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Pregnancy Disease in Sheep

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Flock of ewes in which many cases of Pregnancy Disease were found.

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PREGNANCY DISEASE IN SHEEP

CECIL ELDER AND A. W. UREN

For many years losses in sheep, and in some cases rather heavy losses, have been occurring in all parts of Missouri as the result of a disease that has been known under a host of different names. We have concluded from our study of the trouble that the name pregnancy disease in sheep is the most appropriate.

This disease has been known and recognized for a long time but many factors, especially the exact cause, have never been well understood. Its occurrence in Missouri was reported as early as 1918 but so many different names have been given this trouble that considerable confusion and misunderstanding have resulted. Probably the most common names given to this disease are pregnancy disease in sheep, toxemia of pregnancy, and ante-partum paralysis or lambing paralysis. It has been described under these and many other names in the literature but as it does not seem advisable or necessary no attempt will be made to review the literature in this publication.

Pregnancy disease has been observed in ewes in all parts of the State and as the name indicates is confined entirely to pregnant ewes. It occurs during the latter part of the gestation period when animals are heavy with lamb, from three or four weeks prior to lambing up to the time of lambing. It is seldom seen in any animals except those which are carrying twins or triplets, but if it occurs in animals carrying singles the lambs are as a general rule quite large in size and well developed.

All breeds of sheep are susceptible, but this disease is seen only in the older and more mature ewes. According to our investigations well over 75 per cent of the trouble in Missouri is seen in thin ewes or in animals in only fair condition. It may be well to mention here that several writers have described a disease in fat sheep which in some ways resembles this trouble, many of the symptoms being similar. We have confined our discussion in this bulletin to a description of the disease as we have most often seen it in Missouri. Just as soon as the ewes have lambed, the danger from this disease has passed. We have not observed the trouble in large flocks, and, in our experience, it has been confined to farm flocks.

From an economic standpoint, this disease has come to be of extreme importance in Missouri. We now look upon it as being one of the most serious problems in mature sheep, ranking second

only to parasitic infestation. Not all flocks in the State are affected, but when total numbers are considered many flocks throughout Missouri are found to have this trouble. The losses in these affected flocks will vary usually from 1 to 25 per cent of the flock. It is difficult to determine the exact or total losses in Missouri from pregnancy disease, but during the last several years the annual mortality rate has been numbered in the thousands of animals. The disease seems to be more prevalent during the last few years. This can be explained in part by the fact that during the last few years owners have changed their breeding dates so their ewes will bring earlier lambs and as a result have had their ewes lamb at a time of year when the disease is most prevalent.

The disease never occurs in any sheep other than the pregnant ewe, although at times there has been some confusion due to the fact that symptoms resulting from over-feeding are somewhat similar to the symptoms observed in this disease. Trouble from overfeeding occurs in all ages and in both male and female sheep.

CAUSE

The exact cause of this disease is not known, but it will be of interest and possibly of some value to discuss some of the factors which are considered contributory to this disease and to outline some of the facts which we have gathered in the study of this disease. Many authorities are of the opinion that the disease is confined largely to animals which are over-fat, but it has been our experience that this is not true in the majority of the cases we have observed in Missouri farm flocks.

Lack of exercise is another factor which many authorities have considered as most important. It has been observed that the disease very often appears at a time when there is a sudden change in feed or a sudden change in weather. For this reason, lack of exercise has been looked upon as important because it is the policy of many of our sheep raisers to pen up ewes when they reach the latter stages of gestation and start feeding grain and more concentrated feed. As exercise is reduced at this time it makes it appear that lack of it has been an important factor. Several cases of the disease occur after storms and extreme cold weather or when the feed is covered with snow, and here again there is a tendency for the animals to take less exercise than they normally have been taking. It appears to us from our study of the disease that these changes may be more of a coincidence than anything else and we are of the opinion that the disease probably occurs at this time in the period of gestation rather than because the animals

have been penned up and given more concentrated feed. Constipation has been looked upon as a contributory factor but this has not appeared to be of any great importance in the large number of cases of animals which we have had an opportunity to observe and study.

Reports have been received that the disease appears a day or two after salting, but this is looked upon as a coincidence only, and little importance has been attached to it.

We have never seen the condition in any sheep which have been fed for any length of time on a good legume hay and where that roughage has been supplemented with a good grain ration. It is almost entirely confined to flocks which have been fed on timothy hay, corn stover, oat straw, poor pasture, and in flocks which have received no grain other than corn. In some cases, the animals were receiving a considerable quantity of grain but this consisted entirely of either shelled corn or ear corn. In most cases, the animals have had plenty of exercise; in fact, in hunting for food they have traveled long distances during the course of the day. In animals which have been on good bluegrass pasture and properly managed, the trouble is seldom if ever seen.

Kentucky workers report that greatest losses have occurred in that state when sheep have been receiving roughage and insufficient pasture or when they have been on considerable corn but with no alfalfa or clover.

At one time, it was thought that this trouble was due to a calcium deficiency and was so reported by some of our experiment stations. We have never been able to confirm this finding and we are of the opinion that calcium deficiency is not the cause, though we must admit that the ration these animals have been receiving is quite low in calcium content. At one time, we were of the opinion that low calcium content was a factor, but investigational work during the past two years has forced us to change this opinion. Chemical analyses which have been run in our laboratory have failed to demonstrate a calcium deficiency in the blood. The use of calcium in the treatment has further verified this finding by the fact that it failed to give any beneficial results.

Due to the fact several cases of the disease occur at the same time, it has been the opinion of many sheep owners who were unfortunate enough to have this disease occur in their flocks that they were dealing with an infectious or contagious disease. It has been very definitely proven that the trouble is not infectious or contagious but merely appears so because large numbers of

cases occur at or about the same time. This undoubtedly is because they are all in about the same stage in their periods of gestation.

It is interesting to note that the disease, in many of its manifestations, is very similar to the toxemia observed in human pregnancies. In this latter condition, the exact cause has not yet been determined, but many of the theories regarding the causative agent may be to a certain extent applicable to the trouble we are experiencing with sheep.

Up to the present writing, no one has been able to isolate a toxin from these cases, even though the disease has been named a toxemia and from its clinical picture would make one suspect a toxic substance of some kind being present. This is further borne out by the fact that the trouble immediately stops after the flock of ewes has lambed, and also in the animals which are affected complete recovery rapidly takes place in the early stages of the disease just as soon as the ewe is able to have her lamb.

We are of the opinion that the disease in sheep is one which is largely concerned with problems of feeding and management and is probably closely associated with a disturbance in the carbohydrate metabolism. Reports very often come to us from owners who are having trouble that the disease affects their best ewes first and those that are in the best condition. They also report that after an animal becomes affected that it loses flesh very rapidly. This latter fact is no doubt true, but upon investigation we often find the entire flock to be in only fair or poor condition. It has been the policy of many sheep owners to judge a sheep by the appearance of its wool and if the fleece is heavy they conclude the animal is doing well and that it is in good condition. This heavy fleece covers up the true facts regarding the animal's body and the owner has been misled. Upon catching these animals and examining them it is generally found that they are thin, although the flock may as a whole be very active and look to be in fairly good condition. After the animal is sick and goes down, she is handled more and her true condition is then ascertained. This causes the farmer to conclude that they lose flesh rapidly after becoming affected, because he had looked upon her a few days before as being in good condition. In this connection, it might be well to determine the condition of a flock of sheep by handling and feeling the amount of flesh along the backbones rather than by observation alone.

All of our attempts at reproducing the disease have been negative, with the possible exception of one case, which was pro-

duced in our experiment flock the past season. Although this animal at the time showed symptoms that were not typical of the disease as it usually occurs, we now believe we produced an actual case of this disease by our methods of feeding and handling. There is one limiting factor in this observation, however, which should be kept in mind, and that is that after the lambing season was over we found a very small number of twin lambs and practically all of our experimental sheep dropped single lambs. As has been stated before, the disease is seen almost altogether in ewes carrying twins or triplets. If it does occur in ewes with single lambs, those single lambs have without exception been extremely large individuals.

We have never been able to reproduce the disease in our fat animals, even though they were penned up in very small pens for long periods of time and were given no exercise at all. From our study of the field cases, we were at one time of the opinion that it would be rather a simple procedure to reproduce the disease. We found, however, that this was not easy to do, even though we approximated field conditions just as accurately as we possibly could.

During the past two years, we have observed the disease in many flocks and found the animals to be very fat in less than 5 per cent of the many flocks which we have visited and on which we have been able to collect data. This leads us to believe that since it is so rarely seen in flocks that are fed a balanced ration and properly managed, the disease is largely a nutritional and management problem. In years when feed is short or legume hays are very high in price, one would naturally expect to find more cases of this disease developing.

From our chemical analyses and studies, we have shown that there is a marked decrease in the alkaline reserve of the blood stream. This verifies the findings of other workers that there is an acidosis present in these cases. We look upon the acidosis as being a result of the effects of the disease rather than the cause of the trouble. The disturbances in the liver and kidneys observed upon examination after death are also probably the result of the disease rather than its cause.

Some owners, when asked about the ration being fed, have reported the animals were receiving alfalfa hay. Others have reported they were feeding soybean hay and have raised the question of the possibility of the soybeans causing the trouble. Upon further inquiry, we have found that the alfalfa hay either was not fed in sufficient quantity or had not been fed for a long enough

time prior to the occurrence of the trouble. In many cases the soybean hay was of poor quality and the bundles consisted mainly of weeds rather than soybean plants. We have seldom seen the trouble where the animals were receiving an adequate supply of alfalfa hay or a good grade of soybean hay. The trouble has been observed, however, in flocks receiving alfalfa hay but no grain and the question has naturally arisen as to whether or not ewes can eat enough roughage alone, even if it is good quality hay, to carry them through pregnancy. In animals that are carrying twins or triplets, more nutriments are required as there is an increased demand upon the system of the ewe.

SYMPTOMS

As a general rule, the early symptoms are seldom noticed and the disease is not recognized by the owner in the very first or early stages. Its presence in a flock is not fully realized until one or several animals have gone down. Upon closer observation the first symptoms seen will be stiffness and unsteady gait, especially in the hind quarters, and the animals have a tendency to lag behind the flock. Sheep are dull and may pay little or no attention to people, or move off slowly. Sometimes the head is held with nose pointed upwards and the animals may walk in circles or run into objects. Again they may stand leaning or pushing against a fence or building or stand alone with the head hanging down (Fig. 1). If an attempt is made to catch them, they very often go down on the hind feet and make little effort to rise. Some of the ewes appear dull or to be in a stupor and stand around taking little exercise of their own accord. After a short time, one or two days as a rule, the animals go down, unable to rise. They often lie with the head turned around to the side of the body and will stay in this position for hours or even days (Fig. 2). The temperature is generally normal or may be subnormal. There is loss of appetite but animals often will drink water. Breathing becomes more rapid. One of the most common symptoms which is observed more or less throughout the whole period the animal is affected is the grinding of the teeth. In many cases there is a blindness or partial blindness as affected animals run into objects or run into other sheep. Thus far in our study no visible changes in the eye have been observed. Microscopical studies have not been completed.

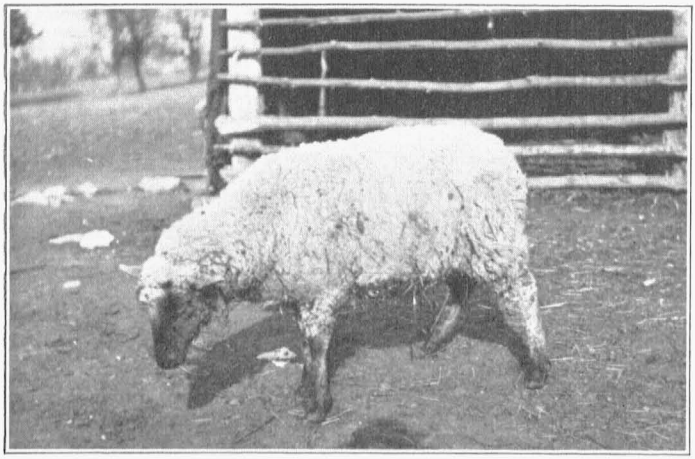

Fig. 1.—Mature ewe showing typical well marked symptoms of pregnancy disease in the earlier stages.

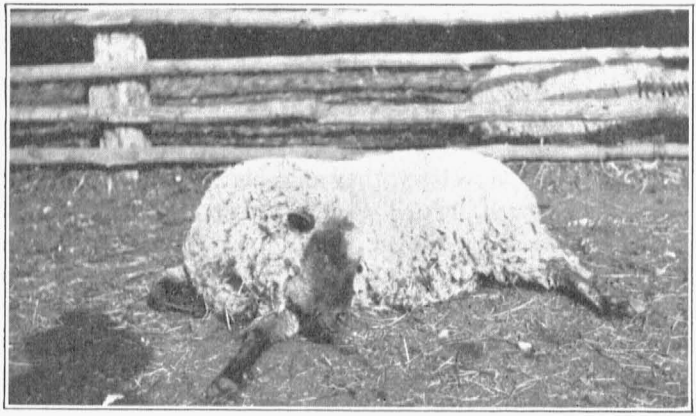

Fig. 2.—More advanced stage of the disease. This ewe was unable to stand and remained in this position for a long time

Fig. 3.—Last stages of the disease. Note the position of the feet and the comatose condition.

As the disease develops the animals become stupefied or comatose. Even when helped to their feet they are unable to stand, but drop back to the ground (Fig. 3). They appear to be paralyzed and hence the name "lambing paralysis," previously mentioned in this bulletin. This is not a true paralysis, but more of an incoordination accompanied with general weakness. Some animals show a nervousness and irritability when disturbed, nervous movements of the head and ears being in these cases noticeable. Animals may lie in a comatose or semi-comatose condition from one to several days. They generally linger four, five, or six days, or even longer before death finally takes place.

The condition is a true acidosis and the urine is changed from alkaline to acid in reaction. Urinalysis shows albumen, acetone and increased ammonia.

Fig. 4.—This ewe was markedly affected but dropped twin lambs the day before this picture was taken. She made a complete recovery.

If lambing takes place during the early stages of the disease, or before the ewe becomes too weak, rapid recovery is the result (Fig. 4). Even with this the mortality rate in affected ewes is well over 90 per cent.

LESIONS

If animals are autopsied it will be noted that the carcass is almost always very thin. On first observation, there appears to be a fairly large amount of fat in the omentum and around the internal organs, but when closely studied this fat is found to be decreased in amount and mottled in appearance. There is much less fat around the skeletal muscles, also, than in a normal healthy sheep.

The most characteristic change is found in the liver, which is a yellow or clay color and sometimes mottled on the surface. It is rather friable and brittle as a general rule. Microscopic examination reveals a marked fatty infiltration of the liver tissue. In all probability there is some degree of fatty infiltration in the liver of any pregnant ewe but in pregnancy disease the fatty degeneration change is more marked and carried to a far greater degree. The other organs appear normal but the kidneys on microscopic examination may also show fatty degeneration changes. Some of our field cases have shown an acute nephritis. In the majority of

the cases that we have examined, the digestive tract is empty, or nearly so and there is little evidence of constipation. We do not find any marked evidences of diarrhea in most of them.

The uterus is normal in appearance and structure and the lambs are normal but in the large majority of cases twins or triplets are present. In one series of fifteen field cases studied last year all of the ewes except one were carrying twins or triplets. This one lamb was unusually large and well developed but died at time of birth because the ewe had trouble lambing, due to the size of the lamb. In practically all cases, if the affected ewe is killed and immediately opened, the lambs will be found alive and it will be seen that apparently normal development of the lambs has taken place during the period of gestation.

TREATMENT

At the outset it may be stated that to date no satisfactory curative treatment has been found. In our work many and varied treatments have been administered and tried but in every case with the same result. However, rapid recovery may be expected if the affected ewe is able to lamb in the early stages of the disease or before she has become too weak (Fig. 4). Taking the lambs prematurely has not given satisfactory results and does not appear to be practical under the ordinary field conditions. Various drugs have been tried with no consistent beneficial results. The various calcium salts, glucose, etc. have been equally ineffective in our hands, even though intravenous injections were made and rapid absorption was insured. Similar results have been reported by several other workers when dealing with this disease.

Best results may be expected when efforts are turned to prevention of the disease in the unaffected sheep, rather than trying to cure the sick animals. Fortunately preventive measures have been worked out and their value thoroughly proven when properly applied and followed.

PREVENTION

Experience has shown that an outbreak of pregnancy disease in a sheep flock can be prevented and controlled, so far as the prevention of additional cases is concerned, if proper precautions are taken and correct feeding and management practices are instituted. Financially this may at times be quite difficult but if desired results are to be obtained it is absolutely essential. We are of the opinion that the added expense is more than compensated for eventually because of the decreased loss in the ewes and the

marked improvement in the quality and condition of the lambs as well as the ewes.

The ration should be changed and a legume hay added, such as good alfalfa hay, clover hay, or soybean hay. This should be fed in liberal amounts, supplemented with a good grain ration fed twice daily. A moderate amount of exercise should be allowed but it is not necessary to enforce exercise to an extreme degree, especially when the ewes are poor or in only fair condition. Plenty of water and salt, self-fed, should be available at all times. Under average Missouri conditions green pasture is not always possible at the time this trouble occurs, but if sheep can be put on pasture with plenty of green feed available or put on a succulent feed the best results will be obtained. We have never observed the trouble where animals were running on good pasture with plenty of feed. Even on the above ration the results necessarily are not immediate but it is surprising how soon the trouble can be stopped; at least this has been our experience in recent years in all of the affected flocks where this feeding program as outlined was instituted. Some cases may develop after the above change is made but as a general rule they are few according to our records.

In flocks where the disease has not yet occurred it can easily be prevented by proper methods of feeding and management.* In addition to preventing pregnancy disease, if a ration consisting of legume hay and grain is fed during the months of December, January and February, the ewes will do better—will have a better milk flow and will raise better lambs. Even if such a ration is not fed continuously flock owners will find it advisable to feed a legume hay at times when there are storms and snow and when the pasture is covered with snow and ice.

When a flock is found showing symptoms somewhat similar to the ones described here and there is evidence of the sheep being too fat and over-fed, increased exercise and a reduction in the amount of feed given, are recommended. Most trouble in Missouri, according to our investigations, has been found where the ewes have been too thin rather than too fat.

One of the major problems in mature sheep is parasitic infestation, especially stomach worms and tape worms. If the sheep have not been treated for stomach worms late in the previous fall,

*For further information on the feeding and care of sheep see Extension Circular 263, Missouri College of Agriculture, and other available publications.

or even if they have been treated, close observation should be made for any evidences of infestation. Where symptoms are found the entire flock should be treated for stomach worms. In several instances we have found flocks affected with pregnancy disease and infested with internal parasites at the same time. Best results cannot be expected under such conditions unless the flock is properly treated and the parasites removed and at the same time a change made in the feed.

SUMMARY

Pregnancy disease in sheep has been found to be very prevalent in Missouri farm flocks during recent years. An extensive study of the disease has been made, the source of material studied being a large number of field cases, part of which have been examined in the field and a part in the laboratory. In addition to the large number of field cases that have been available, some study has been made upon a group of experiment animals kept under control conditions.

We are of the opinion that the disease in sheep is one which is largely concerned with problems of feeding and management, and is probably closely associated with a disturbance in the carbohydrate metabolism. This disease was found most frequently in flocks which were in poor or only fair condition. In most cases they have been fed on timothy hay, corn stover, oat straw, poor pasture, and have received no grain other than corn.

Attempts to produce experimental cases have not given very satisfactory results.

The disease has been seen most often during the period extending from three to four weeks prior to and up to the time of lambing. It has been confined almost entirely to mature or aged ewes that have been carrying twins or triplets. When animals are found carrying singles the lambs are unusually large and well developed. The sick ewes linger for several days before death takes place and the mortality rate of affected sheep is well over 90 per cent.

The most characteristic change found after death is the yellow color of the liver, which upon microscopic examination shows marked fatty degeneration changes.

All attempts in developing a curative treatment have been unsuccessful. Recovery does take place, however, if the animals are able to lamb before the disease has progressed too far and the changes in the internal organs have become too severe.

Excellent results in preventing the disease in flocks having the trouble have been obtained by changing the ration. A legume hay, such as alfalfa, clover or soybean hay, supplemented with a good grain ration and fed twice daily, at the same time allowing the ewes to take a moderate amount of exercise, has given excellent results in preventing the trouble.