

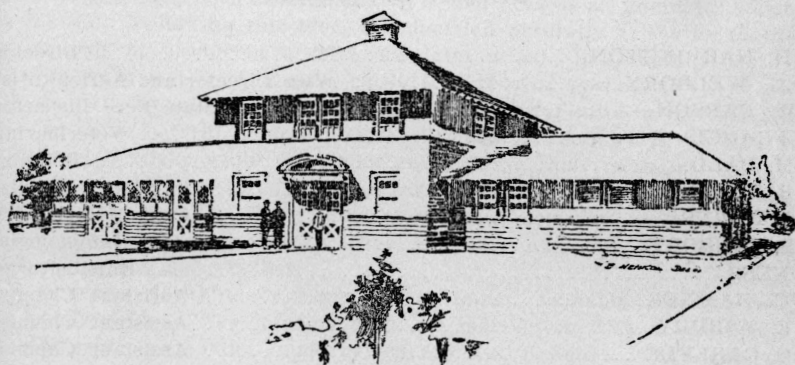
TEXAS AGRICULTURAL EXPERIMENT STATION.

BULLETIN NO. 111.

September, 1908.

Texas Fever

(Third Report.)



Veterinary Hospital.

Post Office.

COLLEGE STATION, BRAZOS COUNTY, TEXAS.

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TEXAS FEVER

(Third Report.)

BY

M. FRANCIS, Veterinarian

Twenty years ago the authorities of the Texas Experiment Station decided to take up the Texas Fever problem, and, if possible, work out some plan by which the discouraging losses that followed the importation of high-class cattle for breeding purposes, could be avoided. In Bulletins 53 and 63 of this Station will be found the results of our work in this direction, but as these have long been out of print and we continually receive calls for the information contained in them, we have decided to present a re-statement of the essential facts of this matter.

Every one who has had much practical experience with this disease must have been impressed with the fact that, while it is usually fatal to mature cattle, young ones usually survive it, and possess an immunity which lasts for life. Following this idea, the question naturally arises as to the best methods of producing a mild, non-fatal attack, and thereby justify the purchase of strictly first-class cattle for breeding purposes.

It seems reasonably certain that all calves born of cows in the infected area possess no natural immunity to the disease, but acquire it, by becoming infected by ticks while yet young and nursing their mothers. In this way they usually pass through the fever stages successfully and thereby become immune for life. If we notice these more closely we will find some that fever severely, pass bloody urine and may even die, if the attack occurs during the hot weather.

If it seems desirable or necessary to import valuable breeding animals from outside of the infected area, we may do so with a reasonable degree of safety by having young calves, say 4 to 6 weeks of age, shipped by express, and, immediately upon arrival, put them on good nurse cows. If this be done during our winter months it is almost always successful. If there should arise a question as to whether the calf has become infected after being exposed a few weeks, it is a very simple matter to inoculate it with blood occasionally. We sometimes find such calves show little or no fever from these inoculations, though they be repeated four or five times. As a rule, however, they fever later, though they may have carried quite a number of ticks, and were supposed to be safe against serious sickness.

In case we decide to bring older calves into Texas, we should prepare some months in advance a suitable place to handle them until they have recovered from the inoculation fevers. The best plan seems to be to select a piece of land in April or May that is high enough not to receive the surface water from a ticky pasture. No cattle or other animals should be permitted in it, though there is no great objection to putting it in culiva-

tion, if the work stock be horses or mules. No double fence is necessary, though it reduces the risk somewhat.

When the Fall rains occur plant a suitable crop for green winter pasture, say oats or a mixture of wheat and rye. In the Northern part of the State a green wheat field answers the purpose.

In the absence of such a prepared enclosure an ordinary horse lot will do, but there is always more or less danger of such pens having been occupied by cattle through carelessness or ignorance of those in charge.

The most suitable subjects are calves from 10 to 20 months of age. They should be in good, thriving condition. Thin, weak, half-starved animals that have been bought "awful cheap" are usually too weak to stand the fever, and turn out a disappointment. We must have animals that are in strictly prime condition; those that have that quality called "good constitution," and that appear somewhat heavy and coarse in the head, horn, throat and chest. Heifers must not be pregnant, as they usually abort during the fever stages, and all kinds of mischief and even death follows.

They should be shipped South during December, January, or February, in clean, disinfected cars, fed and watered in the car, and not unloaded into stockyards along the route. A competent man should always be in charge of the animals to see that these points are strictly observed.

When they finally reach their destination the animals should be hauled in a suitable wagon from the car to the pens prepared for their reception. We seldom have weather cold enough to make it safe to drive such animals over ordinary roads. These remarks may seem silly to those who have little or no knowledge of this subject, but we can trace our greatest failures to a disregard of these precautions.

It would seem best to permit the calves to rest a day or two before inoculation. We have, however, of late adopted the plan of inoculation immediately on arrival with black-leg vaccine and with blood for Texas Fever. We have observed no evil effects of this.

It is very important that the animals be marked in some conspicuous manner to prevent mistakes. We have found that a hair brand on the rump answers the purpose and remains legible about 60 days.

The inoculation proper is very simple. The calves to be inoculated should be haltered and tied in a row so that we may secure each one promptly and make no mistakes. The animal which supplies the blood should be one that appears in good health, and that has a reasonable number of ticks on it. We usually select one 2 or 3 years of age. We have no way of knowing the quality of the supply animal's blood without making a practical test of it. We find some whose blood will fever almost every calf simultaneously, and others whose blood produces all sorts of irregularities.

Having secured the supply animal, take a strong, clean, sterile, hypodermic syringe and fill it by forcing the needle into the jugular vein. When you have done so detach it from the needle, attach another needle and immediately inject about one cubic centimeter of the blood under the skin of each calf. If there be a number of calves to be inoculated, we either fill several syringes at once, or return to the supply animal and refill the first one. If the blood clots in the syringe before the work is finished, no harm is done as the clotted blood can be forced through the needle and injected

as before. The important thing is to have everything ready, then proceed promptly and rapidly.

If the number of calves to be inoculated be large, say 50 or more, and we have them in an ordinary stock pen with a chute, we usually draw the blood from the supply animal with a sterile trocar or a fleam and collect it in a clean, sterile beaker, or similar vessel. It must now be stirred with some sterile mechanical object, sa a bundle of wire, to separate the fibrin from the serum and corpuscles. This requires a few minutes. When clotting has ceased we strain the liquid blood through a thin cloth so as to remove any small clots that may obstruct the needle. The blood is now ready for use. It must be kept clean and warm until the work is finished. Fill the syringe with the prepared blood, and, having the calves well secured in the chute, inject 1 cubic centimeter of it under the skin of each one. It is well to have sufficient labor so that the work will proceed with speed and accuracy. The calves should be well fed. No radical changes in diet are advisable, but we find that a grain ration of about 1 per cent. of body weight per day is a safe one to begin on, with access to green winter pasture. The green stuff acts as a laxative, prevents inaction, and enables the animal to throw off the waste products produced by disease.

If the animals be gentle we take their temperature every morning and keep a record of it. The normal temperature of cattle varies from 101 to 102.5. We often find higher temperature in calves just off the cars or in those which have a heavy coat of hair. These should be noted and distinguished from the fever produced by inoculation.

The inoculation fever usually appears from the 8th to the 10th day after injection of the blood, and continues from 2 to 6 days as a rule. We call this the primary reaction. As long as it remains within reasonable bounds, say from 103.5 to 105 degrees F., we pay no attention to it. The calves will appear somewhat dull, will not eat with their usual relish, and prefer to lie down apart from their fellows, or to straggle along behind the bunch in the pasture.

We prefer to keep them out in a small pasture where they can have plenty of room to scatter out and have access to shade and water. Bulls from 15 to 20 months of age are especially benefited in this way. If they be somewhat wild, no attempt should be made to ascertain their temperatures, as the excitement and struggling incident to it are very harmful.

No medicines are successful. If there be some tendency to constipation, we may give a good dose of salts, but this must be done early in the attack only. Much mischief is often done by superfluous attention and frequent use of medicines to reduce the fever. We have no medicines which will do this. During recent years we have been trying the serum of horses, the salts of quinine, preparations of haemoglobin, etc., but in no instance were desirable results obtained; in fact, we usually made matters worse.

If the primary fever be very mild, say 103.5 degrees F., for one day only, or if it escapes our observation entirely, we must simply wait until the reaction occurs. It almost always does so about 30 days after inoculation. In one case it was delayed for 43 days. In such cases it is very unsafe to make a second inoculation of blood, as we have caused quite a number of deaths by doing so. When the primary fever has been running high, say 106 to 107.5 degrees, for a week or so it usually terminates quite abruptly.

We may find it falling as rapidly as 1 degree per hour. This is a critical time with the animal, and deaths occur very frequently at this time. If it falls below 100 degrees we put the animal in a warm place and give stimulants, say whiskey and nux-vomica, and keep the animal very quiet.

If the urine becomes red nothing can be done to remedy it. Those that pass red urine during cool weather usually recover, while in hot weather they usually die. We often try to control the temperature by applying cold water with a brush and injecting some of it into the bowels. In some cases marked results are obtained in this way, but whatever we do must be done quietly and with the least possible disturbance to the animal. The primary fever terminates about the twentieth day after inoculation. The animals will have lost a good deal of flesh, and the hair often becomes erect, dead, and much of it falls out along the neck and between the thighs.

The calves then recover rapidly, eat with former relish and regain much of their lost condition. This continues a week or ten days, when a second fever period occurs. We call it the secondary reaction. In a large number of cases it occurs about the thirtieth day after inoculation. This secondary reaction is usually similar in duration and severity to the previous one, but we find cases in which it is more severe, and others in which it is less so. There is no typical temperature curve. If we examine the records of a number of cases we may find about four types or varieties.

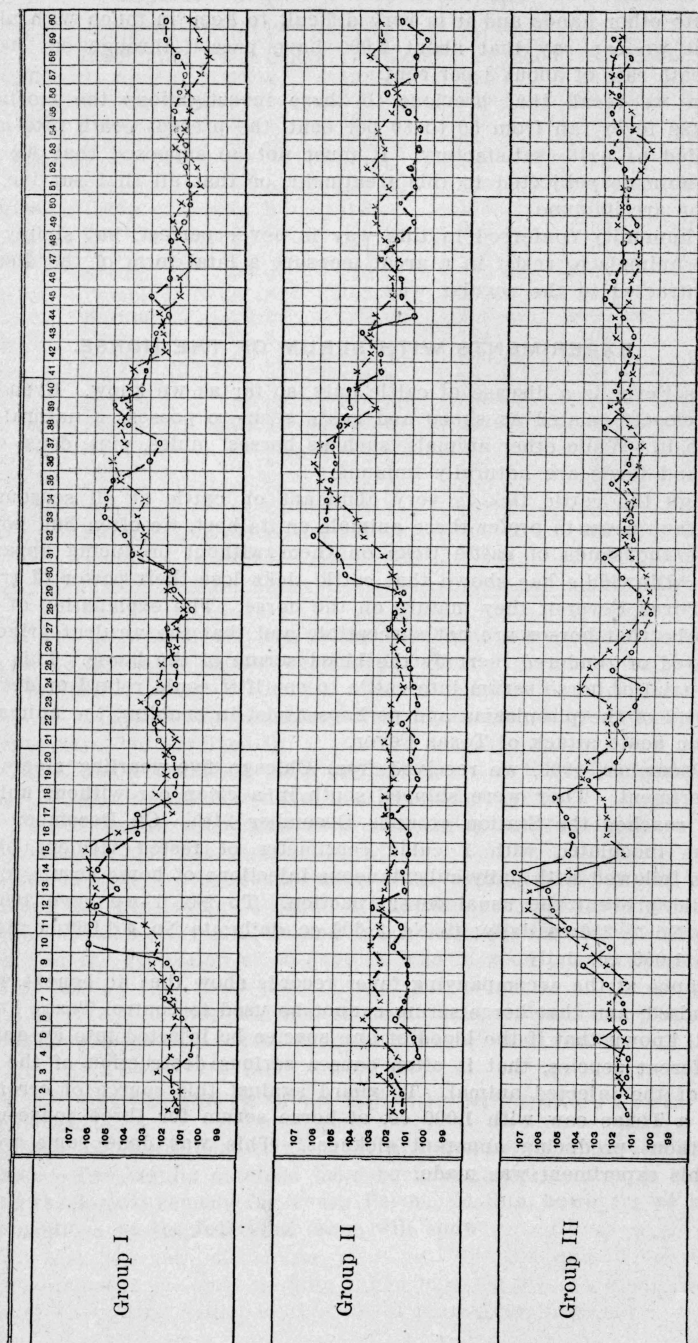
First. Those in which the primary and secondary reactions are nearly equal in duration and severity. See Graphic Record.

Second. Those in which the primary reaction was short or feeble, or apparently absent, while the secondary was prolonged and severe.

Third. Those in which the primary reaction was acute, severe, and accompanied perhaps with red urine, and the secondary reaction was delayed, irregular and mild.

Fourth. Those which have three or more feeble reactions at irregular intervals, which usually become chronic, with great loss of condition, deadness of hair, weakness, and stunted, unthrifty condition that continues for months. These are often observed eating dirt and may consume a sufficient quantity of sand to cause serious intestinal disturbances.

It is usually about 60 days before the animals will have recovered their strength and be in condition to be exposed to ticks or be shipped to the ranches. It seems that the first few exposures to ticks may be made with considerable safety if it occurs in the early spring months, when grass is soft and abundant. It often occurs that such animals may be put out in pasture, say April 1st, and carry an abundance of ticks during May and June, and be apparently safe until the hot weather of July and August occurs. Then they fever severely and may die. It seems advisable to be somewhat careful during July and August, and to keep the animals in a barn during the day; feed them well, apply some oil or grease to limit the number of ticks, and turn them out only at night. It is impossible to do this with young bulls which are in service. In such cases we may divide them into three or four lots and turn out any one lot at a time. After a week or so get them in and turn out the second lot, and so on. The first summer is a very trying time on young bulls, and many of them fever severely and become stunted from over service, fighting and lack of food. We usually lose about 3 per cent of the animals from the inoculation fevers and about 5 per cent more from fever and casualties during the following



Graphic Record of the Different Types of Inoculation Fever.

year. We cannot give exact information because many of the animals have passed into other hands and it is very difficult to keep in touch with all of them, but we can say that about 5,000 have passed through our hands with a death rate of about 8 per cent.

When we recall that previous to these investigations the mortality from Texas fever ran from 50 to 80 per cent, the present death rate must be regarded as quite satisfactory. It must not be supposed that we can save all animals subjected to this treatment, or that all that survive the inoculation are immune.

The immunity conferred in this way is never perfect, but simply enables the animals to resist in a great measure a fatal form of the disease when contracted in the regular way.

EXPERIMENTS WITH SERUM OF THE HORSE.

Texas Fever is a disease of cattle only, so far as we know. Even animals so closely related as sheep and goats seem to possess a natural immunity to it. While other animals, such as horses, mules, pigs, dogs, cats, rabbits, and fowls are naturally immune.

Though the cattle tick is very abundant on cattle at all seasons of the year, and seem to prefer these animals as its host, we often find horses that have thousands of cattle ticks on them without producing apparent sickness. Dinwiddie has shown that cattle ticks lose their power of transmitting Texas Fever if they mature on the horse. The explanation of this seems to be that horses are not susceptible and that the virulent principle is destroyed or rendered inert by the blood serum of the horse. This suggested a trial of horse serum into cattle to see if it could retard or destroy the activity of the piroplasma and perhaps assist in enabling the animal to survive an acute attack of Texas Fever.

In December, 1903, we received from Chicago five yearling steers for this experiment. They were shipped south in a clean car without unloading, and reached the Station grounds December 24th. On December 26th each was inoculated with 1 cubic centimeter of tested virulent blood. This was followed with daily subcutaneous injections of horse serum to see if it could prevent the usual fever reaction. To No. 1 we gave 100 cc. daily; to No. 2, 250 cc. daily; to No. 3 600 cc. daily; to No. 4 1,000 cc. daily; to No. 5 1,000 cc. daily.

A glance at the accompanying fever records show that no benefit whatever resulted, and that horse serum cannot be used to control Texas Fever. It is well known that if the blood of one species be injected into an animal of a different species, that it often causes serious destruction of the corpuscles of the injected animal. To guard against this source of error we injected a Texas cow with 1,000 cc. of horse serum for three consecutive days without producing apparent sickness. This was done some weeks before this experiment was made.

1903.	Steer I	Steer II	Steer III	Steer IV	Steer V
Dec. 26th—Temp.	101.8	101.4	101.6	101.4	101.2
Inoculated.	1 cc blood	1 cc blood	1 cc blood	1 cc blood	1 cc blood
Dec. 27th—Temp.	102.4	101.2	101.6	101.4	102
Serum ...	100 cc	250 cc	600 cc	1000 cc	1000 cc
Dec. 28th—Temp.	101.4	102	102.2	102.6	102.6
Serum ...	100 cc	250 cc	600 cc	1000 cc	1000 cc
Dec. 29th—Temp.	102	101.5	103	103	104.8
Serum ...	100 cc	250 cc	600 cc	1000 cc	1000 cc
Dec. 30th—Temp.	101.8	103	103	103.8	106
Serum ...	100 cc	250 cc	600 cc	1000 cc	1000 cc
Dec. 31th—Temp.	102	101.8	102.6	103	107
Serum ...	100 cc	250 cc	600 cc	1000 cc	1000 cc
Jan. 1st —Temp.	101.8	102.4	102.2	103.8	108.2
Serum ...	100 cc	250 cc	600 cc	1000 cc	1000 cc
Jan. 2d —Temp.	101.2	102	104	106	106
Serum ...	100 cc	250 cc	600 cc	1000 cc	1000 cc
Jan. 3rd —Temp.	104.2	102.6	103.6	105.8	104.8
Serum ...	100 cc	250 cc	600 cc	500 cc	500 cc
Jan. 4th —Temp.	105.4	104.6	104.6	105.2	103.8
Serum ...	100 cc	250 cc	475 cc	500 cc	1000 cc
Jan. 5th —Temp.	103.2	102.8	102.8	105.6	103.6
Serum ...	100 cc	250 cc	600 cc	500 cc	500 cc
Jan. 6th —Temp.	104.6	102.2	102.8	104.4	106.2
Serum ...	100 cc	250 cc	600 cc	500 cc	1000 cc
Jan. 7th —Temp.	102.4	102.8	102.4	103	103.6
Serum

It will be noticed that the serum injections were discontinued January 7th, as no favorable results were forthcoming.

The further history of these animals is as follows:

No. 1 had a strong secondary fever from the thirty-sixth to the forty-seventh days, but survived it.

No. II had a secondary fever beginning on the thirty-fourth day, running about 106 degrees for four days, then somewhat lower.

No. III had a secondary fever, beginning on the thirty-seventh day and continued high five days.

No. IV had a very severe secondary fever, beginning on the thirty-first day and continuing 24 days. He became very thin, but survived.

No. V had a very mild second fever, only 103 degrees for two or three days. At the expiration of 60 days he was in good condition, except some loss of hair.

The results of this work were such that we found no encouragement to continue the use of horse serum to control Texas Fever.

EXPERIMENTS WITH QUININE IN TEXAS FEVER.

For many years physicians have used Quinine as a specific for malaria of man. The results obtained have been so favorable that it would seem to be the logical remedy for Texas Fever. In this, however, we have been disappointed, as the following cases will show:

Case I.—A Shorthorn heifer, age 12 months, and weighing about 800 pounds, was inoculated with 1 cc virulent blood in December, 1901. Fever appeared on the

9th Day,	Temperature	104.2	—Gave	4	Drachms	Quinine	via	mouth
10th	“	“	“	“	“	“	“	“
11th	“	“	“	“	“	“	“	“
12th	“	“	“	8	“	“	“	“
13th	“	“	“	8	“	“	“	“
14th	“	“	“	4	“	“	“	“
15th	“	“	“	4	“	“	“	“
16th	“	“	“	4	“	“	“	“

17th “ **Dead.** Passed bloody urine for three days. It will be noticed that five ounces of Quinine were given this animal without any desirable results.

Case II.—A Red Polled bull, age 13 months, weight 910 pounds, was inoculated with 1 cc virulent blood. Fever appeared on the

7th Day,	Temperature	107.5	—Gave	8	drachms	Quinine	via	mouth.
8th	“	“	“	“	“	“	“	“
9th	“	“	“	“	“	“	“	“
10th	“	“	“	“	“	“	“	“
11th	“	“	“	98	Dead,	red	urine	two

Case III.—A Hereford bull, age 14 months, weight 1,140 pounds, was inoculated with 1 cc virulent blood. Fever appeared on the

9th Day,	Temperature	103	—Gave	2	drachms	Quinine	via	mouth.
10th	“	“	“	“	“	“	“	“
11th	“	“	“	“	“	“	“	“
12th	“	“	“	“	“	“	“	“
13th	“	“	“	“	“	“	“	“
14th	“	“	“	“	“	“	“	“
15th	“	“	“	102	No	medicine.		

It will be noticed that this was a typical case of inoculation fever that terminated spontaneously, and it appears that the result was not due to the use of Quinine. A secondary fever period, extending from the 32d to 37th days, occurred, which terminated equally favorably without Quinine.

Case IV.—A Shorthorn heifer, aged 14 months, weight 960 pounds, was inoculated with 1 cc virulent blood. Fever appeared on the

9th Day,	Temperature	103	—Gave	4	drachms	Quinine,	via	mouth.
10th	“	“	“	“	“	“	“	“
11th	“	“	“	“	“	“	“	“
12th	“	“	“	“	“	“	“	“
13th	“	“	“	“	“	“	“	“
14th	“	“	“	“	“	“	“	“
15th	“	“	“	“	“	“	“	“
16th	“	“	“	“	“	“	“	“
17th	“	“	“	107	No	medicine.		
18th	“	“	“	107	“	“		
19th	“	“	“	106	“	“		
20th	“	“	“	104.4	“	“		
21st	“	“	“	103.2	“	“		
22d	“	“	“	102	“	“		

From this time the temperature ranged within the limits of normal variation until the 32d day, when a secondary reaction, lasting seven days, occurred. This terminated favorably without medicines.

It will be noticed that in these cases we gave Quinine in doses of 2, 4, and 8 drachms daily, during the fever periods, without apparent benefit. Similar results were obtained by Dinwiddie of the Arkansas Station.

SUBCUTANEOUS INJECTIONS OF QUININE.

In cases 5 and 6 we tried the subcutaneous injection of the Bimuriate of Quinine with Urea.

Case V.—A Polled Durham steer, age 15 months, and weighing 975 pounds, was inoculated with 1 cc virulent blood. We decided to follow this immediately with injections of Quinine to see if the infection could be arrested. Fever appeared on the

3rd Day,	Temperature	103.5	—Gave 5 grammes Quinine subcutaneously.				
4th	"	103	"	"	"	"	"
5th	"	105	"	"	"	"	"
6th	"	105.4	"	"	"	"	"
7th	"	104.2	"	"	"	"	"
8th	"	103.6	"	"	"	"	"
9th	"	105	"	"	"	"	"
10th	"	104.2	"	"	"	"	"
11th	"	104	"	"	"	"	"
12th	"	103.4	"	"	"	"	"
13th	"	105	"	"	"	"	"
14th	"	103.6	Gave no medicine.				
15th	"	104	"	"	"	"	"
16th	"	106.4	"	"	"	"	"
17th	"	107.2	"	"	"	"	"
18th	"	106	"	"	"	"	"
19th	"	106.2	"	"	"	"	"
20th	"	106	"	"	"	"	"
21st	"	104.6	"	"	"	"	"
22nd	"	101.8	"	"	"	"	"
23rd	"	100.8	"	"	"	"	"

Case VI.—A Polled Durham steer, age 18 months, weight 1050 pounds, was inoculated with 1 cc of same blood and the same as No. V. Fever appeared on the

3rd Day,	Temperature	103.2	—Gave 10 grammes Quinine subcutaneously.				
4th	"	102	"	"	"	"	"
5th	"	106	"	"	"	"	"
7th	"	105.6	"	"	"	"	"
8th	"	105.4	"	"	"	"	"
9th	"	104	"	"	"	"	"
10th	"	105	"	"	"	"	"
11th	"	106	"	"	"	"	"
12th	"	106.8	"	"	"	"	"
13th	"	104.6	"	"	"	"	"
14th	"	107.4	"	"	"	"	"

15th	"	"	102.6	Gave nothing.
16th	"	"	103	" "
17th	"	"	104.4	" "
18th	"	"	104	" "
19th	"	"	103	" "
20th	"	"	102	" "
21st	"	"	102.2	" "
22nd	"	"	101	" "

The injections were made into the loose cellular tissues along the neck and sides. In some cases we inserted a long needle in the muscles of the thigh and made the injections quite deep. It will be noticed that no beneficial effects were obtained.

A remarkable after result in both cases (V. and VI.) was the development some days later of symptoms resembling tetanus. In both of them the cramps and rigidity became so intense that both died.

INTRA VENOUS INJECTION OF QUININE.

Case VII.—A Polled Durham steer, aged 14 months, weight 1150 pounds, was inoculated with 1 cc virulent blood. The primary fever was mild and irregular, so we decided to wait until the secondary one was well developed. It ran as follows:

30th day,	temperature	104 degrees	
31st	"	"	104
32nd	"	"	104.8
33rd	"	"	103.8
34th	"	"	105
35th	"	"	107.2—Gave 6 grms. Quinine.
36th	"	"	106.2 " 5 " "

On the 35th day we dissolved 6 grammes Bimuriate of Quinine in 100 cc normal salt solution and injected this slowly into the jugular vein. Almost immediately the animal struggled violently, fell to the ground, gasped several times, and appeared to be dying. After some minutes it regained its feet and walked away. The heart evidently had been disturbed by the treatment. Winslow calls attention to this in his "Veterinary Materia Medica and Therapeutics," page 461, in these words: "When injected into a vein or directly applied to the cardiac muscle, quinine causes diastolic arrest of the heart by paralyzing the cardiac muscle or its contained ganglia."

The next day the animal appeared no worse from the treatment, though the temperature had fallen 1 degree.

We suspected that possibly we had not been careful enough to have the solution blood warm. It was decided to reduce the dose to 5 grammes and inject it slowly at the temperature of the blood.

This was attended to, but before the entire quantity was injected the animals staggered, fell to the ground, floundered around, gasped several times and died within a minute.

It is evidently too dangerous to give Quinine in this way, so no further experiments were attempted.

DON'TS.

Please **Don't** ship cattle to us for inoculation without having arranged some weeks in advance for their reception.

Please **Don't** ship us a lot of thin, weak, stunted animals or old, pregnant cows or aged bulls because you can "get 'um awful cheap."

Please **Don't** buy a show bull and keep him a few weeks to show at the fairs, and to breed to a few choice cows, and then have him inoculated. This is very risky.

Please **Don't** have your stock sent to the ranch and allowed to mix with native cattle a few weeks until some of them fever and die, and then wire us to "Send man to my ranch quick to inoculate car of fine bulls to stop them from dying." It is then too late.

Please **Don't** fool with this thing at all unless you follow a carefully made plan, something along the suggestions printed in this bulletin.



Map of United States, Showing Area Infested by the Fever Tick.