined by actual count of the red blood cells in a definite quantity of blood; the test being made before, during and after or following the fever. In healthy old cattle the average number of red blood cells in a cubic millimeter is about 6,000,000. In healthy young calves the average number of red cells per cmm. may be as high as 8,000,000. In healthy mature or middle-aged cattle the average number may be about 7,000,000 per cmm. In acute cases of Texas fever the number of red cells in the blood may be reduced 2,000,000 or less per cmm. In mild cases of Texas fever the number of red cells will vary between 3,000,000 and 5,000,000 per cmm.

As associated with, or as a result of the great loss of red blood cells (anæmia) the red cells will vary in size and shape; some are very much larger than normal red blood cells and when stained with Lœffler's alkaline methyl-blue, become diffusely stained, and some of them contain very small granules. These large red cells are found in some forms of anæmia in man, and are called megalocytes.

The **UNITED STATES GOVERNMENT** has **ESTABLISHED** a **QUARANTINE LINE** which is fixed for the regulation of inter-state trade in cattle, so that Southern tick-infested cattle cannot be taken into non-tick-infested States (excep for immediate slaughter) during the warm seasons when pastures and susceptible cattle may become infected with ticks, and the latter inoculated with the micro-parasite of Texas fever. All the States, or parts of States, south of this line are in the tick-infested region, and all north of it are in the tick-free region. This line starts at the Atlantic Ocean, near the southern boundary of Virginia, runs westward, leaving nearly all of North Carolina, all of Georgia, Alabama, Mississippi, Louisiana, and Texas, part of Tennessee, Arkansas, Indian Territory, New Mexico, Arizona, and the southern part of California south of the Governmental quarantine line, in the tick-infested part of the United States.

This quarantine line and the fact that all Northern-bred cattle shipped into the South have Texas fever, have led many people to believe that Texas fever occurs only in Northern-bred cattle, and never in the native cattle of the South. But it has been proven in some cases, beyond doubt, that calves are not born immune to Texas fever even though their dams are immune. In truth, it is very probable that all cattle are born susceptible to Texas fever, and only acquire immunity after birth, by having one or more attacks of the fever. The micro-parasite in the blood of the dam can not pass into the fœtus in the uterus because the blood in the circulation of the mother does not pass directly into the circulation of the fœtus. The serum of the blood of the mother passes through membranes into the circulation of the fœtus and it is very probable that the micro-parasite does not pass through these membranes. Moreover, blood serum contains very few of the micro-parasites.

The calves that are born of immune cows and live in tick-infested lots or pastures, acquire immunity while young, by having such a mild attack of the fever that it is not observed. Possibly complete immunity is only acquired by two or more mild attacks that appear as the succeeding broods of ticks inoculate them.

Some of the calves born of immune cows escape tick infestation, and consequently escape inoculation. When full grown, or several years old, they may be taken into a tick-infested pasture or the ticks may be brought to them by introducing new cattle into the herd; then they may die of Texas fever. Many farms in Alabama are tick-free; many town lots are tick-free; parts of many farms and pastures are tick-free; consequently cattle that are bred and raised in such tick-free places are susceptible to Texas fever. Tick-free lots, pastures and farms are so made by keeping all cattle off them for one or more years, by rotation of crops and pastures, by burning the grass, by killing all the ticks on the home cattle, by stock law all the year round, and by introducing no new cattle without first completely ridding them of ticks. Ticks do not travel any great distance (a few feet only), except when upon their host; by themselves, ticks will rarely, if ever, cross a road 60 feet wide. Hence a tick-infested and tick-free farm may be very near each other and remain in that condition, providing cattle and horses are not permitted to go from one farm to the other, except when these farm animals are free of ticks. Records of losses in Alabama of native, Southern-bred cattle, from Texas fever have been reported to me every year for several years, and I have records of Texas fever occurring in Alabama-bred cattle in every season of the year. Of course the severe and fatal cases occur mostly in hot portions of the year, while most cases that occur in winter are mild. One or two illustra-

tions may bring out some of the above-mentioned conditions. A certain dairyman had kept his cattle and farm free of ticks for several years. He bought some new cattle, which were infested with ticks, and placed them in his herd. In due time his home-raised cows began to die with what he called "red water," which was Texas fever. Another man sold his entire herd of cattle that had been kept free of ticks; these cattle were moved just a few miles, and in a short time many of them died of Texas fever. Parties who buy calves or feeders from various farms in a neighborhood, beat or county, nearly always lose several some time after the calves or feeders have been brought together in the new feeding pens or pastures.

It might be well to state here that Hunt of Australia claims that some cattle ticks do not possess the micro-parasite of Texas fever—especially in a virulent form. This might explain some of the outbreaks of Texas fever among Southern-bred cattle in herds that are collected from many different farms or pastures. But so far as I know, all ticks of this species in the United States that have been tested, have been able to transmit the micro-parasite; and no positive facts have been discovered that show that the micro-parasite will vary in its virulency. Hence we must regard all ticks of this species as carriers of the Texas fever micro-parasite.

THE SOUTHERN CATTLE TICK (*Boophilus bovis*, Riley), is said to be a native of Northern Africa, and reached the Southern States by way of Spain, South America, Central America and Mexico. The life history of this tick, as discovered by Cooper Curtice, is described as follows:

The large female tick (the one so easily observed on cattle) drops to the ground when filled with blood from

its host; hides in some secluded place; lays or deposits from 1,500 to 3,000 eggs, and then dies. The incubation period, or time required for the eggs to hatch, will vary from 14 to 45 days; the length of time depends upon varying conditions of temperature and moisture. Warm weather and a little moisture shortens the period of incubation; cool weather or heavy rains prevent or retard hatching of the tick's eggs and destroy many young ticks. The small ticks fresh from the eggs are six-legged, and very lively, collecting in bunches, not unlike in appearance a mass of chicken mites. They are called "seed ticks" because they look like a small seed or because they are said to be the seed of the tick. They crawl or climb upon grass, weeds or any object near the place of hatching. Cattle passing through the grass or weeds will become infested with "seed ticks," which soon attach themselves by their mouth parts to the skin of their host. In 12 to 15 days the "seed tick" molts ("sheds its skin") and then possesses eight legs (4 pair) instead of six. A second molting occurs in from four to six days after the first, and following this second molting, the female tick very soon becomes larger than the male; the male possesses pointed shoulders, and never gets much larger after the second molting. The female engorges itself with blood from its host, and thus develops into the large, plump, fat tick that can be so easily observed upon infested cattle, and when mature drops to the ground and dies laying eggs. Thus the round of life is completed.

COULD ALABAMA OR THE ENTIRE SOUTH EXTERMINATE THIS SPECIES OF TICKS?

According to some authorities tick extermination is possible. One farm, one beat, one county can be made tick-free. Why not an entire State? If every cattle

owner in Alabama would voluntarily (or by compulsion) fight for the extermination of the tick it might be accomplished in two years. But extermination would now be next to impossible in the free-range counties of Alabama. It could be much more easily accomplished in stock law counties where the cattle are not permitted to run at large during the entire year. Every cattle owner being required to keep his cattle confined to his own pastures or definite limits could, by use of dips or washes, destroy the ticks on his cattle, horses and mules. He could also change his pasture from one part of his farm to another, at least once a year, or as often as he applies some dip or wash to the cattle to kill the ticks. The best time to get rid of the ticks on the cattle is in the winter when there are very few ticks. Once getting the cattle entirely free of ticks, they could then be put in a pasture where no cattle had been for one year or more. Following this the cattle must be inspected closely once every week, and if ticks should appear again kill them with dips and washes. Three applications of a tick-destroying dip or wash should be made; the second application should be given about ten days after the first, and the third about ten days after the second. The cattle are then ready to go into the tick-free pasture. If the herd is large it would be best to construct a dipping tank large enough to immerse one animal at a time. The tank might be wholly or partly sunk into the ground, having a pen and approaching chute, and a draining platform near the exit chute. The Bureau of Animal Industry at Washington, and Dr. Francis of College Station, Texas, have used large dipping tanks, and by applying to either of them by letter, plans and methods of constructing such tanks might be secured. Beaumont oil floating on warm water in the tank could be used to destroy ticks. It is cheap, and

could be applied full strength. Cotton seed oil or kerosene oil emulsion can be used, but they are more expensive than Beaumont oil. Where a farmer has only a few cattle the Beaumont oil could be applied with cotton lint or rags by putting each animal in a brake or chute and going over the animal thoroughly with the oil.

All new animals entering the herd must be made tick-free before being turned into the pasture with the herd.

What would be gained by having Alabama or the entire South free of ticks?

The most important advantage would be free and unrestricted cattle trade with the North, and all of Europe at all seasons of the year. You could then bring into the South cattle from the North at any season of the year without danger of loss from Texas fever. If Alabama or any Southern State were to produce "feeders" or "stockers" they could be shipped directly to the corn belt States at any season, and not be hampered by a quarantine extending from March or April until November or December. In short, the entire train of troubles coming from Texas or Southern cattle fever would be wiped out. All of this would be most desirable if all the tick-infested States would line up and completely exterminate the tick. But if one county or beat should exterminate the ticks within its borders (unless it be adjacent to the Government quarantine line), it would be in a great deal of trouble by its isolation. Unless adjacent to the quarantine line it could not ship its cattle out only at such times as could the tick-infested counties. Moreover, breeders in the tick-infested counties could not buy cattle in the tick-free county because such cattle are as susceptible to Texas fever as the Northern-bred cattle. Cattle from tick-infested counties could not be taken into a tick-free county without keep-

ing them in quarantine until they are made tick-free by dipping, etc.

The question of extermination of the tick resolves itself into this: It is a good thing for counties of townships contiguous to the Government quarantine line to make a fight to exterminate the tick and have the quarantine line moved South of them. But to commence in the center of a tick-infested State would only lead to trouble by increasing the number of outbreaks of Texas fever or by completely shutting off tick-free places from cattle trade with surrounding territory. I would not advise local tick extermination in Alabama except to get small pastures or places for acclimation purposes, and such places are not absolutely necessary for the new methods of acclimating Northern or foreign-bred cattle. Now this does not mean that any cattle owner should permit his cattle to become literally covered with ticks, but instead every cattle owner can keep off the excessive number of ticks and yet have a sufficient number of ticks to keep his cattle immune and to permit the calves to acquire immunity. No doubt excessive tick infestation retards the growth and development of beef cattle, and also the milk-producing capacity of the milch cow.

HOW TO RECOGNIZE AND DISTINGUISH TEXAS FEVER IN THE LIVING ANIMAL.

1. Learn the history of the diseased cattle. Were they bred and raised in a tick-infested or a tick-free region? Were new ticky cattle brought into the herd, or were the sick cattle put into a new pasture where ticks are present, either upon cattle or in the pasture? Look carefully for the small ticks upon the sick cattle. It takes an inexperienced person some time to find the small, young ticks. In some cases the ticks may have

been entirely or partially removed by use of oils or drugs or dips, but not until after the ticks had inoculated the animal.

2. The temperature of a tick-inoculated animal may rise before any other symptoms are observed. In mild cases the temperature will range between 103 and 105; in severe cases it may vary from 105 to 108 degrees Fah. The temperature may remain above normal a few days then drop to normal (102) for a few days. In chronic cases there may be variable or regular periods of alternate rising and falling of the sick animal's temperature. (See Admiral's temperature record in Table No. II.)

3. In mild cases the appetite is capricious or changeable. The sick animal may refuse feed at one time, and at another eat quite or nearly a normal or full feed. In acute or severe cases the appetite is entirely or almost completely lost; the sick animal may nibble at this or that feed, but will eat very little. Rumination is suspended (does not chew the cud) in all severe cases, during the high fever period, and some times until convalescence begins; this would lead some persons to claim that the animal was sick from "loss of cud."

4. At first or during the high fever period, the bowels are inactive. Loss of appetite, ceasing to ruminate and inactivity of the bowels indicate that digestion is suspended. The inactivity of the bowels may be indirectly a result of loss of red blood cells, a result of the high fever, or it may be due to congestion and sometimes inflammation of smaller or larger areas of mucous membrane lining the fourth or true stomach and of the intestines. Sometimes upon post mortem examination the mucous membrane of the fourth stomach and of intestines are found eroded or ulcerated—the membrane in small spots or patches has sloughed off. No doubt that the bowels are paralyzed, and no amount of heavy

purgatives will move them in that condition. Very probably many cases are killed by frequent doses of heavy purgatives, when small oleaginous (raw linseed oil) laxatives should be given to soothe the inflamed areas. Fermentation may be kept down by giving dram doses of creolin in one-half pint of water three or four times per day. When the animal's condition changes for the better, or begins to improve, the bowels may then become freely active; but in no case should the active bowels be checked; this will be corrected as the animal improves.

5. The respirations may be slightly accelerated, but in acute cases they are very rapid, running as high as 30 to 60 per minute. The rapid respirations are short or shallow, and in some cases are accompanied by a cough, and sometimes by groaning or grunting sounds.

6. The pulse in acute cases is rapid and as the number of red blood cells decrease, the pulse grows weaker. The weakness of heart and blood vessels and general muscular weakness cause the patient to lie down much of the time. When it attempts to walk the gait is wabbling, staggering, unsteady equilibrium. Sometimes the sick animal stands with depressed head and arched back.

7. The kidneys are usually quite active. Large quantities of urine are passed. In mild cases the urine is darker than usual and in severe cases the urine may be blood red (port wine color). This excess of color is the coloring matter from the broken-down red cells of the blood, and it is excreted from the body largely by the kidneys. The red colored urine does not contain blood, yet it leads many to call the disease "bloody murrain" or "red water." Remember that all acute cases or fatal cases do not pass red urine, but out of a number of sick animals in a herd some of the severe cases will pass red urine.

8. In some cases the eyelids become swollen so much that the animal can hardly open the lids sufficiently wide to see. Many cases are accompanied by a more or less prominent swelling under throat or root of the tongue, between the branches of the lower jaw.

As a rule the sick animal becomes separated from the rest of the herd; if weather is warm it seeks the shade, stands with arched back and shrunken abdomen, or lies down from weakness. In cool weather, or during the winter season, many cases perish largely from exposure to cold nights and cold rains.

EXAMINATION AFTER DEATH may help one in making an accurate decision in regard to the disease causing the death of the animal. Post mortem conditions are sometimes quite characteristic and constant; yet in some instances some of the common characteristics may be absent or not sufficiently marked as to be recognized. The condition of the carcass as to flesh will vary with the length of time the animal was sick, and the type or severity of the disease. As a rule a few days of high fever that suspends all digestive action will lead to rapid emaciation. In cutting through the skin notice that there is very little blood in it or the tissue just under the skin, and the small amount of blood in the skin is pale, and does not readily coagulate. After opening the abdominal cavity, examine the liver, the spleen, the kidneys, the bladder, the stomachs, and the intestines. If the animal died in one to three days after becoming sick the liver may be very large—engorged with blood and bile, giving it a rather dark brown color; but if the animal lived a number of days after becoming sick the liver will be engorged with bile and will have a deep yellowish tinge; this yellow color is very prominent upon a cut surface of the liver. The gall bladder is usually

excessively distended with thick flaky bile. The bile is said to be thicker and more flaky in cases that were sick several days before dying than it is in cases that die in a short time after becoming affected.

The spleen or "melt" is generally much larger than it is in the healthy animal; it may be three or four times as large as a normal, healthy one. It is darker than a normal one, and when cut open its bluish-black contents slowly flow out. There are some genuine cases of Texas fever in which the spleen is not very much enlarged or changed in color and structure.

The mucous membrane lining the fourth stomach and intestines may be inflamed or eroded in spots or patches; cut them open and wash away the contents so that the red, inflamed or ulcerated condition may be distinctly observed. In some cases the contents of the fourth stomach and of the intestines in places may be tinged with blood; if the intestinal contents are hard and firm they may be surrounded by a gelatinous material or exudate that is in places tinged with blood.

In severe cases when the animal dies early in the course of the disease, the kidneys may be enlarged and they may have a uniform brownish red color throughout their entire structure. Cover glass smears made with blood taken from the kidneys will show that a very large per cent. of the red blood cells contain the microparasite. The bladder will usually contain more or less dark brown or red colored urine. The color is produced by the hæmoglobin that is held in solution in the urine and comes from the disintegrated red cells of the blood. The urine also contains albumen.

The white membranes or tissues of the body—such as the serous and mucous membranes, the connective tissue under the skin, etc.—may become tinged with yellow very like the jaundice yellow in man. This is most

prominent or marked in chronic cases or cases of long duration.

The heart, according to Smith, has the right ventricle "distended with blood, fluid or clotted, according to the time elapsing between death and the examination. The left ventricle is usually firmly contracted and may contain a small quantity of fluid or clotted blood." The small extravasations of blood under the epicardium and endocardium are quite constant; they are most numerous on the outside and inside of the left ventricle.

WHAT IS IMMUNITY TO TEXAS FEVER?

IMMUNITY means that an animal is not susceptible to Texas fever. It is now believed that an animal can acquire immunity only by having the disease—one or more attacks. One severe attack of the fever or two or more mild attacks usually insure a safe immunity.

Immunity will last as long as the life of the animal, if said animal becomes infested with ticks one or more times each year of its life. But my observation of the disease, as it occurs in native Alabama-bred cattle, leads me to believe that immunity can be lost in two or three years by keeping the animal free of all ticks. I am confident that loss of immunity in this way explains the occasional outbreak of Texas fever in herds that have been kept free of ticks for two or more years, and then letting the cattle become infested with ticks.

METHODS OF PRODUCING IMMUNITY TO TEXAS FEVER.

The natural method is the one in which the ticks do the inoculating. Four different forms of tick inoculations have been tried. In many instances Northern-bred cattle were brought into the South, turned out with the herd; permitted or forced to "rough it," and survive or

perish with slight or excessive tick inoculation and poor care. Fifty to ninety per cent. of Northern-bred and imported cattle so treated died—a mortality too great to be profitable. A modified form of this careless way has been employed by many with much more favorable results. The susceptible animals are kept by themselves in barns, pastures and lots separated from native Southern cattle; at the same time a few ticks are allowed to get on the cattle, but excessive tick infestation is prevented. In a majority of such animals tick-inoculation occurs gradually. One summer in the South under such conditions has usually produced immunity. However, losses by this means are too great to recommend it when better means can be obtained.

Dr. Connoway of the Missouri Experiment Station, and Dr. Francis of the Texas Experiment Station, have tried to control tick inoculation by placing a definite number of young seed ticks upon the suscpetible animals at different times. Collect full grown female ticks from Southern cattle and put them in a fruit jar or some vessel having a little moist earth at the bottom; this jar is then placed in an incubator or in the kitchen near a warm chimney or stove; in 15 to 20 days the female ticks will have deposited their eggs and the eggs will have hatched into a mass of lively seed ticks. About 25 of these seed ticks are placed upon each susceptible animal (best time in late fall or in winter) and they will inoculate each animal so that in the course of 10 to 30 days the fever will appear. When the animals recover from the mild attack of the fever (say in 40 to 50 days) a larger number (about 100) of incubator seed ticks are put upon each animal; this should produce a second attack of fever. When the cattle recover from it they are immune and ready for the pasture. At no time in this treatment should the cattle want for good feed and pro-

tection from cold nights and rains. Some losses occur by this method, and it is a little more inconvenient and uncertain than either of the two methods that will be mentioned following this.

The fourth modified form of tick inoculation is the **one where sucking calves, 2 to 4 months old, are brought into the South in the fall or winter or early spring**, and allowed to take milk from a Southern-bred cow or are fed fresh sweet milk from a Southern cow. While young and during the time before it is weaned, put a few seed ticks upon the calf or permit them to get upon it in small numbers. Natural tick inoculation will then occur when the calf is best able to resist severe fever and to recover from it. It is possible that the milk of a Southern-bred immune cow may have some immunizing power, but I doubt it. I think the milk of a non-immune cow would be as effective because it keeps the calf in the best of condition to resist, and to recover from, the fever or attack of the micro-parasites upon the red blood cells. It is a well-known fact that young calves or cattle do not have Texas fever in as severe a form as do older or mature cattle. All competent observers or investigators of Texas fever have noted that fact. According to Hunt of Australia, (who produced by inoculation the fever in calves born of immune cows), immunity is not inherited. It is very probable that all Southern-bred calves do not inherit immunity, but acquire it after birth by tick inoculation. No doubt that the vast majority of Southern-bred calves have the fever in such a mild form that it is not appreciable. This partial immunity of calves to the fever may be explained by the fact that young animals have a greater number of red blood cells per cubic millimeter than do older animals, and can carry on the functions of the blood better in case of loss of red blood cells. Also, the power of reproducing red

blood cells is greater in the young than in the older animals. This may be due to the fact that there is a relatively greater quantity of red marrow in the young animals, and this red marrow tends to reproduce red blood cells nearly as fast as they are destroyed by the micro-parasite. The general vigor of a young animal may add to its resisting and recuperating power. Moreover, it is well-known that young animals exhibit greater power of repairing wounds and recovering from almost any disease than older ones. Broken bones unite quicker and better in young animals than in mature ones. As Dr. Francis remarks, this method of immunizing sucking calves is a good and safe way for farmers who buy a few animals; but where many animals are wanted for a large ranch it is cheapest to use the defibrinated blood method. One drawback to immunizing calves is that the owner must wait one or two years before the calves develop into breeding animals; it means loss of time, but is a safe method.

The Defebrinated Blood Method of producing immunity to Texas fever in cattle was originated or discovered in Australia. It has been most extensively employed i nthis country by Dr. Connoway of the Missouri Experiment Station, and Dr. Francis of the Texas Experiment Station. It has been tested by the Bureau of Animal Industry at Washington, D. C., and by the Louisiana, the Mississippi and the Alabama Experiment Stations.

Brefly speaking, it consists in inoculating a susceptible or non-immune animal with blood that is freshly drawn from an immune animal and defebrinated. The animal from which the blood is derived should be at least two years old, and Southern-bred, and known to have had ticks upon it some time during the second sum-

mer of its life. A Northern-bred animal, that has acquired immunity by having had an attack of Texas fever within one year, may also be used as a source of blood for inoculation. After securing the animal the following instruments and articles should be prepared for the inoculation:

A sterilized hypodermic syringe, one or two sterilized scalpels or sharp knives, one or two sterilized aspirating needles with an inside diameter of 1 to 2 millimeters; a clean sterilized beaker or wide-mouth bottle, containing a small glass rod, and the bottle or beaker should be plugged with aseptic absorbent cotton; one pair of scissors, a 2 per cent. solution of creolin, and sterilized cotton or sponge, and sterilized distilled water. The water may be sterilized by boiling one hour.

Any or all of the above named articles, except the creolin solution and water, may be sterilized by placing them in a vessel of cold water, and then heating the water until it boils for one hour.

The animal from which the blood is to be drawn may be secured by using a cattle nose-leader or by casting it with ropes, hobbles, etc. Clip the hair very close over a space 3 to 6 inches long and 2 inches wide along the jugular forrow on either side of the neck (just over the jugular vein). Wash the clipped skin with soap and water; then with the creolin solution and then with distilled water. Now cord the neck of the animal as the neck of a horse is corded just before it is to be bled. When the neck is corded the jugular vein stands out prominently. Now the aspirating needle, with its point inclined toward the head, is pushed into the jugular vein and the blood that escapes through the hollow needle is caught in the sterilized breaker or wide-mouth bottle, and stirred slowly with the glass rod, being careful to

hold the cotton plug over the mouth of the breaker or bottle while stirring. As the fibrin collects in clots on the glass rod, it may be lifted out, and by a quick jerk of the rod the clot is dislodged from the rod and the rod is then returned to the breaker or bottle, and the blood is stirred until no more fibrin collects on the glass rod. In the breaker or bottle will remain nearly all of the red blood cells floating in the blood serum and some of these red blood cells will contain the micro-parasites that cause Texas fever. This deferinated blood should be kept warm (above 90 degrees Fah.) and when the susceptible animals are ready for inoculation, the defebrinated blood may be drawn into the warm hypodermic syringe and 1 cc injected under the skin of each susceptible animal. Remember that it is essential that the defibrinated blood should be kept warm and that the inoculations should be made as soon as possible after the defirinated blood is prepared, because it may become cool, or contaminated with septic or pus germs. It is best to have the cattle that are to be inoculated confined by halter or chains or stanchions in stalls. I should not advise the use of defibrinated blood that is over an hour old.

In about six to ten days after the inoculation the temperature of the inoculated animals will rise, ranging between 103 and 106 degrees Fah. The fever may continue from 3 to 15 or more days; then fall to normal (102); a secondary fever usually begins about the thirtieth day after the inoculation and may continue for several days. According to Pound, Francis and Connoway the primary inoculation fever appears in 6 to 10 days, and the secondary inoculation fever appears about the thirtieth day after the inoculation. The primary inoculation fever, as a rule, is more regular or will occur with greater regularity than the secondary inoculation

fever. In many cases the primary inoculation fever will be constant and regular, thereafter the temperature may rise and fall irregularly. In rare instances there may be a low continuous fever covering 20 to 40 days. Again there may occur but one fever period and that occur 20 to 30 days after the inoculation. As a rule, it requires from 40 to 50 days to pass through the inoculation fever periods. After recovery from the first inoculation, a second one is given to each animal. In case the first inoculation does not produce a fever running up to 105, it is always best to give a second inoculation and increase the dose of defibrinated blood; if 1 cc was employed in the first inoculation, use 2 cc of defibrinated blood in the second inoculation. As a rule, the second inoculation produces fever periods as in the first inoculation, but the fever is milder than it was following the first inoculation.

Inoculations to produce immunity to Texas fever should be made in the South sometime between Nov. 1st and the following March 1st, and never during hot weather. During the early spring or during the winter, immediately after the cattle have recovered from the inoculation fever, permit a few ticks to get on them. And when the hot weather of June, July, August and September comes, keep off the excess of ticks by applying once per week over places where ticks are most frequently found on the animals, crude Beaumont oil, or a 20 per cent. kerosene oil emulsion.

Immune animals are injured to some extent by supporting an excessive number of ticks.

In looking for accurate results from a large number of inoculations I wrote Dr. Francis of the Texas Experiment Station, and he kindly gave me the valuable facts which you may see in his letter published below.

Notice that out of 1,500 animals inoculated by him 3½ per cent. were lost by inoculation fever and less than 7 per cent. by exposure to tick inoculation after recovery from defibrinated blood inoculation. Remember that the vast majority of the cattle inoculated by him were placed in large pastures on ranches where little or no attempt was made to keep off ticks; and that in many previous instances Northern-bred cattle under like conditions had a mortality as high as 50 to 90 per cent.

College Station, August 5, 1901.

Dr. C. A. Cary, Auburn, Ala.

Dear Doctor—I have your letter of the 2nd in regard to our experiments with Texas fever. I am preparing a bulletin on the subject now and hope to have it off within six weeks. I have inoculated about 1,500 calves. These run all the way from a few months old to two years of age. I cannot tell you without several hours' work just how many of each age. I may say, however, that the best age is about one year old. The best time of the year is any time from November to March.

We consider one cubic centimeter as a standard dose. We use all the way from one-half of one cc to two cc, but one cc is a standard dose. We take the blood direct from the jugular vein of any Texas-raised animal that is in good health. We usually take something that is two or three years old, so as to avoid the transmission of tuberculosis.

As a general rule, we make two inoculations. I think, however, that one is enough, but we use two merely to be sure of an infection. If the time between inoculation and exposure to ticks is several months, I favor two inoculations.

I think that all our calves born in Texas are susceptible to fever, but pass through it while they are still young. I have seen some of our calves with the acute fever and passing red urine that were born and raised here. If they be raised in a pen, say in town, the death rate is pretty high among them, but those that are raised out in pastures the death rate is very low, and the attacks escapes ordinary observation.

The mortality from inoculation fever is about 3½ per cent. Dr. Conoway has written me the exact number that he has done, and the mortality. It is essentially the same as ours, but I hardly feel at liberty to give you his data. He will certainly supply you with it if you write him. I am yours very truly,

M. FRANCIS.

P. S.—To make a general statement will say that we now save about 90 per cent. of all Northern cattle brought into this country. M. F.

TABLE I—Temperature Records of Registered Northern-Bred Cattle, Inoculated with Defibrinated Blood.

DATE.	Admiral.		Baroness.		Champion.		Gazelle.		Clemantina.		Charley.	
1899.—1900.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.
Dec. 26	.....	100.6	.....	102.6	.....	103.0	.....	102.6	.....	101.6	.....	102.6
Dec. 27	102.0	101.4	102.2	100.8	100.0	102.2	100.4	102.0	102.0	101.6	100.4	100.4
Dec. 28	104.4	101.8	100.4	101.6	100.8	102.0	100.2	101.6	100.0	101.6	100.6	102.4
Dec. 39	101.6	102.2	101.2	102.2	101.4	102.8	101.6	102.6	101.4	101.2	100.8	102.8
Dec. 30	101.8	101.4	101.4	102.6	101.8	102.2	101.8	102.2	101.4	101.8	101.6	102.2
Dec. 31	101.8	101.8	101.8	101.2	101.2	102.2	101.8	101.8	101.4	101.4	102.0	102.2
Jan. 1	101.8	102.0	101.8	102.8	102.2	102.4	101.8	102.2	101.4	101.4	103.2	101.6
Jan. 2	102.0	101.6	101.8	103.0	101.8	102.6	101.2	102.6	101.0	102.0	102.2	102.4
Jan. 3	102.4	102.0	102.4	102.6	102.8	102.6	101.4	102.4	101.0	101.6	102.4	102.2
Jan. 4	101.4	102.0	103.4	103.0	101.4	102.8	101.6	102.4	101.4	101.4	100.8	102.4
Jan. 5	102.2	102.0	104.2	103.6	102.2	103.6	101.4	102.4	100.4	101.4	102.0	102.2
Jan. 6	101.4	101.4	104.8	104.6	102.0	102.4	101.6	103.0	101.2	102.0	101.8	102.0
Jan. 7	101.4	102.0	104.2	104.2	102.0	103.8	103.8	104.6	100.8	101.0	101.8	102.0
Jan. 8	102.0	101.8	103.0	104.8	102.6	102.2	103.2	103.4	101.4	101.8	101.8	102.0
Jan. 9	101.6	102.8	103.6	104.8	102.6	103.0	101.4	103.2	101.2	101.6	102.0	102.2
Jan. 10	101.8	101.6	103.8	105.0	102.5	103.2	104.0	104.2	101.2	102.4	101.8	102.5
Jan. 11	102.2	102.4	104.8	104.0	104.2	104.0	104.4	104.2	102.0	102.2	102.2	102.8
Jan. 12	101.3	101.6	102.4	103.2	101.8	101.8	103.4	104.8	101.8	102.2	101.0	101.4
Jan. 13	101.6	101.8	103.0	104.0	101.6	102.6	104.0	105.4	102.0	101.8	102.0	102.0
Jan. 14	101.6	101.8	103.2	104.6	102.0	102.1	104.6	104.3	101.2	102.0	100.8	101.6
Jan. 15	101.4	101.8	103.6	104.4	102.0	103.4	103.4	103.0	101.6	101.8	101.8	102.5
Jan. 16	101.6	102.8	104.1	105.2	102.0	103.4	102.2	102.6	101.4	101.8	101.4	101.8
Jan. 17	101.4	101.2	103.6	104.8	102.8	103.2	102.4	102.4	102.0	101.6	101.2	102.6
Jan. 18	102.8	103.4	104.6	105.4	102.3	103.0	102.8	103.2	101.0	101.4	102.2	102.2
Jan. 19	102.0	102.0	103.6	103.6	103.0	103.8	102.2	103.6	101.0	101.6	101.5	103.0
Jan. 20	102.0	102.4	103.8	105.0	101.8	101.4	103.0	104.4	101.4	101.6	102.2	101.8
Jan. 21	101.2	102.0	103.0	104.2	102.2	103.2	104.0	104.2	100.2	101.0	101.6	102.2
Jan. 22	101.6	103.1	105.2	105.4	102.2	102.9	103.6	104.2	101.2	101.4	102.2	103.2
Jan. 23	102.0	102.0	102.2	103.4	101.8	103.2	103.4	103.8	101.0	102.4	103.0	103.8

Jan. 24	101.6	103.2	102.6	104.0	102.0	102.4	102.8	103.2	101.0	102.2	102.6	103.4
Jan. 25	103.4	103.2	102.8	103.4	102.8	104.2	102.6	102.2	101.0	102.6	102.8	103.0
Jan. 26	102.2	103.2	102.6	103.0	103.0	104.2	102.0	102.2	101.4	102.0	103.6	103.6
Jan. 27	104.0	104.4	102.2	102.8	103.0	106.0	101.8	101.4	102.0	101.8	103.0	103.8
Jan. 28	102.0	104.0	102.2	103.2	104.4	106.0	101.4	101.6	101.6	102.0	103.0	103.0
Jan. 29	103.4	104.8	103.2	103.4	103.6	106.0	101.6	102.2	102.2	102.2	102.2	102.8
Jan. 30	103.0	103.6	103.6	103.6	104.2	105.2	101.4	102.6	101.6	102.8	102.6	103.2
Jan. 31	103.0	103.4	102.8	102.4	105.0	105.6	102.4	102.6	101.2	102.8	102.6	103.0
Feb. 1	104.0	104.6	103.0	103.6	105.6	105.6	103.4	103.0	102.8	104.2	102.0	102.0
Feb. 2	102.6	103.6	102.8	103.6	105.2	105.8	103.0	103.4	102.6	105.0	102.0	102.0
Feb. 3	102.8	103.8	103.0	103.0	103.4	105.8	102.0	101.4	102.0	105.6	101.6	101.8
Feb. 4	102.6	102.6	102.8	103.0	105.0	105.2	101.8	102.2	101.6	104.4	101.4	102.2
Feb. 5	101.2	102.0	103.2	103.4	104.6	104.6	102.0	102.0	102.6	105.0	101.2	101.0
Feb. 6	102.8	102.0	102.6	103.0	105.6	105.8	101.6	102.0	101.4	103.0	102.2	102.0
Feb. 7	102.2	102.0	103.0	102.2	104.4	103.0	102.4	103.0	102.6	103.4	102.4	101.6
Feb. 8	102.0	102.0	103.0	102.6	102.4	102.0	102.2	102.6	102.4	103.2	102.0	101.8
Feb. 9	101.2	101.0	102.6	102.6	101.0	102.2	102.0	102.4	102.0	102.0	100.6	101.4
Feb. 10	101.4	101.8	103.0	102.6	102.4	101.8	102.4	102.6	102.0	102.2	102.0	101.6
Feb. 11	102.0	101.4	103.2	102.8	102.0	102.8	102.4	102.4	102.2	102.0	102.0	101.8
Feb. 12	102.0	101.6	103.4	103.4	104.0	101.8	102.0	102.2	101.6	102.4	102.4	101.4
Feb. 13	102.0	101.8	102.6	102.4	102.4	103.0	101.8	102.4	101.6	102.0	101.4	101.6
Feb. 14	101.0	102.0	102.0	102.0	101.8	103.4	102.6	102.0	101.4	101.6	102.2	102.6
Feb. 15	101.6	101.6	102.4	102.4	102.0	103.0	101.8	102.4	102.0	102.0	102.2	101.8
Feb. 16	101.2	102.0	102.4	102.8	101.8	102.4	102.0	102.4	101.2	102.0	101.8	102.8
Feb. 17	101.8	101.4	103.0	103.2	101.8	101.4	101.8	102.4	101.6	102.0	102.6	101.6
Feb. 18	100.8	101.4	103.4	103.6	101.4	102.4	102.4	102.6	101.8	102.4	102.0	102.4
Feb. 19	101.2	101.6	103.4	103.6	101.4	103.0	102.6	102.6	100.4	101.4	101.4	101.8
Feb. 20	101.8	101.4	102.8	103.4	102.4	102.4	101.4	101.4	100.8	102.0	102.0	102.0
Feb. 21	102.0	101.6	102.2	102.4	102.2	102.6	102.2	102.0	102.0	102.0	102.2	101.8
Feb. 22	101.2	101.6	102.2	102.2	101.8	101.8	101.4	100.6	100.8	101.4	101.2	102.2
Feb. 23	101.2	101.6	101.8	102.6	102.2	103.0	101.4	101.8	101.0	101.4	101.0	102.0
Feb. 24	101.4	101.8	101.8	103.0	102.0	101.8	102.0	102.2	101.4	101.8	101.8	102.0
Feb. 25	101.4	101.6	101.6	102.6	102.0	102.6	101.8	101.4	102.0	101.2	101.2	102.4

TABLE I.—Continued.

DATE.	Admiral		Baroness.		Champion.		Gazelle.		Clemantina		Charley	
1899.—1900.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.
Feb. 26	100.8	104.0	102.0	102.0	102.0	102.4	100.4	102.4	100.8	101.6	101.6	101.6
Feb. 27	101.4	103.4	102.0	105.2	101.4	102.8	101.8	101.6	102.0	102.4	101.8	101.6
Feb. 28	101.0	101.4	102.0	102.0	102.2	102.6	101.2	101.2	101.0	101.0	101.4	101.0
March 1	101.4	102.6	102.2	102.8	101.6	102.2	101.4	101.0	101.2	102.4	101.8	101.6
March 2	101.0	102.0	104.4	103.8	102.8	103.2	101.2	101.4	100.8	101.0	101.4	102.0
March 3	102.0	103.6	103.6	105.4	101.2	104.6	101.2	102.0	101.8	101.4	101.6	102.4
March 4	102.0	102.0	101.0	102.0	101.2	102.4	102.0	102.0	102.0	101.8	101.0	102.0
March 5	101.0	102.0	102.0	102.2	102.4	102.2	101.6	102.0	100.8	101.4	102.0	102.0
March 6	101.0	101.2	101.6	102.0	103.0	102.6	101.4	102.2	101.2	102.0	101.6	102.0
March 7	101.4	101.4	101.8	102.0	102.0	102.0	101.4	101.6	101.4	101.6	101.6	101.0
March 8	101.4	101.0	102.4	101.6	102.4	101.8	101.8	101.2	101.6	101.4	101.4	101.0
March 9	102.0	102.4	102.4	103.6	101.6	103.4	102.0	102.0	102.0	101.6	101.6	102.2
March 10	101.0	102.0	102.8	102.8	102.0	102.8	101.2	102.0	101.0	101.8	102.0	101.4
March 11	101.0	102.0	102.2	102.6	101.6	105.0	101.6	102.8	101.4	102.0	101.8	103.8
March 12	101.0	102.6	102.0	103.2	102.0	104.4	102.2	101.8	101.4	101.6	101.8	103.0
March 13	101.0	102.0	104.0	104.4	101.8	103.6	101.8	102.0	101.6	102.0	101.4	102.4
March 14	101.2	101.8	102.4	103.0	103.0	103.4	102.2	101.6	101.4	101.2	101.6	102.4
March 15	101.4	101.0	102.0	102.0	103.0	102.4	101.2	101.4	101.4	101.4	102.4	101.4
March 16	101.0	101.8	102.4	102.4	102.2	103.0	101.4	102.0	101.4	102.0	101.2	102.0
March 17	102.0	102.0	101.8	102.4	102.2	102.2	100.8	101.8	101.4	102.0	100.8	101.8
March 18	100.4	101.8	101.4	102.6	101.6	102.0	101.0	102.0	100.8	101.4	100.6	101.8
March 19	101.0	101.6	102.2	102.2	101.0	102.8	101.2	102.0	101.2	101.2	100.6	101.8
March 20	101.2	102.2	102.8	104.0	101.6	102.2	101.2	102.4	101.6	101.6	101.0	102.0
March 21	101.0	102.0	102.8	102.0	101.8	101.6	102.0	102.0	101.2	101.6	102.0	102.0
March 22	103.0	101.6	102.4	103.0	101.4	102.2	101.2	102.0	101.2	102.2	102.0	102.0
March 23	101.0	101.0	102.4	103.0	101.0	102.2	101.0	101.2	101.4	101.8	101.4	100.6
March 24	101.0	101.6	102.6	102.6	101.0	102.0	101.8	102.0	102.0	102.4	101.0	102.0
March 25	101.2	101.2	102.8	102.2	102.6	102.0	102.0	101.4	101.6	101.6	102.0	102.4
March 26	101.4	101.8	102.0	102.2	102.0	102.6	101.6	102.2	101.6	102.0	102.0	101.6

March 27	100.6	101.5	101.8	103.2	102.0	102.2	101.6	102.0	101.4	103.0	101.8	102.5
March 28	100.8	101.4	101.4	102.6	102.2	102.4	102.0	102.2	101.8	102.0	101.8	102.6
March 29	101.0	101.6	101.6	102.4	102.0	102.4	101.4	102.4	101.2	102.6	101.8	101.8
March 30	101.4	101.8	101.2	102.4	101.6	102.8	101.4	102.2	102.0	102.6	102.0	102.2
March 31	101.6	101.6	101.0	102.8	102.0	102.8	101.8	102.0	101.2	103.0	101.8	102.4
April 1	.....	.....	.....	.....	.....	.....	.....	.....	103.2	103.2	.....	.....
April 2	.....	.....	.....	.....	.....	.....	.....	.....	102.2	102.8	.....	....
April 3	.....	.....	.....	.....	.....	.....	.....	.....	.....	102.2	.....	.....
April 4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
April 5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

TABLE II.

Temperature Records of Registered Bulls which had Texas Fever as a result of Tick Inoculation the first Summer following Defibrinated blood Inoculation.

DATE.	Admiral.		Charley.		Champion.	
1900.	A. M.	P M	A. M	P M.		
August 10	.....	107.0	.....	107.0	.....	.....
August 11	105.8	106.2	106.2	106.0	.....	.....
August 12	106.4	106.4	105.4	104.8	.....	.....
August 13	106.0	104.8	103.0	101.8	.....	.....
August 14	105.0	106.6	101.0	102.8	.....	.....
August 15	101.8	100.8	101.0	102.0	.....	.....
August 16	100.0	101.0	101.2	103.0	.....	.....
August 18	.....	105.4	.....	105.8	.....	.....
August 19	107.0	107.4	105.0	105.4	.....	.....
August 20	106.0	105.6	104.8	106.3	.....	107.4
August 21	105.0	105.4	.....	104.8	.....	.....
August 22	103.6	105.0	105.0	102.8	106.0	105.0
August 23	103.0	105.0	101.8	102.4	102.4	102.4
August 24	100.6	104.8	102.0	103.4	101.0	102.4
August 25	104.0	104.8	102.0	102.4	103.0	104.0
August 26	104.0	104.9	101.8	104.0	102.0	104.6
August 27	104.0	104.2	101.8	102.4	101.2	101.8
August 28	103.0	105.0	101.8	104.4	102.0	100.4
August 29	103.0	105.0	101.8	105.0	106.0	105.0
August 30	103.0	104.2	102.4	104.4	102.8	105.4
August 31	103.0	104.2	.....	103.6	.....	105.2
September 1	103.4	104.2	.....	102.0	.....	102.2
September 2	103.2	103.8	.....	.....	.....	.....
September 3	103.0	103.9	.....	.....	.....	.....
September 4	103.0	104.4	.....	.....	.....	.....
September 5	103.6	104.4	.....	.....	.....	.....
September 6	103.0	104.2	.....	.....	.....	.....
September 7	103.0	104.2	.....	.....	.....	.....
September 8	104.0	103.8	.....	.....	.....	.....
September 9	103.0	104.8	.....	.....	.....	.....
September 10	103.0	104.3	.....	.....	.....	.....
September 11	103.0	104.6	.....	.....	.....	.....
September 12	103.4	104.8	.....	.....	.....	.....
September 13	102.8	103.0	.....	.....	.....	.....
September 14	103.0	103.8	.....	.....	.....	.....
September 15	102.8	104.6	.....	.....	.....	.....
September 16	102.8	104.8	.....	.....	.....	.....
September 17	102.6	103.8	.....	.....	.....	.....
September 18	102.0	102.8	.....	.....	.....	.....
September 19	101.6	104.8	.....	.....	.....	.....
September 20	101.6	104.4	.....	.....	.....	.....
September 21	101.4	104.4	.....	.....	.....	.....
September 22	102.4	104.2	.....	.....	.....	.....
September 23	101.8	104.6	.....	.....	.....	.....
September 24	101.6	104.8	.....	.....	.....	.....
September 25	102.8	105.0	.....	.....	.....	.....
September 26	102.2	103.8	.....	.....	.....	.....
September 27	102.2	105.0	.....	.....	.....	.....

TABLE II.—Continued.

DATE.	Admiral		Charley.		Champion	
1900	A. M.	P. M.	A. M.	P. M.	A. M.	P. M.
September 28	103.0	105.6	.....	.....	.....	.....
September 29	102.2	105.6	.....	.....	.....	.....
September 30	101.0	104.6	.....	.....	.....	.....
October 1	101.8	103.8	.....	.....	.....	.....
October 4	104.0	104.6	.....	.....	.....	.....
October 6	103.2	104.4	.....	.....	.....	.....
October 7	103.2	104.6	.....	.....	.....	.....
October 8	.....	103.6	.....	.....	.....	.....
October 9	.....	102.8	.....	.....	.....	.....
October 10	.....	103.6	.....	.....	.....	.....
October 11	.....	102.8	.....	.....	.....	.....
October 12	.....	102.8	.....	.....	.....	.....
October 14	.....	102.8	.....	.....	.....	.....
October 19	.....	103.2	.....	.....	.....	.....
October 20	.....	104.0	.....	.....	.....	.....
October 21	.....	102.8	.....	.....	.....	.....

CLINICAL RECORDS OF THE ANIMALS INOCULATED WITH DEFIBRINATED BLOOD.

All of the cattle that were inoculated at Auburn were stabled at night, carefully handled during the entire period of inoculation. The ticks were kept off by weekly applications of kerosene oil emulsion. Neither cotton seed nor any of its products were fed them during the inoculation periods. Unless otherwise mentioned, the blood used in the inoculations was derived from a two-year-old Southern-bred Jersey heifer, which had been infested with ticks during its second summer, and had been tested for tuberculosis.

1. Admiral (see Table I), a red poll bull, bred in Illinois, arrived in Alabama Nov. 11, 1899, at the age of ten months, weighing 742 lbs. December 26, 1899, was inoculated with 1 cc of defibrinated blood. Very little, if any, primary inoculation fever occurred; but a fairly good secondary inoculation fever began January 25, 1900 (30 days after the inoculation), and continued until February 4. He was inoculated a second time February 21, 1900, with $1\frac{1}{2}$ cc of defibrinated blood. A very slight rise of temperature appeared on February 26 and 27, March 3 and 4, and March 22. The inoculation fever periods in this animal were all more or less irregular, very slight or absent, excepting the secondary inoculation fever following the first inoculation. During the entire inoculation periods he exhibited no signs of ill health. Ticks first appeared upon him June 16. July 21 he was very much depressed or dumpish. August 10 he began to breathe rapid and shallow; morning temperature 107, and at noon 108 degrees Fah., remaining at about 106 for the next four days; then it dropped to normal for two days, rising to 107.4 on August 19. His

temperature ranged between 103 and 105 until September 15, remaining above normal nearly all of the time from August 19 to October 1. Thereafter there were occasional or irregular rises in his temperature (see his temperature record in Table II). When the high fever began his urine became highly colored (port wine color), and was excreted in large quantities; this condition continued for more than a week. The urine contained a large quantity of albumen.

August 11, about the beginning of the fever, his bowels became inactive; he was first given Epsom salts, and then raw linseed oil with rectal injections of warm water,—the last being given three times per day. But the moderate doses of purgatives and large enemas failed to produce a normal action of the bowels for 14 days. His bowels began to act August 26, and the feces were very soft, dark in color and many times were covered with gelatinous mucus. His appetite was almost entirely lost; he nibbled at bran, sorghum, hay and grass; but did not ruminate until he began to recover. Digestion was almost entirely suspended. During the suspension of digestion, fermentation and bloating were controlled by giving internally dram doses of creolin and by using the trocar and canula (tapping the rumen or pounch to let out the gas). His weakness caused him to lie down much of the time. About August 26 he began to improve, his appetite became a little better; rumination and digestion were resumed, and his bowels began to act freely; yet recovery was slow and in fact he has not yet completely recovered. Periods of improvement and periods of depression have appeared irregularly for twelve months. August 8, 1899, two days before the fever began, he weighed 1027 lbs., and September 24, 805 lbs.; March 30, 1901, 775 lbs.; October 5, 1901, 905 lbs. His appetite, digestion and assimilation

have been deficient; have been below normal, and consequently very little improvement has been made.

August 13, 1900, there were 4,175,000 red cells in 1 ccm. of his blood.

August 20, 1900, there were 4,550,000 red cells in 1 ccm. of his blood.

August 23, 1900, there were 4,400,000 red cells in 1 ccm. of his blood.

August 17, 1901, there were 6,400,000 red cells in 1 ccm. of his blood.

September 26, 1901, there were 7,090,000 red cells in 1 ccm. of his blood.

The treatment of Admiral during the fever was directed toward keeping the bowels active by using rectal injections of warm water, and by giving, per mouth, small doses of raw linseed oil,—creolin and tapping being used to control bloating. Quinine in 30 to 120 grains doses were given every six hours to destroy the micro-parasite which causes the disease. To keep up heart action and tide over periods of great depression and weakness, tincture of digitalis was given in 2 to 4 fluid dram doses; also tinct. of nux vomica was used to stimulate the heart. Gention was given as a stomachic to improve the appetite and digestion after the acute stage had passed; also tincture chloride of iron and Fowler's solution of arsenic were tried, with the idea that they would increase the hæmoglobin and number of red blood corpuscles. But no appreciable results followed the use of the last two named drugs.

Clemintina (see Table I), a registered red poll heifer, bred in Illinois, was 1 year old when shipped to Auburn, Ala., arriving November 8, 1899, and then weighed 770 lbs. December 26 she was inoculated with 1 cc of defibrinated blood. She had no primary inoculation fever,

and a very slight secondary fever appeared February 1 to 8, about 36 days after inoculation. February 21 she received a secondary inoculation of 1½ cc of defibrinated blood. A very slight elevation of temperature occurred about 40 days after the second inoculation. Of all the six full blood cattle inoculated at the same time she reacted the least. During the shipment she accidentally got with calf and aborted July 26. Preceding and following the abortion she had some fever and it is very probable that the abortion was caused by the fever. According to the Australian authorities Texas fever produced by defibrinated blood inoculation is often attended by abortion in pregnant cows. This heifer has kept in the best condition, and has made an almost continuous growth from the time of her arrival in Alabama to the end of her second summer. November, following her first summer she weighed 1020 lbs. at 2 years old, and on August 10, 1901, she weighed 1190 lbs. She dropped a bull calf about September 20, 1901.

Champion of Alabama, (see Tables I and II), a shorthorn bull, bred in Missouri, arrived at Auburn, Ala., November 8, 1899, at the age of 7 months, weighing 472 lbs. In shipping he caught cold and had an attack of bronchitis the first week after his arrival in Alabama. December 26 he was inoculated with 1 cc of defibrinated blood. If primary fever appeared it lasted only one day, on January 11. A well marked secondary inoculation fever occurred from January 28 to February 7, beginning 31 days after the inoculation, and continuing 12 days. February 21, 1900, he received a second inoculation of 1½ cc of defibrinated blood. The fever periods following the second inoculation were indistinct and irregular. During the secondary fever period of the first inocula-

tion he became very sluggish, lost his appetite and decreased about 20 lbs. in weight. This calf was weak and unthrifty when inoculated, and had days of dumpishness and loss of appetite during the entire winter. While the reaction to the inoculation was well marked for only one period, yet he seemed to be affected more by the fever than any of the other five animals that were inoculated at the same time. During the summer of 1900 and of 1901 he became infested with ticks at different times, and for a short time in August had a period of high fever, going as high as 107 one evening (see Table II). Thereafter he made rapid gains, and on August 10, 1901, he weighed 1200 lbs. His growth during the second summer has been very good.

Sixth Gazelle of Maple Hill (See Table I), a shorthorn heifer, bred in Missouri, arrived in Alabama November 8, 1899, at the age of 11 months, weighing 692 lbs. Was first inoculated December 26 with 1 cc of defibrinated blood. The primary inoculation fever began January 7, (12 days after inoculation), and continued until January 26 (19 days). The secondary inoculation fever appeared about January 31; it was very mild and not distinctly marked. On February 21, this heifer received a second inoculation of $1\frac{1}{2}$ cc of defibrinated blood, but no distinct fever reaction followed this inoculation. She lost her appetite one or two days, and had one day of short and rapid respirations during the primary fever of the first inoculation. February 16 and 22 a very few ticks were found on her. June 16 several ticks were found on her, having been in tick-infested pasture since April. July 16 she appeared dull and stupid, and July 24 her temperature rose a little above the normal; no doubt she had, at this time, a very mild attack of fever. She passed through the first summer

making good gains and growing. At the beginning of the inoculation period she weighed 685 lbs. at the close (April 4, 1900), 805. After this she passed her first and second summers and second winter, much of the time in tick-infested pastures. August 10, 1901, she weighed 1060 lbs., and August 11 dropped a fine 77-lb. heifer calf.

Baroness of Alabama, (see Table I), a full blood Angus heifer, bred in Illinois; arrived in Auburn, Ala., November 8, 1899, at the age of 8 months, weighing 520 lbs. December 26 she was inoculated with 1 cc of defibrinated blood. The primary inoculation fever began about January 2 to 4, and continued until about January 22. The secondary inoculation fever appeared about the last day of January and first of February. Following the primary fever occasional irregular rises of temperature appeared. February 21, 1900, she received her second inoculation of 1½ cc of defibrinated blood; the 9th and 10th days following the inoculation she had fever, and on the 20th day she had a temperature of 104 morning and evening. The primary inoculation fever following her first inoculation was good and continued longer than usual, and the heifer then became sluggish and off her feed. At time of first inoculation she weighed 555 lbs.; near the close of the primary fever 540 lbs.; at the close of the inoculation periods (April 4), 570 lbs.; September 1, 1900, 700 lbs.; March 30, 1901, 810 lbs.

Charley Gardner, (see Tables I and II), an Angus bull, bred in Illinois, arrived at Auburn, Ala., November 8, 1899, at the age of 8 months, weighing 605 lbs. December 26, 1899, he was inoculated with 1 cc of defibrinated blood. An almost imperceptible primary fever appeared about January 1. The secondary inoculation fever began January 22 (27 days after the inocu-

lation) and lasted abuot 10 days. At no time did his fever reach 104. On February 21, 1900, he received a second inoculation of 1½ cc of defibrinated blood. No fever followed this inoculation. After being infested with ticks some time in June or July, he had a rather severe attack of fever, beginning about August 10, when his temperature ran up to 107. This period of fever lasted three days; his temperature went up to 104-106 for four days. The fever checked his appetite and made him lose some in weight, but rumination, digestion and action of bowels were at no time completely suspended, as in Admiral's case.

August 8, 1900, just before the fever, he weighed 1015 pounds.

September 1, 1900, just after the fever, he weighed 930 pounds.

August 10, 1901, near close of his second summer, he weighed 1450 pounds, when about 30 months old.

REMARKS ON INOCULATION OF THE SIX CATTLE IN TABLE I.

One positive mistake that we made with the three full blood bulls which were inoculated at the same time as the three full blood heifers, was that they were not permitted to get ticks on them early in the spring immediately following recovery from the inoculation fever. The heifers were turned out with the herd cows and became infested with ticks early in the spring, while the bulls were kept by themselves in small pasture lot, and did not, in fact, get but few ticks on them until July, when the weather was hot, a dangerous time for fever. Another mistake was made in the second inoculation of all those that did not react well to the first inoculation. The second inoculation dose (coming from same source

as first) should have been 2½ cc instead of 1½ cc. The fever must be produced by the inoculation at least once and if possible twice before the animal is safely immune. The temperature should run up to, at lowest, 104 to 105.

TABLE III.

Temperature Records of Northern-Bred Grades that were Inoculated with Defibrinated Blood.

DATE.	S. H. GRADE		A GRADE I		A. GRADE II		A GRADE III	
1899—1900	A.M	P. M.	A.M.	P. M	A.M.	P. M	A.M.	P. M.
Nov. 24	102.0	102.0	104.0	103.0	102.0	102.6	102.6	105.0
Nov. 25	102.0	102.0	102.0	102.0	102.0	102.6	101.6	103.0
Nov. 26	102.0	102.0	102.0	102.6	102.0	102.0	102.2	102.6
Nov. 27	102.0	101.0	102.0	102.0	102.0	102.6	102.2	103.0
Nov. 28	102.4	103.0	102.6	102.0	102.0	103.0	102.0	102.0
Nov. 29	102.2	103.0	102.0	102.0	102.0	102.6	101.0	103.0
Nov 30	102.4	103.0	102.0	102.6	102.2	102.4	101.4	103.0
Dec. 1	104.0	104.0	102.0	102.6	103.6	104.0	102.6	103.6
Dec. 2	102.4	103.6	102.0	103.0	102.2	103.0	101.4	104.0
Dec. 3	102.4	102.4	102.0	101.6	102.0	102.2	103.0	102.2
Dec. 4	103.0	103.0	102.2	102.6	102.4	102.0	103.0	103.4
Dec. 5	103.2	102.8	102.0	102.4	102.0	102.2	103.4	102.6
Dec. 6	100.0	102.0	102.0	103.0	102.0	102.0	102.6	104.0
Dec. 7	101.6	102.0	102.0	103.0	102.0	103.2	101.6	103.0
Dec. 8	101.0	102.0	102.0	102.6	102.4	103.0	101.6	103.0
Dec. 9	102.6	102.6	103.0	103.6	102.0	102.2	101.0	102.0
Dec. 10	102.0	103.0	102.6	103.6	102.6	103.0	102.6	103.2
Dec. 11	104.0	103.0	103.0	103.2	103.0	103.4	102.6	103.4
Dec. 12	100.4	103.0	102.0	103.4	102.8	102.0	102.0	103.6
Dec. 13	100.6	102.6	102.0	102.4	101.8	103.0	100.8	104.0
Dec. 14	102.0	103.4	102.4	103.0	102.0	103.2	102.6	103.4
Dec. 15	100.0	102.0	102.0	103.0	102.0	102.4	101.4	102.6
Dec. 16	100.2	102.6	102.4	103.0	102.0	103.0	102.2	103.4
Dec. 17	101.2	102.6	102.6	103.0	102.0	102.6	102.4	103.2
Dec. 18	102.0	102.6	103.0	103.0	100.0	102.0	102.0	103.0
Dec. 19	102.2	103.6	102.6	104.0	102.4	103.6	100.0	103.0
Dec. 20	102.2	103.2	102.0	103.0	102.2	103.0	102.0	103.4
Dec. 21	102.6	102.6	102.6	102.8	102.0	103.0	102.4	102.4
Dec. 22	102.0	102.2	102.6	102.6	102.4	103.0	102.6	102.8
Dec. 23	101.0	102.0	102.6	103.0	102.0	103.0	101.0	103.0
Dec. 24	102.2	102.4	102.6	102.6	102.4	103.0	102.0	102.6
Dec. 25	101.0	102.0	102.4	103.0	102.0	102.4	102.2	102.4
Dec. 26	100.8	102.0	102.0	102.6	102.4	103.0	102.2	102.4
Dec. 27	100.0	102.0	102.4	103.0	102.2	102.6	102.2	102.6
Dec. 28	102.6	102.6	102.6	102.6	102.4	102.6	102.0	102.6
Dec. 29	102.0	102.0	102.6	103.0	102.4	102.0	102.0	103.0
Dec. 30	102.2	102.4	102.6	103.0	102.4	102.6	102.0	102.6
Dec. 31	102.0	102.4	102.6	103.2	102.0	102.4	102.4	102.6
Jan. 1	101.0	102.0	102.4	103.2	102.0	102.6	102.2	102.4
Jan. 2	102.0	102.2	102.0	102.2	101.6	102.0	102.4	102.6
Jan. 3	102.0	102.4	101.4	102.6	101.0	102.0	102.2	103.0
Jan. 4	102.2	102.6	102.0	102.2	102.0	102.2	102.0	105.0
Jan. 5	102.0	102.2	102.6	102.6	102.0	102.2	101.2	102.0
Jan. 6	101.0	102.0	102.2	102.6	102.4	102.6	102.0	102.0
Jan. 7	102.0	102.2	102.6	103.0	102.6	102.6	102.4	102.6
Jan. 8	102.0	102.4	102.0	102.4	102.2	102.6	102.0	102.2
Jan. 9	102.2	102.6	102.4	102.6	102.6	103.0	102.6	103.0
Jan. 10	101.6	103.0	102.6	103.0	102.6	102.6	102.0	102.6

TABLE III.—Continued.

DATE	S. H. GRADE		A. GRADE I		A. GRADE II		A. GRADE III	
1899—1900.	A M	P. M.	A M	P M	A.M.	P.M	A. M	P. M.
Jan. 11	103.0	103.0	102.6	103.0	103.0	103.2	103.4	103.0
Jan. 12	102.2	101.6	102.0	102.0	102.6	102.4	103.0	102.6
Jan. 13	102.2	102.0	102.0	102.4	102.6	102.6	102.6	103.0
Jan. 14	101.6	102.0	102.6	102.6	102.6	103.0	102.0	102.6
Jan. 15	102.4	102.6	102.6	102.6	103.0	102.6	102.6	102.4
Jan. 16	102.6	102.0	102.6	102.4	103.0	102.6	102.6	102.6
Jan. 17	102.2	102.4	102.6	102.0	103.0	102.6	102.0	102.0
Jan. 18	103.0	102.6	103.2	102.4	103.4	103	0.103.0	102.2
Jan. 19	103.0	102.4	103.0	102.4	103.6	103.0	102.6	102.2
Jan. 20	102.2	102.4	102.2	102.6	103.6	103.0	102.0	102.6
Jan. 21	102.4	102.6	102.0	102.6	102.6	103.0	102.0	102.6
Jan. 22	102.0	102.4	103.0	102.0	102.6	102.2	102.0	102.2
Jan. 23	102.0	102.2	102.0	102.4	102.6	102.6	102.2	102.6
Jan. 24	.....	102.4	.....	102.2	.....	102.6	.....	102.0
Jan. 25	102.0	102.6	102.0	102.6	103.0	102.6	103.0	102.2
Jan. 26	102.0	102.4	102.0	102.6	102.6	102.4	102.4	102.6
Jan. 27	102.0	102.4	102.0	102.6	102.6	103.0	102.0	102.4
Jan. 28	102.0	102.2	102.0	102.6	102.2	102.4	102.0	102.2
Jan. 29	102.0	102.2	102.0	102.6	102.6	103.0	102.0	102.2
Jan. 30	101.4	102.0	102.0	102.0	102.0	102.2	101.6	102.0
Jan. 31	102.4	102.6	102.4	102.6	102.6	103.0	102.4	102.6
Feb. 1	102.2	102.0	102.0	102.4	102.6	102.0	101.0	102.0
Feb. 2	102.4	102.0	102.6	103.0	103.0	103.0	103.0	103.2
Feb. 3	102.0	102.0	102.0	102.2	102.6	102.2	102.0	103.0
Feb. 4	102.4	102.0	102.6	102.6	102.6	102.4	102.6	102.6
Feb. 5	102.0	102.0	102.4	102.0	102.6	102.4	102.4	102.0
Feb. 6	103.0	102.6	103.0	102.6	102.6	102.4	102.6	102.4
Feb. 7	103.2	102.6	103.0	102.0	103.0	102.2	102.6	102.0
Feb. 8	104.0	103.0	103.2	102.6	103.2	103.0	103.0	102.6
Feb. 9	102.6	102.0	103.0	102.6	102.6	102.6	102.0	102.0
Feb. 10	103.0	102.6	103.0	102.6	102.6	102.4	102.2	102.2
Feb. 11	102.0	102.0	102.6	102.0	102.6	102.0	102.0	101.6
Feb. 12	103.4	103.0	102.6	102.0	103.0	102.6	103.0	102.6
Feb. 13	102.6	102.4	102.0	102.4	103.0	102.6	102.0	102.0
Feb. 14	102.6	102.0	102.0	103.0	102.0	102.0	102.6	102.0
Feb. 15	102.0	102.2	102.0	102.6	102.6	102.6	103.0	103.0
Feb. 16	102.6	103.0	102.0	102.6	102.4	102.2	102.4	102.0
Feb. 17	102.6	102.6	102.0	102.4	102.2	102.4	102.2	102.0
Feb. 18	102.6	102.4	102.0	102.0	102.4	102.0	102.0	102.0
Feb. 19	102.6	102.0	101.2	102.6	102.0	102.2	102.0	102.0
Feb. 20	101.6	102.0	102.0	102.4	102.4	102.6	103.0	102.6
Feb. 21	102.2	102.6	102.0	102.2	102.4	102.6	102.4	102.6
Feb. 22	102.0	102.2	102.0	102.1	102.6	102.2	102.6	102.4
Feb. 23	101.2	.....	102.0	.....	102.6	.....	102.6	.....

The four Northern-bred grades that were brought to Auburn, Ala., November 8, 1899, with the six full bloods, were inoculated one month before the full bloods, and were differently handled and fed. They were all inoculated the first time November 24, 1899, with 1 cc of defibrinated blood, derived from the same two-year-old Southern-bred Jersey heifer; and on January 24, 1900, they all received a second inoculation of 1½ of defibrinated blood. During the inoculation periods they were fed small rations of bran and very poor hay; housed at night and bad days, and allowed the run of a dry lot on good days. (See temperature records in Table III).

Shorthorn Grade Heifer, bred in Missouri, about 8 months old at time of arrival in Alabama, and weighed 320 lbs. The primary fever began about November 28 or December 1, and continued until about December 5th. and rose slightly again December 9, 10 and 11. Her temperature came up again December 18, and irregular slight elevations of temperature occurred until the second inoculation on January 24. During this first period a low fever prevailed, and the heifer exhibited weakness and an unthrifty condition. The low fever following the second inoculation was a little higher and more unbroken or continuous than the fever following the first inoculation. This heifer was not in good condition at the beginning of the inoculation periods, and was not fed a sufficient quantity of good feed during the fever. A liberal supply of good feed is always essential during inoculation fever. She was turned into a tick-infested pasture about March 1, and became so badly infested with ticks in April that it was necessary to get her up and treat her with kerosene oil emulsion in order to remove them. This heifer did make some growth during her first summer, but did not begin

to improve in a normal, healthy manner until the spring of 1901. September 1, 1901, she weighed about 800 lbs.

Angus Grade Heifer No. I; bred in Illinois, about 8 months old at time of arrival in Auburn, Ala. About December 8 the primary reaction began. Slight irregular rises of temperature occurred every few days until second inoculation on January 24, 1900. Primary reaction began about February 6, and lasted about 4 days. February 23 she was turned into tick-infested pasture with the herd, and became infested with ticks early in the spring. She made good gains in flesh during the summer, and on November 10, 1900, weighed 725 lbs. During the second summer she developed without any checks, and now weighs about 900 lbs.

Angus Grade Heifer No. II, bred in Illinois, at time of arrival in Auburn, Ala., 8 months old, and weighed 415 lbs. Primary inoculation fever appeared about December 1. Secondary inoculation fever not very difinitely located, but probably began about January 9. Temperature rises were irregular and very mild, following both first and second inoculations. She never showed symptoms of ill health and at the end of the inoculation periods she weighed 490 lbs. She was turned into a tick-infested pasture and became infested with ticks early in the spring, and never showed any signs of sickness, weighing at the end of the first summer 670 lbs. At the end of the second summer she weighed about 800 lbs.

Angus Grade Heifer No. III; bred in Illinois, about 8 months old at time of arrival in Auburn, Ala., and weighed 420 lbs. About December 1 the primary reaction began. The secondary inoculation fever not very distinctly located unless January 7 to 13 or January 18 to 24 be so regarded. The primary reaction following

the second inoculation began about February 3, and the secondary reaction appearing about February 20. No reaction is high or very distinctly located. This heifer was very wild and mean to handle, and was not fed during the first and second summers and the second winter, as were Nos. 1 and 2. At the end of the first summer she weighed 610 lbs., and in September, 1901, she weighs about 800 lbs. She became infested with ticks the first summer and several times since, but has never exhibited any signs of ill health.

TABLE IV.

Temperature Records of four Registered Angus Calves. Inoculated with Defibrinated Blood.

DATE	Barnes, H. I		Barnes, H. II		Barnes, B.		Little B.	
1900.	A. M.	P. M.	A. M.	P M	A. M.	P.M.	A. M.	P. M.
February 13	103.0	102.6	103.0	102.6	102.0	102.2	.....	.....
February 14	102.0	103.6	102.6	102.6	102.0	103.6	.....	.....
February 15	102.6	103.0	102.6	103.0	101.6	102.0	.....	.....
February 16	102.6	103.2	102.6	103.0	102.0	103.0	.....	.....
February 17	102.6	103.2	102.6	103.2	102.0	103.0	.....	.....
February 18	102.6	102.0	102.6	102.0	102.0	102.2	.....	.....
February 19	102.0	103.2	102.0	104.0	101.0	103.0	.....	.....
February 20	103.0	103.2	103.4	103.6	101.6	103.0	.....	.....
February 21	103.4	103.6	103.6	105.0	102.0	105.0	.....	103.0
February 22	102.0	103.6	102.6	103.6	102.0	102.0	102.0	102.0
February 23	102.6	103.0	103.0	104.0	102.0	102.6	102.0	102.0
February 24	102.6	102.6	103.0	102.6	102.0	102.0	103.0	102.0
February 25	102.6	103.0	102.6	102.6	102.0	102.2	102.6	102.0
February 26	104.6	103.0	103.2	103.0	101.2	102.0	102.0	102.0
February 27	103.6	103.0	103.0	103.2	101.6	102.0	102.0	102.0
February 28	102.6	102.2	102.0	102.0	102.0	102.0	102.0	102.0
March 1	102.6	102.4	102.0	102.0	102.2	102.0	102.2	102.0
March 2	102.6	103.0	103.0	104.0	102.0	103.0	103.0	104.0
March 3	102.0	102.6	102.0	102.6	103.0	102.6	104.0	105.0
March 4	103.0	103.6	102.6	103.0	102.0	103.0	104.0	104.0
March 5	102.6	103.0	102.0	102.6	102.0	102.6	105.0	106.0
March 6	102.6	103.0	102.6	103.0	102.0	102.6	106.0	106.0
March 7	102.0	102.6	102.6	102.6	102.0	102.0	106.0	105.2
March 8	102.0	102.0	102.0	102.0	101.2	102.0	104.2	103.4
March 9	102.0	102.6	102.0	102.6	102.0	104.0	102.6	103.0
March 10	103.0	103.0	103.0	103.0	103.0	102.6	103.0	103.0
March 11	103.0	103.6	103.0	102.6	103.0	103.0	102.6	102.0
March 12	102.6	102.6	102.6	102.6	103.0	102.6	102.0	102.0
March 13	102.4	102.6	102.4	102.6	103.0	103.0	102.0	103.0
March 14	103.0	103.0	103.0	103.0	102.0	103.0	104.4	105.0
March 15	102.6	102.4	103.0	102.6	104.0	103.0	104.0	103.2
March 16	102.6	103.4	102.0	103.4	101.6	103.0	103.0	102.0
March 17	102.2	102.0	102.0	102.6	102.0	102.6	102.0	102.0
March 18	102.4	103.0	102.0	102.6	102.0	102.6	102.0	102.0
March 19	102.6	103.0	102.6	103.4	103.6	103.0	102.6	101.4
March 20	103.0	102.6	103.0	102.6	103.2	103.0	102.6	102.0
March 21	102.0	103.0	102.4	103.2	103.0	103.6	102.6	102.2
March 22	103.0	103.2	102.0	102.6	102.6	102.6	102.0	102.0
March 23	103.0	103.2	102.6	103.2	103.4	104.0	102.4	102.6
March 24	102.0	102.0	103.0	102.6	103.0	103.0	103.0	102.0
March 25	102.6	102.4	102.6	103.0	103.0	103.4	102.6	102.0
March 26	102.2	103.0	102.4	103.0	102.4	103.0	102.0	102.2
March 27	102.0	103.0	102.0	102.6	102.6	103.2	102.2	.....
March 28	102.0	102.6	101.6	102.6	102.6	103.0	.....	.....
March 29	102.0	102.2	102.0	102.0	102.0	102.6	.....	.....
March 30	102.6	102.6	102.0	102.2	102.6	103.0	.....	.....
March 31	102.0	102.4	102.0	102.6	102.2	103.0	.....	.....
April 1	102.6	103.2	102.0	102.0	102.6	102.6	.....	.....
April 2	102.6	102.2	102.4	103.0	102.2	103.0	.....	.....
April 3	102.6	102.4	102.0	102.0	103.0	102.6	.....	.....
April 4	102.6	102.4	102.2	102.0	103.0	103.0	.....	.....
April 5	102.0	.....	102.0	.....	102.2	.....	.....	.....

In Table No. 3, "Barnes, H., I," "Barnes H., II," and "Barnes, B.," represent two heifers and one bull. They are full blooded Angus calves about 6 months old at time of their arrival in Alabama, and were bred in Illinois. February 11 they arrived in Auburn, Ala., and February 13 they were each inoculated with 1 cc of defebrinated blood derived from the same two-year-old Alabama-bred Jersey heifer. The inoculation fever periods are fairly well marked (see Table No. IV), but are somewhat irregular. These calves were fed shorts, corn meal, and received daily from 3 to 4 gallons of milk from two Alabama-bred Jersey cows. The milk very probably had no immunizing power, but it kept these calves in excellent condition to withstand the inoculation fever. They all grew and gained in weight during the inoculation period. April 5, 1900, they were taken to the home of their owner, Hon. R. B. Barnes, Opelika, Ala., where they have spent two summers without showing any symptoms of Texas fever. The heifers were turned into tick-infested pastures and the bull was kept by himself in a small pasture where he did not get many ticks on him the first summer. Consequently in November following the first summer the bull was given a second inoculation of $1\frac{1}{2}$ cc of defibrinated blood. The cattle have suffered no inconvenience from the inoculation, and the exposure to tick inoculation during the second summer.

The "Little B." in Table No. IV. represents an Angus bull calf, bred in Missouri. He arrived at Auburn, Ala., February 20, 1900, and was then about 10 months old. This calf was small and thin at time of arrival, but on February 21 he was inoculated with 1 cc of defibrinated blood from the same Alabama-bred Jersey heifer. Notice by the table that his reactions or inoculation fever periods were better marked than were those of the

Barnes calves. This is partly due to the fact that he was older and was not fed milk to keep him stronger and better able to resist the micro-parasites. He was fed shorts, wheat bran and corn meal, and maintained a growing appetite and made good gains in weight during the entire 35 days he was in Auburn. When shipped to his owner, Mr. W. G. Little, Livingston, Ala., he could not be forced into the small crate in which he came to Auburn from Missouri. This animal has now passed two summers in Alabama, and has never exhibited any signs of Texas fever.

TABLE V.—SUMMARY OF CATTLE INOCULATED WITH DEFIBRINATED BLOOD IN ALABAMA.

No.	OWNER.	BREED.	AGE.	Native State.	Time of Arrival in Ala.	First Inoculation.	Dose.	Second Inoculation.	Dose.	Deaths from Inoculation.	REMARKS.
3	Expt. Station,	Angus grades	8 mo's.	Ill.....	Nov. 8	Nov. 24	1cc	Jan. 24	1.5cc	.....	
1	" "	S. Horn grade	8 "	Mo....	"	"	1cc	"	1.5cc	....	
1	" "	S Horn Bull .	8 "	Mo.....	"	Dec. 26	1cc	Feb. 24	1.5cc	...	
1	" "	S.Horn Heifer	1 year.	Mo....	"	"	1cc	"	1.5cc	.....	
1	" "	R. Poll Bull	1 "	Ill.	"	"	1cc	"	1 5cc	.....	Had severe fever following Summer.
1	" "	R. Poll Heifer	1 "	Ill. ...	"	"	1cc	"	1.5cc	.....	
1	" "	Angus Bull ..	8 mo's.	Ill.	"	"	1cc	"	1 5cc	.....	
1	" "	Angus Heifer.	8 mo's.	Ill.....	"	"	1cc	"	1.5cc	.....	
1	Barnes,.....	Angus Bull.	6 mo's,	Ill.....	"	Feb. 12	1cc	Nov.	1.5cc	.....	Given Jersey milk during Inoc.
2	"	Angus Heifers	6 mo's.	Ill.	Feb. 9	"	1cc	.....	.....	.....	" " " " "
1	Little.....	Angus Bull .	10 mo's	Mo....	"	Feb. 21	1cc	.....	.....	.....	
1	Dumas.....	S. Horn Bull..	9 mo's.	Tenn. .	Feb. 20	Nov	1cc	.....	....	.....	Passed first sum'r without fever
2	"	S. Horn H. .	9 mo's.	"	Nov.	"	1cc	.....	....	.....	" " " " "
1	Mr. G.....	Herefords....	2 years	Mo.....	"	Mch 13.	2cc	.....	....	.....	
1	T. and P.....	Jersey H....	2 years.	Ky .. .	Winter.	Mch 14.	2cc	.....	....	1	The last nine were inoculated
1	Sadler.	Jersey H.....	2 years.	Ky.....	"	"	2cc	.....	.....	1	by Fred G. Matthews, of South
1	Proctor	Jersey H.....	18 mo's.	Ky.....	"	"	2cc	.....	.....	.....	Florence, Ala.
1	Thurman.....	Jersey B.	2 years.	Ky.....	"	"	2cc	.....	....	.....	
1	Cohens.	Jersey H.....	2 years.	Ky.....	"	"	2cc	.....	....	.....	
1	Nathan,.....	Jersey Cow ..	4 years.	Ky.....	"	"	2cc	.....	....	.....	
1	"	Jersey Calf...	6 mo's.	Ky.....	"	"	2cc	.....	....	.....	

The total number of cattle inoculated was 27, and out of this number two died of inoculation fever and one was seriously injured by severe attack of Texas fever as a result of tick inoculation the first summer. At least four others had the fever some time during the first summer but were not injured by it. Of the 18 inoculated by myself none were lost; one was seriously injured by tick inoculation the first summer, and four others had the fever in more or less mild form the first summer.

Clinical Notes on Dumas Short-Horns.

The two Shorthorn calves, owned by Dumas, of Arlington, Ala., were inoculated only once. (see Table V). This was done in November. The following August Mr. Joel Dumas writes me stating that about ten days after the calves were inoculated the primary inoculation fever appeared and continued about two weeks, the temperature ranging from 103 to 106. The heifer's temperature was invariably higher than that of the bull calf. During the high fever the bowels were kept active by drenching the calves with raw linseed oil, and when they would not eat they were drenched with milk. After recovery they were turned into a pasture with other cattle, and "have had ticks on them all along." He says: "My Shorthorn calves have done very well, and I think now they are perfectly immune." Nov. 1., these calves were safe.

Notes on the last nine cases in Table No. V:

F. G. Matthews, of Florence, Ala., inoculated these animals, and under date of April 8, 1901, writes me as follows:

"I first measured the dose in a small two drachm graduated, allowing something over a half drachm for a dose (2 cc). Nine head of cattle were inoculated. Seven of them were Jerseys (one 6 months old, one 18 months old, four were 2 years old, and one was 4 years old); they came from Kentucky; the other two were 2 year old Herefords, and came from the St. Louis market. All of these cattle were brought to Alabama during the past winter.

"The vessels used were sterilized by placing them in cold water and bringing it up to boiling.

"On the 13th of March I drew the blood from a native scrub bull, 18 months old, defibrinated it, and immediately inoculated the Herefords.

"On the 14th of March I drew 2 ounces of blood, prepared it, and immediately inoculated T. and P.'s 2-year-old Jersey cow; a few minutes later, Sadler's 2-year-old Jersey cow; about 15 minutes later Proctor's 18-month-old Jersey heifer; about 30 minutes later Thurman's 2-year-old Jersey bull; about an hour later Cohen's 2-year-old cow (she was in wood's pasture, and had to be hunted), and about an hour later we secured Nathan's 4-year-old cow and 6-month-old calf and inoculated both of them. (Numbered in the order named). Cows Nos. 1 and 2 died March 25. On that day the temperature of No. 3 was 104; No. 4, 103; No. 5, 105. March 26, No. 3, 107; No. 4, 103; No. 5, 105; Nos. 6 and 7, 104. No. 3 was too weak to stand up long at a time. March 27, No. 3, 105.5; No. 4, 102.5; No. 5, 102.5; Nos. 6 and 7, 105. These temperatures remained this way for several days and then subsided. The animals suffered loss of appetite one or two days. The bull's temperature went up again in a few days to 104, and No. 3 developed a swelling under the throat and weeping at the eyes—these conditions passed off in a few days.

"I can not understand why Nos. 1 and 2 should have died and No. 3 became so violently affected when all others took the regular or normal course. Possibly the severity of the fever in these three cases was due to the freshness of the blood at the time they were inoculated, the blood being somewhat old at the time the others were inoculated."

"Very respectfully,

"FRED G. MATTHEWS."

The time of year when these 9 head of cattle were inoculated was not altogether suitable—the weather was a little too warm. The best time of year for inoculation is from November 1st to March 1st. Moreover, some of

these cattle were too old to be inoculated with safety, and the dose of defibrinated blood was too large for a single or first inoculation. The strength of the blood of an immune animal is never known until it is tested by inoculation; hence it is always safest to use the minimum dose in the beginning or the first time the blood is used. All of these animals should have been collected at one place so that there would have been no delay in the inoculations following the drawing of the blood and the defibrinating it. The vessels were not sufficiently sterilized. They should have been boiled at least for thirty minutes, and for safety one hour.

TABLE VI—Summary of Northern-Bred Cattle shipped into Alabama in the last 3 years and acclimation attempted by natural tick inoculation.

No.	Age when brought to Alabama.	Sex.	State where bred.	Breed.	Owner.	County in Alabama.	Died of Texas Fever	Living and acclimated.	Remarks.
1	1 year.	bull		Polled Durham		Wilcox		1	
1	8 mo's.	heifer		Red Poll	Lambert	"		1	Kept away from Southern cattle.
1	18 mo's.	"		" "	"	"		1	Separated from herd cattle.
2	14 mo's.	bulls		" "	"	"	2		Allowed to run with herd
2	18 mo's.	"		" "	"	"		2	Well cared for and isolated.
2	3–5 yrs.	cows		" "	"	"	1	1	
1	4 yrs.	bull	Tenn	" "		"	1		
1	1 yr.	"		R. P.& S. H. Cross		"		1	Kept isolated.
1	1 yr.	"		Shorthorn		"		1	" "
1	18 mo's.	"		"		"		1	
1	2 years,	"		Red Poll		"		1	
1	45 days.	"		Devon		"	1		
1	45 days.	"		"		"		1	
2	18 mo's.	heifers		Red Poll		"		2	
1	9 mo's.	bull	Ill	Angus	Kernachan	Colbert		1	Well cared for.
1	"	heifer	"	"	"	"		1	" " "
1	1 year.	"	Tenn.	"	"	"		1	" " "
1	"	bull	Mo.	Hereford	Swope	La wrence		1	Isolated and stabled.
5	2 yr's.	heifers	"	"	"	"		5	" " "
1	9 mo's	bu l	Ill.	Angus	Hare	Monroe		1	
3	10-18mo	bulls	Penn.	Devons		Chambers	1	2	
15	"	heifer	"	"		"	4	11	
1	3 yrs.	bull	"	"	McGehee	"		1	Isolated and stabled.
1	8 mo's.	"		Shorthorn	Davis	"		1	
1	"	heifer		"	"	"		1	

TABLE VI—Continued.

1	4 yrs	bull	Tenn	Red Poll grade	Jones	Lee		1	Taken to Florida before summer.
1	4 yrs.	cow	"	" "	"	"	1		Died of Texas Fever in July.
1	3 yrs	cow	"	S. P. & R. P. Cross	"	"	1		
1	5 yrs	cow	"	" "	"	"		1	
1	18 mo's.	heifer	"	Shorthorn, grade	"	"	1		
1	7 mo's.	heifer	"	Red Poll, grade	"	"		1	
9	1 year		Neb	Shorthorn	McLatchy	Washington	2	7	Two of the 7 sick at time of report
1	15 mo's.	bull	Ohio	"	Talson	Etowah		1	Kept isolated.
1	16 mo'f.	heifer	"	"	"	"		1	" "
1		bull		Red Poll grade	Hamilton	"		1	
1	1 yr	bdll	Mo	Hereford	Rodgers	Sumter		1	
2	1 yr	heifer	Mo	"	"	"	2		
1	1 yr	bull	Ohio	Red Poll, grade	McCain	"	1		
1	1 yr	bull	Tenn	" "	McCain & Cobb	"		1	
1	1 yr	bull	"	" "	Horn	"		1	
1	1 yr	bull	"	" "	Scarborough	"		1	
1	1 yr	bull	"	Angus	Thornton	"		1	
1	6 mo's.	bull	Ill	"	Ennis	"		1	
2	6 mo's.	heifer	Ill	"	"	"		1	
1	6 mo's.	heifer	Tenn,	Shorthorn	Paul Gee	"		1	Had Texas Fever and recovered.
1	6 mo's.	bull	"	"	" "	"		2	" " " " "
1	6 mo's.	heifer	"	Red Poll	" "	"		1	" " " " "
2	6 mo's.	heifers	"	Shorthorn	R. & H. Seal	"		1	" " " " "
2	9 mo's.	heifers	"	"	Seymour	"		2	
1	9 mo's.	bull	"	"	"	"		2	

TABLE VI.—Cont'd.

Summary of Northern-Bred Cattle shipped into Alabama in the last three years, and acclimation attempted by natural tick inoculation.

No.	Age when brought to Alabama.	Sex.	State where bred.	Breed.	Owner.	County in Alabama	Died of Texas Fever.	Living and acclimated	Remarks.
10	6-12 mos	3 b, 7 h	Tenn.	Shorthorn	F. I. Derby.	Sumter	2	8	
2	6-22mos	1 b, 1 h	"	"	J. Sims	"	1	1	
1	6 mo's.	heifer	"	"	Wallace	"	1	.....	Died second year.
1	1 yr.	bull	.....	"	Comer	Bullock	.....	1	
1	3 yrs	bull	.....	"	"	"	.....	1	
4	4 yrs	cows	.....	"	"	"	1	3	
1	4 yrs	cow	.....	Jersey	Haughton	"	.....	1	
1	1 yr.	bull	.....	Shorthorn	Foster	"	1	.....	
3	1 yr.	heifers	.....	"	"	"	3	.....	
1	2 yrs	heifer	.....	"	"	"	...	1	
1	2 yrs	heifer	.....	Jersey	"	"	...	1	
5	1 yr	1 b, 4 h.	Miss (?)	Herefords	Rainer	"	3	2	Ship'd Mch from Columbus, Miss.
1	7 mo's.	bull	Tenn.	Shorthorns	Culver	"	.....	1	Shipped in October to Ala.
2	7 mo's.	heifers	"	"	"	"	.....	2	" " " " "
1	8 mo's.	bull	.....	Angus	Goldthwaite	Montgom'y	.....	1	Weight 1400 lbs, at about 30 mo's.
1	5 mo's.	bull	.....	Short horns	Marks	"	.....	1	Shipped Nov. 1899. to Ala.
2	8 mo's	1 b, 1 h	.....	"	Gunter	"	.....	2	
2	8 mo's.	1 b, 1 h.	.....	"	P. Tyson	"	....	2	
4	6 mo's.	1 b, 3 h.	.....	"	McLemore	"	1	3	
3	8 mo's.	1 b, 2 h	.....	"	T. W. Oliver	"	.....	3	
1	.....	cow	.....	"	Smith	"	.....	1	
2	.....	1 b, 1,c.	.....	Red Poll	"	"	.....	2	
1	.....	bull	.....	Polled Durham	"	"	.....	1	
2	.....	.....	.....	Short horns	Torbert	Lee	.....	2	

The total number of Northern-bred cattle on this list is 139. This, however, does not include all the Northern-bred animals shipped into Alabama during the past three years. There were many others brought into Alabama during the same period but we were unable to get authentic reports about them.

Of the total number reported (139), there were 31 fatal cases of fever; or 22.3 per cent. of the entire number died of Texas fever from inoculation, At the same time it should be noted that some of these cattle are still susceptible to Texas fever because they have been kept entirely free from ticks. Comparing the results (22.3 per cent. loss) with about 10 per cent. of deaths of Dr. Francis, where 1500 cattle were inoculated with defibrinated blood to produce immunity, gives a decided favorable balance for the new inoculation method. Or, compare the 22.3 per cent. loss with the 8 per cent. of deaths as shown in the summary of defibrinated blood inoculations made in Alabama.

In order to aid Alabama farmers who may desire to embark in the stock business by buying Northern-bred cattle, the veterinarian of the college and station will inoculate such animals with defibrinated blood, providing his expenses are paid to and from the place where cattle are to be inoculated. Parties desiring such inoculations will please notify the veterinarian in advance so that a date may be fixed to suit his convenience.

All farmers who have bought Northern-bred or foreign-bred cattle into Alabama at any time during the past three years will do us a great favor by reporting the results of their respective attempts at acclimating their cattle. Please give the age of each animal at time of arrival in Alabama; sex, breed, State from whence they came, how long said cattle have been in Alabama, how many are safely acclimated, with method of acclimating, and how many died with Texas or acclimating fever. If a number of animals were acclimated, the report may be tabulated as in Table VI.

We also solicit reports of all contagious or infectious diseases occurring among farm animals in Alabama. In case of serious or alarming outbreaks report directly to the veterinarian, and if possible, and best, he will at once visit the locality to determine the cause, and suggest ways of preventing and treatment.

I wish to take this opportunity to thank all those who so kindly sent in reports, and hope this bulletin will in part repay them for their trouble. I am especially thankful to Mr. R. W. Clark, who has charge of the stock at the Experiment Station, and who so carefully and faithfully looked after ten of the inoculated cattle that were directly in his care.

REMEMBER.

1.—That an animal sick with Texas fever can not infest or transmit the disease to healthy cattle.

2.—That the only known means by which the microparasite that causes Texas fever can be transmitted from diseased cattle to healthy ones is through two generations of the Southern cattle tick.

3.—That tick-free cattle never have Texas fever as long as they are tick-free.

4.—That cattle with Texas fever have or have had ticks upon them.

5.—That all cattle must acquire immunity after birth by having one or more attacks of Texas fever.

6.—That immunity to Texas fever is not inherited.

7.—That Southern-bred cattle have Texas fever when very young (sucking calves), and are usually but slightly affected by it.

8.—That the older the animal the more severe the fever; the older the animal the greater the mortality.

9.—That all cattle north of the government quarantine line are susceptible to Texas fever.

10.—That all Southern-bred cattle raised on tick-free farms and tick-free town lots are susceptible to Texas fever.

11.—That immune cattle will lose their immunity if kept free of ticks for two or more years.

12.—That in hot weather Texas fever is usually more acute and fatal than in cool seasons.

13.—That the best time to bring Northern-bred or foreign-bred cattle into Alabama is between November 1st and March 1st.

1.—That it is safer to bring young sucking calves into Alabama for acclimation than cattle over one year old.

15.—That sucking calves (2 to 4 months old,) can be shipped into the South by express; fed milk from a Southern-bred and immune cow, and be made immune by natural tick innoculation with a great degree of safety or little danger of loss.

16.—That one or two inoculations with defibrnated blood derived from an immune animal will produce a relatively safe immunity to Texas fever.

17.—That the best age for inoculating with defibrinated blood is one year or less.

18.—That the best time for the inoculation is from November 1st to March 1st.

19.—That inoculations should not be attempted in hot weather.

20.—That pregnant cows are liable to abort when they have inoculation or Texas fever.

21.—That inoculated animals should receive the best of feed and care during and after the inoculation fever.

22.—That from 50 to 90 per cent. of Northern-bred or susceptible cattle die with Texas fever when they are turned into tick-infested pastures, and allowed to rustle for themselves.

23.—That less than 10 per cent. of susceptible cattle are lost when they are made immune by the defibrinated blood inoculation method; about 3 per cent. die with the inoculation fever, and about 7 per cent. die with Texas fever as a result of tick inoculation during the first summer.

24.—That it is best to keep all cattle from becoming literally covered with ticks.

25.—That if you are adjacent to the government quarantine line it is best to exterminate all the ticks on your farm and farm animals.

NOTICE—Parties who are interested, and who may desire a Farmers' Institute held in their town or city, will please write the veterinarian of the college and station, stating when they desire the institute, and about how many farmers they can get to attend said meeting. Our funds for this work are limited, but we aim to visit as many counties as possible with our means during the year. We can visit one or two places each month while college is in session, and a number of counties during the summer vacation. Dr. C. A. Cary is Official Director of Farmers' Institute for the station and college.