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MISSISSIPPI

Agricultural Experiment Station

BULLETIN NO. 11.

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**CHARBON**

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G. C. CREELMAN,

VETERINARIAN,

Agricultural College, Miss.

FEB. 15TH. 1890.

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## CHARBON.

(*Bacillus anthracis.*)

On June 11th, 1889, the Station received a telegram from Redding & Lear, proprietors of a livery stable in Yazoo City, stating that Charbon had broken out among the mules in that district and asking for assistance. I went immediately to the locality, and with Dr. Wray, of the United States Department of Agriculture, and Dr. Connaway, of the Missouri Experiment Station, remained there until the crisis of the disease had passed and the rainy season set in. Dr. Connaway remained there, inoculating and treating animals until August 3d, when he returned to his laboratory in Missouri and conducted a thorough pathological examination of parts of the diseased animals. Dr. Wray likewise conveyed specimens from animals that had died from the disease, to the pathological laboratories of the Division of Animal Industry of the U. S. Department of Agriculture, and of Johns Hopkins University. These examinations all terminated in one conclusion, that the disease was true Charbon, caused by the presence of a germ (*Bacillus anthracis*) in the animal body.

### HISTORY OF THE DISEASE.

Charbon has a very ancient history, as we have accounts of it from Asia Minor dating as far back as the siege of Troy; and during the seventeenth and eighteenth centuries great destruction was caused in Europe by epizootic outbreaks of anthrax.—So prevalent was it in 1617 that in the neighborhood of Naples alone, 65,000 persons perished from eating the flesh of diseased animals. Between the years 1757 and 1800, six distinct outbreaks occurred in France, confining themselves to no particular class, all domestic animals being alike affected. During the early part of this century, the French people suffered very severely and have spared no pains to have the disease thoroughly investi-

gated. In this country, little has been done to check its ravages, but the losses in the swamp region of this State during the past season, have so seriously affected the planters in that locality, that a bill has been introduced in the present Legislature to provide for the appointment of a State Veterinarian.

#### CHARBON IN MISSISSIPPI.

In order to ascertain the extent of country affected by the disease, the Station issued a circular containing the following questions and sent some hundreds of copies to planters in the Yazoo Delta counties:

1. At what date did Charbon make its first appearance in your locality this year?
2. Did horses, mules, or cattle suffer most?
3. What proportion of animals attacked recovered without treatment?
4. What remedies were most largely used?
5. What remedies were most successful?
6. How long did untreated animals usually live after being attacked?
7. What preventives were used; in what doses; and were they successful?
8. What kind of drinking water did the animals have before being attacked?
9. What is your estimate of the number of animals which died in your county?

Answers were received from sixty-five planters, representing the counties of Yazoo, Sharkey, Warren, Issaquena, Tallahatchie, LeFlore, Tunica, Holmes, Washington, Claiborne, and DeSoto.—From these replies, together with information received directly from the planters themselves the following facts were obtained:

In 1836, a disease then called "Choking Quinsey," affected the animals in the swamp region, and as the symptoms presented in these cases were identical with the symptoms of Charbon, we have no hesitancy in believing that this epidemic was true Charbon.

In 1865, many cases were reported but it was not until 1867 that the planters had occasion to become seriously alarmed.—The previous winter had been unusually mild and was followed by an early spring. The streams soon dried up and ponds became stagnant, the very grass wilted in many places and all the conditions favored the spread of the disease. What followed may readily be conceived. Scarcely a mule escaped its ravages, and ninety per cent of those affected perished, so fatal did it prove; and several years elapsed before the planters recovered from their heavy losses.

Since that time, it has prevailed more or less every year, always proving more virulent after a mild winter and warm spring.

The years '75, '76, '81, and '82 were marked by light epidemics on both sides of the river. The past season threatened to be a repetition of 1867, but, thanks to the improved condition of the farmers and a consequent improved condition of their stock; their hearty co-operation in assisting us to carry out every detail; and the timely interference of Nature, by sending rain at the proper time, the calamity was to a great extent averted.

This year the disease first made its appearance in Yazoo county along the east side of Silver Creek, from whence it spread all through the low lands, always following the direction of the rivers and creeks and doing little damage on the higher lands.

It confined itself almost entirely to mules and very few of the animals recovered without treatment. Many different remedies were tried, from burning with a hot iron, to drenching with salt and water, but the one which gave the most universal satisfaction was that prescribed by the Station Veterinarian, Dr. D. L. Phares, as follows:

"4 Drachms of Potassium Chlorate.

1 Table-spoonfull of Tincture of Muriate of Iron.

Mix in a pint of water and give every four hours as a drench. Bathe the affected parts in a solution of Carbolic Acid (1 to 8)."

This was printed and sent to all infected localities, and where the directions were followed in the first stages of the disease, scarcely a case was lost.

#### CAUTERIZING.

We cannot condemn too strongly the inhuman practice of severely cauterizing the parts where the swellings appear. Even where animals recovered after this treatment, they were so covered with wounds and scars as to be totally unfit for work for many weeks. Such treatment is directed towards the effect, not the cause of the disease. The swellings are the effect of the blood changes, and the increased temperature of the animal (which sometimes reaches as high as 105°) shows that the disease is general, and not local in the swellings. The disease however if inoculated by a fly, will start locally, in which case cauterization might be valuable. A still better method is to inject into the charbon swelling a dilute solution of carbolic acid (1 to 100). This gives no pain, is more effective, and produces no evil results.

### THE HORSE FLY THEORY.

Many planters in the Delta region advance the theory that the disease is caused by the swarms of flies which infest that locality, and have designated a particular species of horse fly, which is very conspicuous in every outbreak, as the "Charbon Fly."—We gave the subject some study and made the following observations: In some parts of the country, and especially along the lower end of Silver Creek, horse flies attack the animals in such numbers as to leave upon the back, belly, and legs a thick mass of clotted blood. To one who has seen this, the poisoned condition of the blood resulting from the absorption of septic matters would not be surprising. Flies were caught that had filled themselves with the blood of a mule in the last stage of the disease. The blood, when examined microscopically showed the germs in great numbers. After the mule died, horse flies were caught from the carcass, and mounts from the blood gave the same result.—No germs were found in the blood-filled flies which had been feeding on healthy animals.

Bollinger, in writing of Charbon in Europe, observes that the disease is often most prevalent where flies are in the greatest abundance, and he has vaccinated the disease in rabbits by inoculating them with flies caught on the carcasses of animals that had died from Anthrax. He mentions that the flies however resist the influence of the virus although the bacilli are found in them. We conclude therefore that flies are active agents in disseminating the disease. The fact that the disease is due to the presence of a germ, that this germ is found in the blood of flies, and that these same flies cause the clotting of blood on the body of the mules, is strong circumstantial evidence.

### NATURE OF THE DISEASE.

When first noting the symptoms of the present outbreak, we were of the opinion that it was not contagious, and might with good reason be pronounced *Purpura hemorrhagica*, a form of malignant fever. That it was a disease principally affecting the blood was quite evident, but whether it was caused by a specific micro-organism, as the *Bacillus anthracis*, or from absorption of septic products, we could not determine positively without resorting to laboratory methods. Later pathological investigations

at the Department of Agriculture at Washington, and by Dr. Connoway, proved beyond doubt that the disease was the true bacteridean Anthrax.

### SYMPTOMS.

Usually for some hours before the disease is manifested externally, the animal affected will appear languid, the ears droop, and signs of general depression may be noticed. Slight swellings soon make their appearance, these swellings are at first about the size of a walnut and may be simple or compound in structure, round or irregular in outline, but always adhering to a peduncle at the base. They are painful and the sensibility of the surrounding tissue is increased; when touched with the finger a local shivering, like a subcutaneous beating, is distinctly felt. They are variously located, but nearly always on the dependent parts, as under the neck and breast, between the front and hind legs, along the lower part of chest and abdomen, and on the sheath and teats. The sheath in some animals is so enormously swelled as to interfere with urination. We have seen but one case in which the swellings were on or near the back of the animal.—Nearly all animals not treated died in from twelve to thirty-six hours after the first symptoms were noted, the temperature rising to 105° before death.

### POST MORTEM EXAMINATION.

The external swellings, which are the result of infiltration of serum into the areolar tissue beneath the skin, on being cut into, present a yellow jelly-like appearance. The blood in both the veins and arteries is black, fluid, and noncoagulable. The liver appears congested, the kidneys are softened, the substance of the organs giving away easily under pressure, and the capsule is easily peeled off. Internally they have a gray ashen appearance.—The loose tissue surrounding the kidneys is infiltrated with serum and black blood. The urine in the bladder is highly colored, but never sufficiently so to indicate disease, and in no case did we find any blood in the urine. The spleen usually undergoes little change, except in spots, where elevations, half the size of a hen's egg, of a soft puffy nature, may appear on its surface. These

spots on being cut into show a destruction of the tissue at these points. Black thick blood of the consistency of mush, escapes from these cuts. The lungs appear partially congested and collapsed, this condition being brought about by the pressure of the swellings on the larynx and trachea. In the heart and pulmonary arteries are yellow clots, surrounded by the same black fluid blood. The muscles which are attached near the swellings in some cases appear as if beginning to decompose, and are easily stripped from the bone, the periosteum coming off with the flesh. The mucous membrane of the stomach and large intestines never appeared to be much affected, but that of the small intestines was usually somewhat congested. The mesentery had an unhealthy yellowish appearance. The lymphatics were congested, and all the blood vessels distended with the black fluid blood. This blood, upon being collected in a jar, soon separated into two portions. The yellow fibro-albuminous elements collect at the top and coagulate, while the watery portion, holding in solution the soluble matters, remains at the bottom. A considerable quantity of the yellow water, of the same character as that which drips from the cuts in external swellings, is often found in the thoracic and abdominal cavities. This exudation is coagulable on exposure to the air, but while in the body always remains fluid. The ropy, frothy character of the urine shows that there must be a large quantity of albumen passed through the kidneys, therefore the changes in these organs are doubtless due to their efforts to throw off the sero-albuminous products brought to them.

#### PREVENTION.

In severe cases, where the disease is thoroughly established, medical treatment of any kind is useless. The disease germs are now lying dormant in the infected district, ready to produce another epidemic when the proper conditions are supplied. It is interesting to note that the plantations which suffered most in 1867 have been the heaviest losers ever since, while the new plantations in the same localities, where the animals were not allowed to wander about, are practically free from its ravages.— If then, the disease is already there, we must so modify the conditions as to prevent its breaking out. The following conditions

found in the Delta during the last epidemic show that very little was done in this direction:

1. Diseased animals, no longer fit for work, were turned out on the roadsides, or allowed to wander among healthy herds.
2. On Silver Creek, hundreds of animals drank from, and waded into the stagnant waters through the entire season.
3. Diseased and healthy animals of the same herd were frequently watered from the same trough.
4. In most instances, all the mules of one plantation were fed corn from a common trough.
5. Work animals were allowed to graze at night, in pastures which diseased animals had formerly used.
6. Many of the working mules were so poorly fed and cared for, that the system, already broken down, was rendered easily susceptible to any disease.
7. Seldom was anything done to repel the attacks of the myriads of flies.
8. The carcasses of animals that had died from Charbon were, in many cases, allowed to remain for days just where they happened to be when death overtook them.
9. Disinfection was almost unknown.

We urge the hearty co-operation of planters in a thorough disinfection of every plantation that has ever been visited by the disease. In order that the process may be properly carried out, we suggest the following points:

1. In all cases there should be a thorough disinfection of the premises. The stables should be frequently white-washed, and all discharges from the animals deodorized by the use of sulphate of iron (copperas), which is a cheap and efficient agent for the purpose. Dissolve one pound in a bucket of water, sprinkle it about the floor of stable. The sheds should also be fumigated with sulphur twice a week. The doors should be painted with carbolic acid and a blanket dipped in a carbolic solution should be suspended near the door, to aid in keeping out the flies which swarm the stable.
2. The animals should be washed with a solution of carbolic

acid (1 to 100) every evening after returning from the field. This will serve to repel the flies and lessen the effect of the Bacillus.

3. As thorough disinfection of the creeks and roadsides is impossible, animals should be kept in dry lots, every foot of which has been treated with chloride of lime.

4. Animals should receive only well water, and the well should be in a dry lot.

5. If animals break out of the lot and wander onto infected ground, they should, as soon as discovered, be treated with potassium chlorate and iron, as above prescribed. It has been ascertained that the period of incubation is from five to seven days, therefore much may be done to neutralize the poisonous germs before the disease is externally manifested. Such animals however should be placed in a pen apart from all others and every precaution taken to prevent any intermingling with sound animals.

6. All dead animals should be burned immediately where they died and the spot afterwards sprinkled with chloride of lime.

The importance of disinfection and quarantine is seen when we note that the plantations which suffered the heaviest losses this year were those that lost most in 1867, and have proved conspicuous in all the milder epidemics since. The "disease" then is still there. In the highlands, very little Charbon was found, and animals taken from the bottoms and kept in the hills did not take the disease. There was wisdom in removing the mules from localities where the disease had been previously known to exist, and transferring them to a purer atmosphere, surrounded by hygienic comforts which it would be impossible to give them at home.

The following extracts from a letter received from J. G. Poindexter, Palmetto Home, Miss., will give some idea of the value of pure surroundings. He says: "My first experience with Charbon was in 1867 in LeFlore county, Miss., where I then lived. We had about forty cases of which seventy-five per cent died.— They were treated by every method recommended by the most experienced practitioners in the valley, and I became satisfied that no one knew any thing about it, so far as treatment was concerned. The next year (1868) about the middle of May, the

best mule on the plantation was brought in with one of the worst cases I ever saw. Being assured that there was no cure for her, I ordered the men to take her back into the swamp and leave her to die. The mule on the fourth day came home well. During the summer every mule on the plantation had the disease and after spending a few days in the woods, all returned home cured. From that year (1868) until 1882, I had more or less Charbon among my stock and with the same success. In 1881 it was very bad on this (the lower) end of Silver Creek. I wrote (from North Carolina) to my manager to take all of my stock back into the swamps nine miles from the nearest settlement. One of my neighbors had lost several mules and had several sick at the time. My manager allowed him to put his stock with mine and kept them all out several weeks. The sick all recovered and there were no new cases. It again appeared in 1882. Having lost our fences by a flood, I had to keep my mules up, the result was that five out of the ten cases died."

Mr. Poindexter's success was due to his getting his mules off the infected grounds. "Nine miles from the nearest settlement" would put them where no mules had died and consequently where the soil was not infected with the germs of the disease. "The flood of '82" which was followed by hot weather was most favorable to the development of Charbon. The "five out of ten" cases might also have been saved if the proper disinfection of lot and stable had been attended to and pure water provided. I have noticed all through the Delta that farmers are very careless about the quality of water given to stock.

Dr. Williams in speaking of Charbon in Europe says:—"The influence of marshes is so great that precautions are taken in several counties by keeping the animals back from the action of the miasmatic gases and effluvia during the heat of the day; and at the commencement of the heat, the flocks and herds are driven up to the mountains and high places, bitter experience having taught the guardians of the flocks that if they do not take these precautions, nearly their entire stock of animals will be destroyed by Charbon."

### INOCULATION.

Introducing the disease into the system and thus subjecting the animal to a mild attack of Charbon has been proven in Europe to "confer a complete immunity against future attacks of the disease." The following taken from the *Lancet* of October 15, 1881, will illustrate the point: "With regard to Symptomatic Anthrax or Chabert's disease, black quarter or quarter-ill, a disease due to a bacterian, differing in specific effects from that of splenic fever, experiments conducted by Arloing, Cornevn, and Thomas demonstrate in the clearest manner that the injection of the specific bacteria into the blood, care being taken to prevent their introduction into the areolar tissue, causing a slight and evanescent illness, confers a complete immunity against future attacks of the disease, but does not render the animal proof against splenic fever."

"Twenty five cattle were collected at Chaumont, thirteen of these had been inoculated with the virus of symptomatic anthrax, nine months before, the other twelve had not. All were inoculated with symptomatic anthrax in the cellular tissue. Of the twelve unprotected animals, nine are dead and two others are ill. Only one resisted the inoculation and it was found that this animal had been, during the previous year, in a stable which was visited by an outbreak of the disease. Of the thirteen protected animals, only one presented slight pyrexia, lasting a few hours; in the others the inoculation was absolutely without effect." Dr. J. W. Connoway, employee of the Station, spent seven weeks in the Delta, investigating the disease, and during that time inoculated one hundred and thirty-one mules, nine horses, and nine cattle.

Inoculation consists in giving the animal a mild form of Charbon, by injecting into the blood a small quantity of vaccine virus. The process is very simple and can be carried out by any one, willing to exercise a little care and patience. The virus is not expensive and may be obtained through the Experiment Station. The effect of the inoculation will not last more than from seven to eleven months and it would be necessary to inoculate every year. But as the disease occurs as an epidemic only after an exceptionally mild winter, inoculation would only be required during the spring succeeding such a winter.

### THE NEED OF EXPERIENCED VETERINARIANS IN MISSISSIPPI.

The fact that such a disease has existed and caused such great loss of life for so many years without investigation, at once suggests the necessity for more experienced men in our state. We have already scores of "Horse Doctors" with their salt petre and turpentine, but what is needed is an experienced Veterinary Surgeon in every county and every town. I suggest two ways by which this end may be accomplished.

1. Each county might send a bright young man to one of the northern Veterinary Colleges, the county to pay the necessary expenses on condition that after graduation he should settle and practice Veterinary Surgery in that county for a term of years.

2. The State Legislature might appoint a State Veterinarian, so that in case of an epidemic, the State officer could call out, as co-workers, his own men in the persons of farmers' sons.

In other countries and even in the northern states, a knowledge of Veterinary Science is now considered an essential feature of every farmer's education. In this region, it should be doubly so, for here our farms being larger, the farmer is obliged to handle much more live-stock. Our climate also being milder, and our country lower, our animals are more likely to be affected by the germ diseases.

### SUMMARY.

To sum up the practical points enumerated in this bulletin I recapitulate as follows.

*Preventive Treatment:* All mules and horses should be inoculated after a mild winter. Care should be taken that animals do not become overheated, and they should be protected from flies while at work or in the stable, which may be effected by bathing with the carbolic acid solution, one bucket full being sufficient for about five animals. The stable should be disinfected by sprinkling with a solution of copperas, and the stable lot sprinkled with chloride of lime. Animals should be well fed, and have pure water for drinking.

*Symptoms:* Usually for some hours before the disease shows itself by external swellings the affected animal will manifest signs

of general depression, such as drooping of the ears, sunken eyes, and a flagging gait. As the disease progresses the temperature may rise to 105° and swellings make their appearance in the region of the belly, breast, and throat. If not checked, these swellings will continue to enlarge until the animal dies.

*Treatment:* The moment the first symptoms of the disease are noticed the animal should be drenched with—

Chlorate of Potash, 4 drachms,

Tincture of Muriate of Iron, 1 table spoon full.

Give in a pint of water, and repeat in three hours. Bathe the swellings with a mixture of one part of carbolic acid to eight parts of water. If the urine is suppressed add an ounce of salt peter to the drinking water, and if the bowels are inactive give half ounce doses of linseed oil once every two hours until relieved. An abundance of good nutritious food, pure air, well water, and protection from hot sun and rain are absolutely essential to success. All animals dying from the disease should be burned at once, and the place immediately disinfected by sprinkling with chloride of lime and carbolic acid. A supply of medicines should be provided in advance, so as to be ready for immediate use at any time.

