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DISEASES OF SHEEP *AND* CALVES.

BITTER WEED.

D. L. PHARES, Veterinarian

AGRICULTURAL COLLEGE, MISS.

AUGUST 30, 1889.

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SOME ENTOZOIC DISEASES OF SHEEP AND CALVES.

The following extract from a letter dated August 29, 1888, will give an idea of one of these diseases:

"The first symptom of the disease is a swelling under the lower jaw, which, when cut, resembles a colorless jelly. During the night the swelling almost, if not entirely subsides, appearing again about noon the next day. After about the fourth day the swelling under the jaw disappears entirely, and the upper lip becomes swollen, the countenance pale, and a very perceptible enlargement of the stomach. The victim lags behind the flock and shows little disposition to feed or ruminate. Every case so far has proved fatal. The disease runs its course in from ten to fifteen days. After death, an internal examination reveals that the lungs are very much affected, unusually pallid, and sometimes symptoms of mortification. Around the large part or opening in the heart there clings that colorless jelly-looking substance. The liver in some instances is affected, showing spots on the surface, in others seemingly healthy. The abdomen outside of the bowels is filled to excess with reddish colored water. In fact, there is no natural blood in the sheep; but a pale, reddish-looking water seems to have taken the place of blood in all the veins."

OTHER ITEMS.

A personal friend wrote me at the same time:

"I saw one opened just after death this morning and the thing that impressed my unpracticed eye most was the absence of *any real blood*, being about a teaspoonful of clot blood in the heart, and nothing but bloody water anywhere else; also the clear, colorless jelly-like substance all around the base of the heart and thinly distributed over the intestines. One lung was colorless, the other *slightly purple*. The liver seemed perfectly sound. There are about 275 head of Merinos, which were brought here in January last from a point north of this in Texas. The sheep have grazed on a low, flat prairie on Galveston Bay, eating chiefly Texas sedge. In winter they were fed cotton seed meal,

and are in good living order. Mr. — has also a small flock of Cotswold sheep, running on the same range, that are not at all diseased. The Merinoes also have scab, for which he dipped them in Buchan's carbolic sheep wash."

ANOTHER FLOCK.

In a flock of about 4000 Merinoes from the West, arriving in South Alabama in good condition in December, a letter received in May, 1888, reports a similar outbreak. An abstract follows:

"In January and February the loss was trifling, but lost some during the long rains in March. I fed well with corn and cotton seed. The sheep did not seem usually well during the long rains in March. Many got lame, the skin peeled off their legs, looked as if they had been scalded. [In April the weather was all that could be desired, yet a new trouble came.] They run at the nose a little, soon afterward a small bunch appears directly under the lower jaw. It grows larger and larger, swells around the eyes sometimes. The upper lip will be very thick, and when bad there seems to be some difficulty about their breathing. Sometimes the sheep will last two weeks, depending on the strength of the animal. When the swelling is cut open it looks like thick jelly. They don't always run at the nose before it comes, but usually. Sometimes in the night the swelling will nearly all go down. There are others that seem drooping without any bunch or any apparent trouble. Their skin is very white, wool of a dull color, and neither looks natural. I have examined many. The liver, lungs and heart are not right. The heart seems swollen and liver of variegated color. Inside of the paunch or stomach is a small web-like looking material, very thin, which I never see in a healthy sheep. [Is this the jelly-like substance "thinly distributed over the intestines," mentioned in the letter from Texas?] The sheep don't seem to like the grass, occasionally gnaw bark or dirt, not as greedy for salt as usual, and drink very little water. This has been since the new grass. The throat trouble has been far worse since April and good weather."

GREAT MORTALITY.

Information from another source causes me to believe that in a few months about three-fourths of this large flock died. The writer adds:

Native sheep about here have the same trouble, but not till fall. Very few die some years, and other years more. There must be something lacking in the grass or water.

VEGETATION AND WATER AT FAULT.

No doubt both the vegetation and water are the sources of these fearful epizootics, as will be shown later.

BUNCH UNDER JAW EXPLAINED.

There is nothing mysterious about the "bunch" under the jaw forming during the day and disappearing during the night. The blood becoming disorganized, incoagulable and watery, the liver and lungs obstructed, and all the tissues weakened, more force is required to return the fluid from the pendent parts to the heart, while the vessels and muscles concerned in the circulation are less able to do the work. During the day, when the animal is grazing, the head being down, blood has to be raised much higher; while the mechanical obstruction is much increased, the liquid escapes from the vessels into those parts offering least resistance—the loose connective tissue under the jaw. When the animal lies down at night with the head on a level with the body, the mechanical obstruction is removed and the liquid returns from the swelling to the circulation, and in the morning the "bunch" has disappeared. So also of the swelling about the face, around the eyes and the lips. This swelling is inside as well as out, and hence the difficulty of breathing in many cases.

SEEN IN SOUND ANIMALS.

Every experienced stockman is familiar with the fact that when a grazing animal has been kept stabled many weeks, as during winters, and in the spring turned upon short grass for some hours, the whole head becomes swollen. But during the night the head being on a level with the body, in the morning has resumed its normal size. Other forms of illustration could be readily given.

WHY DO NOT THE COTSWOLDS ON THE SAME RANGE WITH THE MERINOES IN TEXAS SUFFER?

This may be accounted for in several ways, of which but two will be mentioned here. But either of these is sufficient answer to the question. First, Some families of the human race are extremely susceptible to tuberculosis, while other families cannot be made to contract pulmonary consumption, owing to difference of constitution; the latter never affording a nusus capable of developing the tubercle germ. So with these two breeds of sheep. The matter may perhaps be made more striking by restricting the numbers in the comparison. Here is a man who cannot live east of a certain mountain on account of his violent attacks of asthma, while his wife enjoys the most vigorous and uninterrupted health. West of the mountain his health is all that could be desired, while the wife cannot live there because of her violent attacks of asthma. The malady is developed in the one constitution under a combination of certain conditions, and in the other under a different combination. Many other illustrations could be given. The reader can make the application.

2d. While the Merinoes grazed on the low, flat prairie, "eating chiefly Texas sedge," the Cotswolds probably preferred other veg-

etation and drank from pools not visited by the Merinoes; the two flocks thus introduced into their systems different species of parasites, which will become more apparent later in this paper.

In Alabama, and in proximity to each other,

WHY WAS THE MORTALITY SO MUCH LESS AND LATER AMONG THE NATIVE SHEEP THAN AMONG MERINOES, BOTH HAVING THE SAME DISEASE?

It is not probable that the disease was identical in the two breeds. It is not probable that the two took into their bodies the same parasite or parasites, or in the same proportions. It is on just such "low, flat praries" as mentioned, and in and around stagnant pools in such localities, that sheep take in the eggs or larvæ of the worms that cause most of their fatal maladies. In and about a single pool often many species of sheep and cattle entozoa are found; and sometimes many species of worms are found in different parts of a single sheep, and again several species in the same organ. There are

SEVERAL SPECIES, ANY ONE OF WHICH CAUSES DEATH.

If two or more of these be present in an animal, it is more violently affected, with more complicated symptoms, and a speedier death. Thus we find often a fatal epizootic bronchitis caused in lambs by the lung thread worm which infests the windpipe, bronchial tubes and lung tissue. Another worm, infesting these organs, causes death by suffocation—their number and the tough mucus they cause to be secreted closing the air passages. Another causes death by reflex nervous irritation; another by anæmia or destruction of the blood as described in the Texas letter above quoted. There are several other species of worms attacking other organs that cause anæmia, dropsy, white skin, pale skin, paper skin, pelt rot, hoose, etc., besides the fluke which causes "liver rot." All these parasites are picked up in such places as described above; none on undulating or hill land or salt marshes, if the sheep are debarred from stagnant pools, overflow bottoms, and are supplied with good well water.

WHY IS THIS?

Because all the above-mentioned parasites, and a number of others, are bred only in such places as described, or in places permanently moist. A single stagnant pool having drainage into it and surrounded by vegetation can, in a single day, supply every one of a flock of sheep with hundreds or even thousands of eggs or recently hatched lung thread-worms, too small to be seen except under the microscope. And the same may be said of other species of worms. Cobbold removed a mass of eggs from a single *Strongylus micrurus*, estimated to number 10,000; some of them containing moving embryos. These eggs were 1-300 of an

inch long and 1-750 in breadth. The embryos escaped from the egg were 1-90 of an inch long and less than 1-1000 of an inch thick. This is the worm which is so destructive to calves, causing the swelling under the jaw, anæmia and dropsy. Many species of parasitic worms pass their several stages of development in different hosts. The eggs of the fluke, for example, being dropped in water, or washed into a pool by rain, hatch, the young being furnished with fine, soft, hair like appendages, swim about and are taken up by snails or other mollusks, or hatching on moist ground or plants, are thus taken in. The snails, crawling over plants, are swallowed by sheep and other ruminants grazing about the pools. So, also, large numbers of eggs and embryos of the lung thread-worms have been found in the common earth-worms, and in the pellets of earth which it deposits so abundantly on the surface of the earth and on plants, whence they are transferred to the ruminant. The microscopic, but active, speck may attain a length of three inches in the sheep's lung. This requires time. The embryos swallowed by the lamb in the spring develop sufficiently by August or September to cause the lamb to begin to languish, and in a few weeks die.

Sheep (native) over two years old rarely suffer seriously from these worms, while, if the spring be wet, it often occurs that nearly all the lambs die in August and later. Very early lambs die in spring or summer.

TREATMENT.

After the disease becomes developed, very little can be done with hope of saving the sick animal. If but few worms develop the case is not necessarily fatal. Often nothing of disease is suspected 'till anæmia occurs, when remedies are inefficient. Hence it will be perceived that

PREVENTION

is the rational treatment. The calves and flocks must be carefully and vigorously excluded from places where the first stages of the parasites occur. This paper is prepared not to teach flock-masters how to cure the disease, but the importance and means of prevention. On well-drained lands sheep and calves do not suffer from worm troubles, if kept in good condition, with pure water, plenty of good food and salt. Nothing is more fatal to these parasites and their first hosts—the snails, etc.—than salt.

SALTING THE LAND.

If there be but a small area of moist land or stagnant water, a free use may be made of salt, the application being renewed after heavy rains. If the area be extensive the salting process would be too expensive to be adopted. The only safety, however, is dry, well drained pastures, supplemented with good water, and

sufficient wholesome feed to keep the animal in good condition. But it must be borne in mind that a flock already infested may perpetuate the parasites for a few years on the best situated pasture. Eggs and embryos are often expelled with mucus by coughing, and, falling on the grass, are swallowed by other sheep and develop. Many eggs and young adhering to excrement are by that means also dropped, and if the weather be damp vitality may be retained for weeks. Therefore, every animal known to be infested should be retained on the pasture, or, better, slaughtered, and the sound ones removed to pastures on which no infested animal has been. The infested land should be cultivated a year or two before returning it to pasture.

I will add that before the disease is developed, if the presence of parasites is suspected, there is a possibility of destroying them by a generous use of salt, sulphur and pine tar or turpentine internally, and inhaling sulphur fumes and turpentine vapor. The parasites are usually enveloped in mucus, which, in a measure, protects them from the vermifuge. Bi-carbonate of soda is a good solvent for mucus and should be given with the other drugs to enable them to reach the enemy.

To give the description, technical names, and life history of the entozoa causing so much loss of life in flocks and herds would require a large volume which few would have time and patience to read. Hence it was thought best to give the farmer in plain language, in a short tract, a general idea of the character of his enemy, where to find him, and how to escape his ravages.

D. L. PHARES.

APPEXDIX.

Since the above was written specimens preserved in alcohol have been received of Mr. T. G. Smith-Vaniz, of Madison county, Miss., and drawings made, as seen in Figures 1 a, 2 a, 2 b, and 4, 4, on the plate. A large number of 1 a were found in sheep's lung. They sometimes infest the trachea or plug the small bronchi. The *Tricocephalus affinis* infests the large intestine, but not in large number. *Strongylus micrurus* is the lung worm of the calf.

Sulphur, salt and turpentine introduced into the stomach are valuable remedies for all these worms. For those infesting lungs and air passages, inhalations of sulphur fumes, turpentine, chloroform, carbolic acid, spraying with these substances, even injecting into the windpipe; turpentine, dilute carbolic acid, salt water in small quantities. In whatever way given they should be preceded by solution of bicarbonate of soda to dissolve mucus and give the vermifuges access to the parasites. With hypodermic syringe piercing between the cartilages these drugs can be safely injected in small doses.

DESCRIPTION OF FIGURES.

Figure 1 a.—*Strongylus filaria* from lung of a young sheep that died March 5, 1889. Some of the worms were full three inches long. The drawing shows natural size of one taken at random from a large number in alcohol.

Fig. 1 b.—Female *strongylus filaria* greatly magnified, copied from Second Annual Report of Bureau of Animal Industry, 1885. *a*, mouth; *b*, funnel shaped insertion of oesophagus into intestine; *c c*, intestine; *d*, caudal extremity; *e*, vulva; *f, f*, uterus full of eggs; *g*, shows a gap where part of the body is not drawn for want of room.

Fig. 2 a.—*Tricocephalus affinis* from a lamb, May, 1889. natural size.

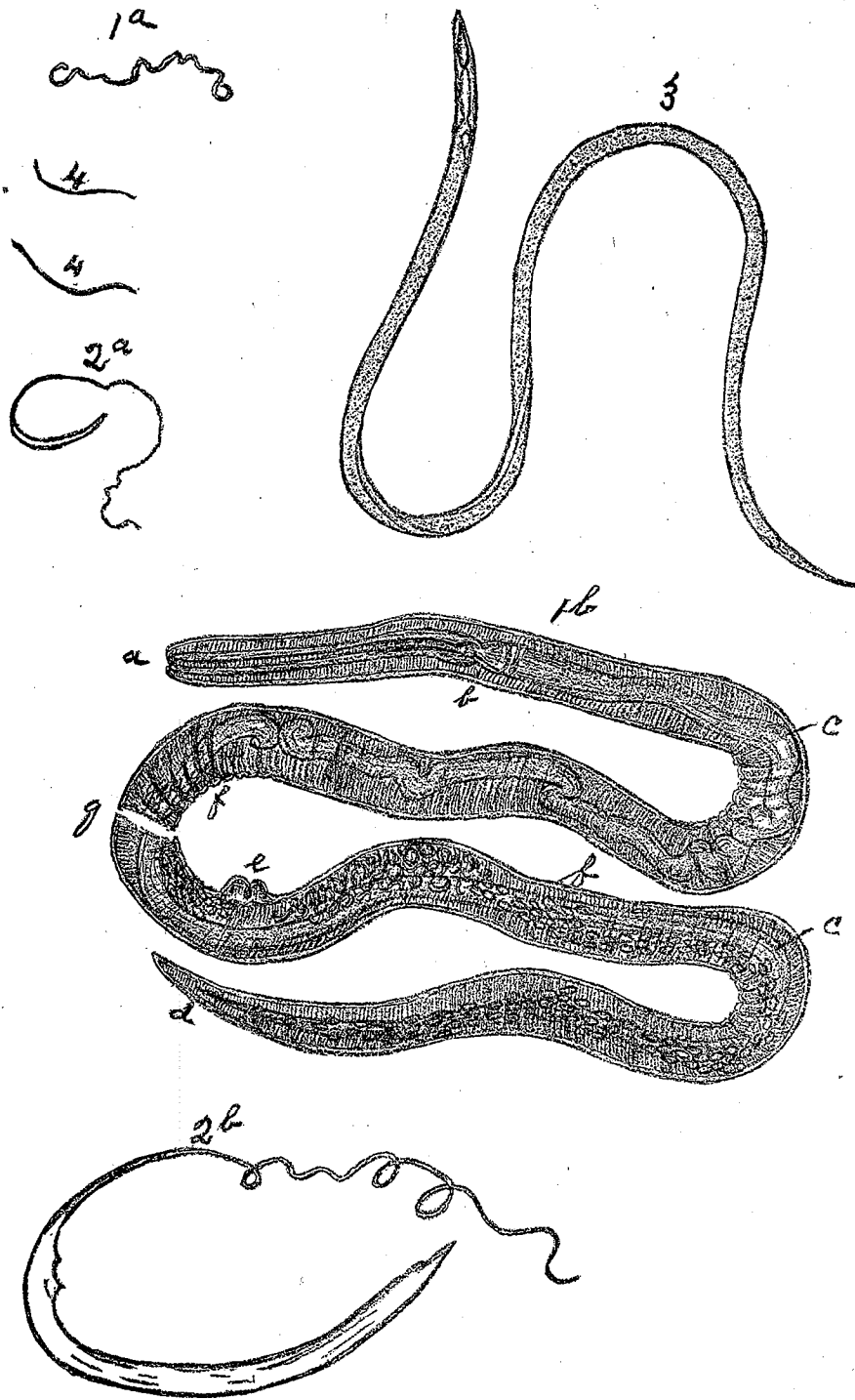
Fig. 2 b.—The same magnified.

Fig. 3.—Female *Strongylus micrurus* filled with eggs, magnified four diameters. Copied from same Report as Fig. 1 b.

Fig. 4 4.—*Strongylus contortus* from fourth stomach of a young sheep, December, 1888, natural size.

D. L. P.

June 20, 1888.



HELENIUM AUTUMNALE.

“False sunflower, sneezewort, sneezeweed, swamp sunflower, yellow star, ox eye. *Ord Composite*. An indigenous herb, with large golden yellow compound flowers which appear in August. All its parts are bitter and somewhat acrid, and when snuffed up the nostrils in powder are powerful sternutatories. Nine different varieties of *Helenum* have been described, but *H. autumnale*, *H. parviflorum* and *H. tenuifolium* are best known; the last two for their peculiar deleterious effects on the nervous system of the lower animals especially.”—Dunghison’s Medical Dictionary.

The number of species is much greater than here stated. The last seems to exert no deleterious effect on the nervous system of the cow and sheep, nor of any other animal, so far as the writer and many friends have observed for forty-six years. It is the bitter weed of the gulf States, and causes the milk of cows eating it to become very bitter; sometimes the butter is also bitter; and often the beef and mutton are bitter. Those tasting the bitter cooked flesh have sometimes become frightened and called a physician to investigate supposed attempts of cooks to poison a family. But this plant seems to be harmless to man and beast. Indeed, it seems to have a good tonic effect on cattle in the spring, and certainly promotes digestion in at least a certain proportion of people. It is a pure bitter, without acridness.

But the *H. autumnale* does injure and kill some of our domestic animals. It is distributed in damp and siping lands from near the great northern lakes to the vicinity of the Gulf of Mexico, and commences blooming late in August and continues till frost. The other species bloom earlier, the entire blooms being bright yellow, while the central portion of this is purplish. While the others are annuals, this is perennial; the root and lower part of the stems survive through the winter. The stems do not branch so near the ground as the others, and the plant is acrid, pungent. In common with the other species, it is also bitter. But the degree of bitterness and acridness is very variable. Within an area of a few square yards plants may be found with these properties very strong, and others in which the bitter is weak and the acridness scarcely perceptible.

EXPERIMENTS.

A series of experiments was commenced at the College in Oc-

tober, 1888, for the purpose of studying the effects of this plant on animals and of discovering antidotes. But neither subjects nor a supply of the green plant could be obtained, and only a few experiments were made on calves, kindly furnished by Prof. Irby.

Experiment 1—Calf about four months old and not fed in the morning. Upon three ounces of the dried plant was poured a pint of boiling water. After an hour the water was decanted with pressure. Mr. J. W. McWilliams, of the senior class, gave all the doses in all the experiments and noted the symptoms. October 6th the above infusion was ordered to be divided into four parts and one part given every half hour, beginning at 11:10 A. M. The first dose produced no very marked effect—only a flow of a few tears. After second dose became restless, later laid down. After third dose breathing impaired, continues lying down and appears sicker for a short while. Fourth dose, breathing harder, but at 3 P. M. the calf was resting easy. Next day he seemed to be nearly as well as usual and took his feed.

Experiment 2—October 13th; same calf. A hot infusion of six ounces of the drug was prepared in one quart of water and given between 8 A. M. and noon. Soon after the first dose some weeping began, but no other marked effect was observed. After second dose the calf laid down. Third dose, he continues down, but somewhat restless and sick. Fourth dose, becomes very restless, bowels loose, staggering, and very sick, holding head down, sucking wind, left flank tympanic but not very tense, right flank contracted, trying to put head between forelegs, and very sick greater part of the day; movements weak and uncertain, purposeless, hyperesthesia very marked, especially along the back, shrinking from least touch, but by persistent handling submits to touch, respiration and pulse quickened, appearance of slight spasm along the back, neither eats nor drinks of food and water and milk in his stall, a little straw from floor in his mouth, and although the jaw is in constant motion the straw is undisturbed and he seems unconscious of its presence. Next day apparently well.

Experiment 3—October 20th; another calf about four months old. One pound of the dry plant was taken, one gallon water poured on it and boiled down to a quart; all given by 10:35 A. M. After third dose the left flank tympanic, feces and urine discharged, slight jerking as though chilled, tremor of muscles of hindquarters, lying on right side over an hour, breathes with some noise and distress, very sensitive from withers to sacrum; at 11 o'clock fullness of left flank subsided, limbs showed weakness and later stiffness, very sick, frothing at mouth and flow from nose. Next day the calf was well.

The large quantity of the drug given this calf producing little more effect than the smaller dose on the former one leads me to suppose that the prolonged boiling may have dissipated a portion of the poisonous principle. Knowing that none of the symptoms

observed would lead on to death no antidote was administered in any of the experiments. The weeping and movement of the jaw were probably due to the pungent effect of the drug on the throat and stomach; and I incline to the opinion that the nervous symptoms were not caused by direct action of the drug on nerve centers, but were reflexes from the irritated throat and stomach.

In the sheep the spasms in severe cases are epileptiform and a sheep may have many such convulsions and yet recover without treatment and after many hours rise up and walk.

The horse and mule succumb to the baleful effects of the poison quicker and more completely than other animals. The effect is manifested very soon after ingestion and with great violence. The animal cannot control his motions, plunges about blindly, falls dead or perhaps breaks his neck in falling forward with the head under the body.

An antidote which has proved effective is a pint or two of melted lard poured down the animal's throat. The relief is very prompt. But it must be given before the horse loses control of his limbs, or it cannot be administered at all. The relief is so prompt and complete that it is difficult to believe that it is the direct effect of the lard on the nerve centres, but as a local emollient applied directly to the burning throat and stomach. The local trouble being quickly relieved, the violent reflex effect on the nervous system suddenly ceases.

When we consider the wide distribution of this plant and that in some places it is so abundant as to hide the earth from view over whole acres, it is remarkable that so few poisonings occur. But animals have no special fondness for it. When they have been long on the road and deprived of green food, stopping where this weed is found and other green plants scarce, they are disposed to eat a little of it. It is under such conditions that the plant is most frequently eaten and the poisoning occurs.

Animals, notably sheep, once intoxicated by the plant and recovering, seem to acquire a mania for it, and when finding themselves in localities where it grows hurry to and devour it.

Within 200 miles of the Gulf of Mexico the *H. quadridentatum* takes the place of the preceding, is very abundant, harmless, blooms early and dies by August.

The Plate illustrates parts of the *Helenium autumnale*, or poison sneezeweed.

Figure 1 is an enlarged disk floret showing calyx, corolla, bifid stigma, below which the cylinder or tube of anthers enclosing the style.

Figures 2, 2, enlarged disk floret buds.

Figures 3, 3, magnified top-shaped, hairy achenia with denticulate, awn-pointed pappus.

Figures 4, 4, 4, 4, magnified ray florets with three cleft corolla.

Figure 5, head a little enlarged, showing 14 ray florets.

Figure 6, the irregularly dentate leaf, natural size.

D. L. PHARES.

