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Pregnancy Disease of Sheep

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SUMMARY

Pregnancy disease of 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. Some study has been made upon a group of experiment animals kept under controlled conditions.

We are of the opinion the disease in sheep is one which is largely concerned with problems of feeding and management, and probably is 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 had been fed on timothy hay, corn stover, oat straw, poor pasture, etc., and had received no grain other than corn.

A few cases of the disease have been produced in our experiment flock by methods of feeding and management.

The disease occurs during the period extending from three to four weeks prior to lambing up to the time of normal parturition. It has been confined almost entirely to mature or aged ewes that have been carrying twins or triplets. 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.

Attempts in developing a curative treatment have been for the most part unsuccessful. Recovery does take place, however, if the animals are able to lamb before the disease has progressed too far and before the changes in the internal organs have become too severe. Further work on treatment is being continued.

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, has given excellent results in preventing the trouble.

Rations are suggested which, if fed in proper amounts throughout the gestation period, will prevent the occurrence of this disease.

Pregnancy Disease of Sheep

CECIL ELDER AND A. W. UREN

One of the chief losses suffered by the sheep industry in Missouri is that due to pregnancy disease, which causes its greatest trouble during the months of January and February. This disease occurs in all parts of Missouri, and in some cases the losses have been very heavy. The malady has been known under a host of different names, but we have concluded from our study of the trouble that the name pregnancy disease of 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 of 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 normal parturition. It is seldom seen in any animals except those which are carrying twins or triplets, but if it does occur 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 80 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 encountered it in this state. 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 para-

sitic infestations. Not all flocks 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 from 1 to 25 per cent of the flock but the mortality rate in affected individuals exceeds 90 per cent. It is difficult to determine the exact or total losses in Missouri from pregnancy disease, but during the last several years the annual death rate has been numbered in the thousands of animals. The disease seems to have been more prevalent during the last few years. This can be explained in part by the fact that 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.

CAUSE

The exact cause of this disease is not known, but it will be of interest and possibly of 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 its study. Some 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 some 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 to 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, that these changes may be more of a coincidence than anything else, and we are of the opinion that pregnancy 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 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. Lack of minerals is not the cause. Some workers have reported that drenching with minerals will not prevent the trouble.

We have never observed 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, etc., 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 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. The condition is rare when feed, care and management are ideal. In years when lambing starts before the appearance of sufficient green feed there will be more cases of parturient paralysis or pregnancy disease than when green feed is plentiful.

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

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 in our investigational work; therefore we are of the opinion that calcium deficiency is not the cause, though we must admit the rations animals in affected flocks have been receiving have been quite low in calcium content. Chemical analyses which have been run in our laboratory have failed to demonstrate a calcium deficiency in the blood of affected ewes. The results of the use of calcium in attempting to treat the disease have further verified this finding because it failed to give any beneficial results when used.

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 proved that the trouble is neither contagious nor infectious but merely appears so because large numbers of cases occur at or about the same time. This undoubtedly is due to the fact the ewes 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, first by the fact the trouble immediately stops after the flock of ewes has lambed, and second, that complete recovery rapidly takes place in individuals which are affected with the early stages of the disease just as soon as those ewes are able to deliver their lambs.

Fig. 1.—Flock of ewes in which many cases of pregnancy disease were found.

We are of the opinion that the disease in sheep is one which is largely concerned with problems of feeding and management and probably is closely associated with a disturbance in the carbohydrate metabolism. Reports 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 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 in general appearance 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.

North Dakota workers[1] report that this problem is definitely related to carbohydrate metabolism. Sampson and Hayden[2] think the essential cause of pregnancy disease is a disturbance in carbohydrate metabolism, due either to a lack of sufficient carbohydrate or carbohydrate forming material in the ration or to an insufficient supply of carbohydrate stored in the body.

Our attempts at reproducing the disease have met with some success, as several cases of pregnancy disease have been produced in our experiment flock the past few seasons. These cases were developed as the result of feeding a poor ration consisting of timothy hay with no other roughage and a small amount of shelled corn. The number of cases produced has not been great but the following thought should be kept in mind in connection with our work. After the lambing seasons were over we found we had a very small number of twin lambs as a great many of our experimental sheep had dropped single lambs. As has been stated before, the disease is seen almost entirely in ewes carrying twins or triplets. When 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. On the other hand, many losses have been reported in the field where there was sufficient exercise. No exercise might be looked upon as a result rather than the cause of the disease. Other authorities have recently made the statement that exercise has nothing to do with the prevention of pregnancy disease. From our study of the field cases we were at one time of the opinion that it would be a rather simple procedure to reproduce this disease. We found, however, this was not easy to do,

[1]Roderick, Harshfield and Haun. J. A.V.M.A., Vol. XC, No. 1 (1937), p. 41.
[2]Sampson, Jesse and Hayden, C. E., J. A.V.M.A., Vol. LXXXVI, No. 1 (1935), p. 13.

even though we approximated field conditions just as accurately as we possibly could.

During the past few years we have observed the disease on many farms and have found the animals to be 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 since it is so rarely seen in flocks that are fed a well balanced ration and properly managed, that 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 effect 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. It should be kept in mind, however, that a few cases may develop in a flock which apparently has been receiving a good adequate ration. In other words, the general condition observed in any flock may not be a true index to the condition of the one or two animals in that flock which develop the disease. On the other hand, the trouble has been observed in flocks receiving alfalfa hay but no grain, so the question has naturally arisen as to whether or not ewes can eat enough roughage alone to carry them through pregnancy, even if the hay is of good quality. In animals that are carrying twins or triplets more nutriments are required, as there is an increased demand upon the system of the ewe. Management and feeding of ewes during late pregnancy are of utmost importance to the sheep raiser. It is a more or less generally accepted fact that sheep require good feed more so than any other farm animal and furthermore are more susceptible to abrupt changes in the feed.

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. The occurrence of several losses in ewes in advanced pregnancy is sufficient basis for one to suspect this

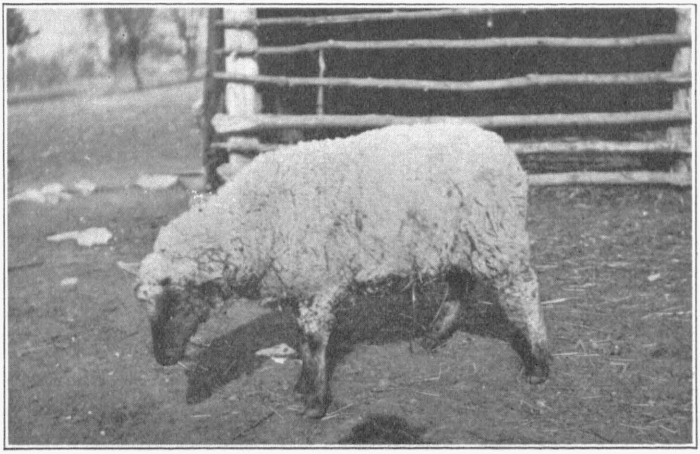

Fig. 2.—Mature ewe showing typical well marked symptoms of pregnancy disease in the earlier stages.

disease. 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. They exhibit difficulty in stepping over small obstructions. 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 animal 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. 2). If an attempt is made to catch them they very often go down in the rear quarters 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 on their sternum with the head turned around to the side of the body and will stay in this position for hours or even days (Fig. 3). Later they lie stretched out with the head on the ground apparently unable to get up without help. The temperature is generally normal or may be sub-normal. 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 af-

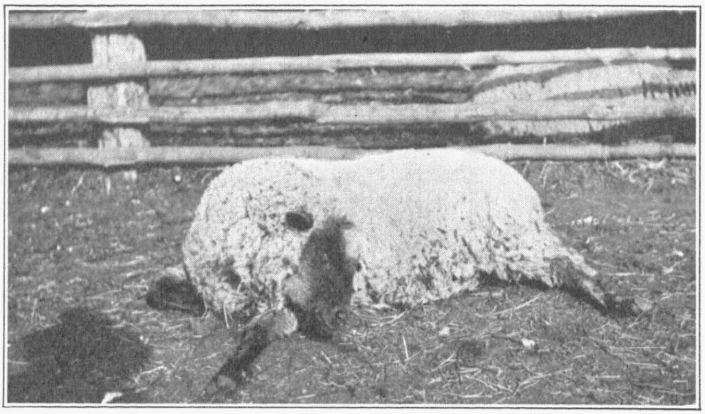

Fig. 3.—More advanced stage of the disease. This ewe was unable to stand and remained in this recumbent position for a long time before death.

fected 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.

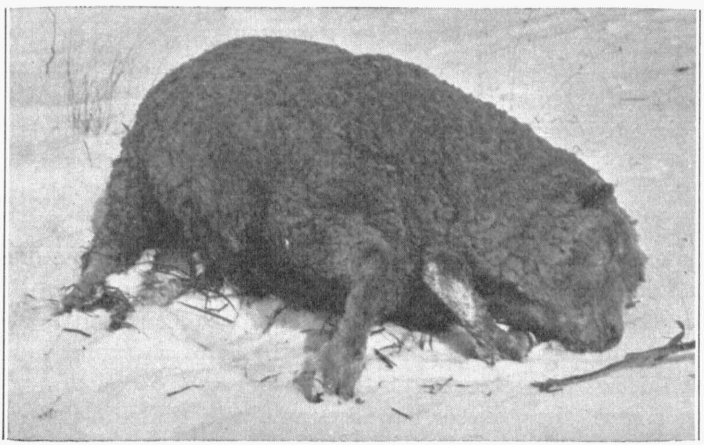

Fig. 4.—Last stages of the disease. Note the position of the feet and the comatose condition.

As the disease develops the animals become stupefied or comatose. Even when helped to their feet they are unable to stand and drop back to the ground (Fig. 4). 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 noticeable in these cases. 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.

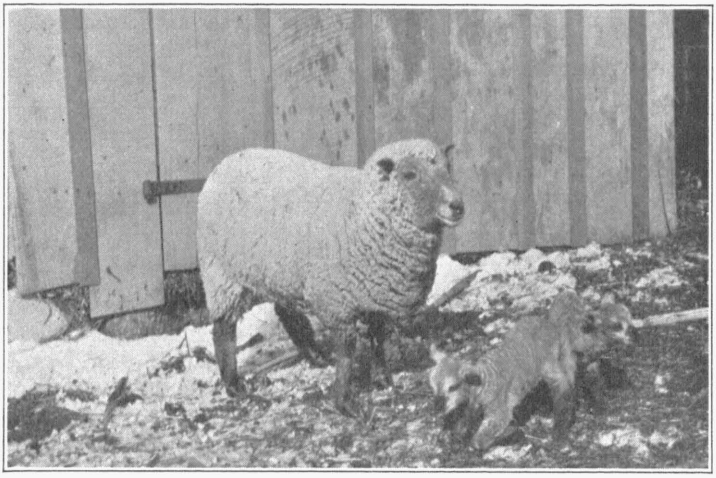

Fig. 5.—This ewe was markedly affected but dropped twin lambs the day before this picture was taken. She made a complete recovery.

The condition is a true acidosis and the urine is changed from alkaline to acid in reaction. Urinalysis shows albumen, acetone and increased ammonia. Rather marked ketones and high ketonuria are usually associated with pregnancy disease of ewes. Acetone in the urine appears to be an early indication of trouble and may be easily demonstrated, using the Ross modification of Rothera's nitroprusside test. This test has been successfully used as a valuable aid in diagnosis in our work at the Missouri Experiment Station. We have found it highly advisable to run the test soon after the urine samples were collected, as old samples gave unreliable results.

If lambing takes place during the early stages of the disease, or before the ewe becomes too weak, rapid recovery is the result (Fig. 5). Even with this the mortality rate in affected ewes is well over 90 per cent.

Some investigators have reported that a high incidence of dead or weak lambs at birth or dead lambs in utero and abortions is not

an uncommon accompaniment to a high incidence of pregnancy disease.

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 than is found 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 changes are more marked and carried to a far greater degree. The other organs appear normal but the kidneys on miscroscopic 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 examined the digestive tract was empty, or nearly so, and there was little evidence of constipation. We did not find any marked evidences of diarrhea in most of the animals autopsied.

The uterus is normal in appearance and structure and the lambs are normal but in a large majority of cases twins or triplets are present. In one series of fifteen field cases studied, 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 and advanced cases are considered hopeless. In our work many and varied treatments have been administered and tried but in every case with the same negative 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 becomes too weak (Fig. 5). Taking the lambs prematurely has not given satis-

factory results and does not appear to be practical under the ordinary field conditions. Caesarean operations in sheep have not been found advisable. Many drugs have been tried with no consistent beneficial results. The various calcium salts, gluconate, 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.

During the past two years we have done considerable work on the treatment of field cases, using Hartman's solution made up with various per cents of dextrose. Hartman's solution is a combined solution of buffer salts. After the solution was made up and sterilized each 10 cc portion contained 85 per cent lactic acid (as sodium lactate) 0.6 cc, sodium chloride, 1.5 grams, potassium chloride, 0.1 gram, calcium chloride, 0.05 gram. Hydrogen ion concentration ranged between 7.3 and 8.7. The solution when used was diluted with approximately 25 times its volume of sterile dextrose solution in different concentrations—ranging up to 10 per cent dextrose. The latter was used to provide the sick sheep readily available food energy. The dextrose was also found to have a diuretic action. This solution is recommended as a potential alkalinizer, as the solution of sodium lactate gradually decomposes to form sodium bicarbonate. The mixture of Hartman's solution and dextrose was given intravenously in order to obtain rapid absorption. This solution gave some promise of having value in the treatment of pregnancy disease, and further work is being conducted, using dextrose in greater concentrations.

Some authorities have recommended dextrose, corn syrup, and molasses in the feed as a valuable aid in flocks affected with this disease. This treatment holds considerable promise, and further investigations along this line will be conducted at the Missouri Experiment Station. It seems that corn syrup or molasses would be most valuable in the early stages of the disease or in flocks where animals are on the borderline of coming down with this malady. If the animals are still eating, the molasses may be given by mixing with water and sprinkling over the roughage that is being fed. When supplementing the roughage with molasses the exact amount used will depend upon the physical condition of the ewes and the feed available. One-fourth to one pound molasses per ewe has been suggested as being valuable in flocks where the trouble has appeared.

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 definitely proved.

PREVENTION

Experience has shown that an outbreak of pregnancy disease in a sheep flock can be satisfactorily prevented and controlled, provided 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 eventually one more than justifies the added expense because of a decreased death loss in the ewes and a marked improvement in the health and condition of both the ewes and lambs.

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 could be put on pasture with plenty of green feed available or put on a succulent feed the best results would be obtained.

A disease spoken of as grass tetany sometimes occurs in livestock running on wheat, barley, or rye pastures during the winter months, particularly in the southern part of this state. Although some of the symptoms of this disease in sheep are quite similar to those of pregnancy disease, the two should not be confused. We have never observed pregnancy disease where animals were running on good pasture with plenty of feed. Even with the suggested change in ration the results necessarily are not immediate, but it is surprising how soon the trouble can be stopped and the occurrence of new cases in the flock prevented. At least this has been our experience in recent years in all of the affected flocks where the feeding program as outlined was instituted. Some cases may develop after the above change is made but as a general rule they are few in number according to our records.

In flocks where the disease has not yet occurred it can be easily prevented by proper methods of feeding and management. When possible, one should select young, strong, vigorous ewes to make up his breeding flock. If it is necessary to start the breeding season with thin, poorly-nourished sheep they should be so fed and managed that

they will gradually and continuously gain in weight throughout the gestation period so as to be in good physical condition when they are ready to lamb. Irregularity in feeding and watering is considered a predisposing cause to pregnancy disease and therefore should be avoided. As a guide in feeding pregnant ewes several rations as suggested and recommended by the Department of Animal Husbandry, University of Missouri, will be found on page 16. In addition to preventing pregnancy disease, if a good ration 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 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 good evidence of the sheep being too fat or over-fed, increased exercise and a reduction in the amount of feed given are recommended. However, most of the 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 sometimes tape worms. If the sheep have not been treated for stomach worms late in the previous fall, or even if they have been treated, close observation should be made for any evidences of parasite infestation. When such 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, the parasites removed, and a change made in the feed at the same time to a well balanced ration fed in liberal amounts. Parasites of sheep are undoubtedly a predisposing cause to pregnancy disease and therefore their elimination from a flock is essential.

WINTER RATIONS FOR PREGNANT EWES

Suggested by Department of Animal Husbandry, University of Missouri

Ration Number	Pasture and/or Roughage	Concentrates are suited to feed with roughages as listed. It is usually necessary to feed grain only during the last six weeks of pregnancy unless the ewes are thin, in which case it should be fed much sooner.
1	Good Bluegrass Pasture. 2 lbs. legume hay.	Corn (shelled basis) 6 parts Oats, 3 parts Soybean oil meal, Cottonseed meal or Linseed oil meal. 1 part By Weight
2	Access to good barley, rye or wheat pasture and legume hay on bad days when they must be confined.	Corn, 6 parts Oats, 3 parts Soybean oil meal, Cottonseed meal or Linseed oil meal. 1 part By Weight
3	Legume hay, 3 lbs. per head daily. Silage, 2 lbs. per head daily. Sufficient exercise.	Corn, 6 parts Bran, 3 parts Soybean oil meal, Cottonseed meal or Linseed oil meal. 1 part By Weight
4	Corn fodder, ad lib. Straw, ad lib. Legume hay, 2 lbs. Sufficient exercise.	Oats, 2 parts Bran, 1 part By Weight
5	Legume hay, 4 to 5 lbs. per head daily. Sufficient exercise.	Oats, 4 parts Bran, 1 part By Weight
6	Corn fodder, ad lib. Straw, ad lib. With these roughages, some bran, legume hay or green pasture are highly advisable as a source of protein, vitamins and laxative. If sheep are thin a corn allowance is advisable. Sufficient exercise.	Oats, 3 parts Bran, 3 parts Soybean oil meal, Cottonseed meal or Linseed oil meal. 1 part By Weight

1. Amount to feed daily will be indicated by the condition of the ewes and will usually range from one-half to one pound per head.
2. When ewes are back to normal usually a few days after lambing, the allowance of concentrates should be increased.
3. Mineral mixture of equal parts ground limestone, steamed bonemeal, and salt should be fed free choice at all times.