FEEDLOT DISEASES OF LAMBS

By I. E. Newsom and Floyd Cross

In the grain pen.

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FEEDLOT DISEASES OF LAMBS*

By I. E. Newsom and Floyd Cross

In Colorado the winter feeding of lambs has become so exten-
sive as to take rank as one of the state’s important industries. There are now nearly a million and a half lambs fed each winter, in the state’s three feeding districts, viz.—Northern Colorado, the Arkansas Valley and the San Luis Valley. These lambs are raised chiefly in the surrounding states and go mostly to eastern markets after from 3 to 5 months feeding.

With the increase in the industry, diseases have made their appearance and in some years losses have been excessive. The Colorado Experiment Station, realizing that little accurate knowl-
edge was available on diseases of feeding lambs, has been engaged in a study of the whole question during the past 20 years. Some special studies have been reported and others are in process of preparation. Reference to special articles will be found at the back of this bulletin. This bulletin is prepared not only for the feeder, to whom it is hoped it will give valuable information, but also for veterinarians who practice in lamb-feeding districts and to whom the feeder will naturally turn for advice and counsel. It is not in-
tended to be exhaustive but to describe briefly the more common causes of loss in lambs on winter feed.

The heaviest losses may be grouped under two general heads, those associated with shipping and those due to errors in diet. The shipping diseases are hemorrhagic septicemia, the dysenteries and sore mouth.

Care in shipping and care in feeding are the slogans on which success is to be attained. Inordinate hunger in lambs to be shipped may result disastrously as discussed under paratyphoid dysentery. Probably a 24-hour fast for purposes of shrinkage is not serious but when another 36 hours on the train is added, untoward results may follow. Exposure to cold wind, rain and snow often results in losses from pneumonia and should be avoided when possible. The rela-
tionship between coccidiosis and sore mouth, and shipping is not so easily proved but the evidence is very strong that it exists.

"The eye of the master fattens his cattle" is just as true of sheep. Extreme care must be used in starting the lambs on grain and this care must be continued until they are marketed. Any lapse in this respect may have serious consequences.

Infectious Diseases

Hemorrhagic Septicemia

In certain years this disease has taken great toll from the feeding industry and at other times only sporadic cases have been ob-
served. Apparently the conditions of shipping and especially the

*Revision of Colorado Experiment Station Bul. 305, Diseases of Colorado Feeding Lambs.
character of the weather have a marked influence on the number of cases. In practically all instances it manifests itself soon after the arrival of the lambs in the pens. Rarely does it show itself after the first month.

**Cause.**—While the cause is now well known to be a germ (*Pasteurella oviseptica*), much experimental work has shown that the disease is not highly contagious and only spreads under certain conditions that render the animal peculiarly susceptible. Just what these conditions are has not been fully determined but there is good reason to believe that chilling and fatigue, and possibly hunger are chief among them. In other words this malady is now looked upon as a "shipping" disease because transportation not only supplies these predisposing factors but also, in many cases, brings the animals into contact with a virulent organism.

![Lambs with hemorrhagic septicemia.](image)

The causative bacterium has been shown to exist in the upper air passages of normal animals, so that like the pneumococcus of man it may produce disturbance at any time that the other conditions are favorable. Like pneumonia of man also, there is considerable probability that an organism acquires virulence by passing thru a susceptible animal and that it is, thereafter, more capable of attack than the normal resident of the throat. It is quite probable that outbreaks are caused not by the organisms normally present in the throat but by one of these that has had its virulence exalted thru animal passage.

**Symptoms.**—At first the sick animal is noticed to be dull; the head may hang and the ears droop. There is a mucopurulent discharge from the eyes and nose and coughing and sneezing are evident, especially on moving the flock. The animal often refuses to feed and appears gaunt. The breathing is more rapid and the temperature is elevated. Later the symptoms become more aggravated and the animal may die—with the acute form even within 24 hours. In the slower-developing cases dejection, nasal discharge and cough
continue, a true pneumonia ensues and may lead to death in from a few days to several weeks. If the animal lives for sometime, emaciation comes on rapidly. Lameness in one leg is not an uncommon symptom, especially in the chronic type. If lameness is exhibited there is often evident a swelling of one of the leg joints.

The disease may appear suddenly in a flock and within a few days a large percentage of the animals may show symptoms. Deaths sometimes take place in considerable numbers for a few days, after which the malady passes off and a large percentage, even of those showing symptoms, will recover. In extreme cases from 25 to 50 percent of the flock may be affected and the mortality may be as high as 10 percent. Apparently the disease is self-limiting, especially under good conditions of weather and housing, and subsides within a week or 10 days without treatment.

Lung showing lobar pneumonia. The type that is characteristic of hemorrhagic septicemia.

Post-Mortem Findings.—In early deaths numerous hemorrhages are found throughout the subcutaneous and subserous tissues. Thus, on removal of the skin, these blood spots will be apparent as well as under the pleura along the ribs and on the surface of the heart. Quantities of clear, straw-colored fluid may be present in the pleural or pericardial cavities. The lymph glands are much swollen and very dark red. The mucous membranes of the whole respiratory tract are very red. The mucous membrane of the fourth stomach and duodenum is often hemorrhagic.

In those cases in which death follows after some days, which nearly always come later in the outbreak, the hemorrhages are less marked and the disease most commonly localizes itself in the chest. The dependent portions of the apical, cardiac and sometimes the principal lobes are solidified and of a mottled appearance—red to
gray in color. The lobes may be adherent and the lung may be fastened to the ribs or to the pericardium, by means of a fibrinous pleuritis or pericarditis.

Heart showing subepicardial hemorrhages. Common in a great variety of diseases.

In animals dying still later, emaciation is extreme. Portions of the lung tissue sometimes circular in outline may have become necrotic and even gangrenous. It is these latter cases that occasionally show effusion into and swelling of one or more joints.

**Diagnosis.**—While the symptoms and lesions above described are fairly accurate as a means of diagnosis in the hands of one of experience, they have been the means of many errors in times past. It is now pretty generally agreed that a great variety of acute diseases will cause the development of hemorrhages visible on post-mortem examination, so that hemorrhages in themselves no matter where found are not diagnostic of this disease. Large blotchy hemorrhages under the peritoneum over the stomach and intestines, and intermuscular hemorrhages, especially visible in the diaphragm and abdominal muscles, are usually not associated with hemorrhagic septicemia. Fibrinous pleuro-pneumonia is a much stronger indication but is not infallible, as there are cases of pneumonia from which no bipolar organism can be isolated. It has become the rather firm conviction of the authors after several years of experience that practically every outbreak of hemorrhagic septicemia shows a considerable number of pneumonic cases after the first few days.

The diagnosis is finally to be established only by the isolation of the organism from the blood or internal organs. While the organism can be isolated from the upper air passages of normal animals, its presence in the lung tissue proper or in the blood stream stamps it as of causative significance, sometimes it is true, as a secondary
invader, but when the typical symptoms and lesions are present, as a primary cause.

**Treatment.**—Separation of the sick should be started immediately and practiced continuously throughout the outbreak. Both sick and well must be placed under the best possible conditions. The sick should be given light diet—good quality alfalfa, plenty of water, with a little light concentrate, such as bran or oats. Nothing in the way of a medicinal agent has been found of value.

**Vaccination.**—Our ideas of vaccination for producing immunity to the disease have undergone considerable change. Since the disease seems to be self-limited, there is very grave question whether the administration of vaccine during an outbreak is of any value. Theoretically, serum should be administered in the immediate presence of the disease but the practical application of this procedure is out of the question on account of the expense.

We now have fairly accurate information on the value of vaccination against shipping fever in cattle which is a similar disease. The United States Bureau of Animal Industry carried on a series of experiments in which feeder cattle were vaccinated as they went thru the yards. Those workers came to the conclusion that cattle vaccinated under these conditions showed a greater loss in the feedlot than those left unvaccinated. They are now engaged in a determination of the value of vaccination some time previous to shipping. Their work showing the inadvisability of vaccination during shipping was also confirmed by the Kansas Experiment Station. If these results may be applied to sheep it may be said that vaccination should not be practiced either as the sheep pass thru the yards or in the immediate presence of an outbreak. If vaccine is to be administered it should be done at least 2 weeks before shipping. Probably the best immunizing substance for sheep is aggressin.

**Paratyphoid Dysentery**

Only two outbreaks of this disease have been sufficiently studied in this country to make sure of the cause. Both were reported by the authors. The first outbreak involved some 30,000 sheep in 1923, causing a loss of 6.2 percent. The second occurred in 1929 involving only 1600 lambs and with a mortality of only 30 head. In both instances serious delays in shipping seemed to be a predisposing cause. In the first instance lambs were held for 9 days where there were very poor accommodations for feeding. In the second instance lambs were on the train for a period of 6 days with rather infrequent feedings.

**Cause.**—From both outbreaks a member of the paratyphoid B group (Salmonella aertrycke) was shown to be the cause of the disease. It is believed that this organism is a normal resident of the intestinal tract of some sheep and that it develops excessive virulence under certain predisposing conditions. In the experiments
carried on at this station, hunger was shown to be a strong predisposing cause as illustrated in the following table taken from Colorado Experiment Station Bulletin 302.

<table>
<thead>
<tr>
<th>Lamb No.</th>
<th>Fasted</th>
<th>Amount of Culture</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>24 hrs.</td>
<td>30 c.c.</td>
<td>Sick 4th day, died 6th</td>
</tr>
<tr>
<td>2</td>
<td>48 hrs.</td>
<td>30 c.c.</td>
<td>Sick 2nd day, died 5th</td>
</tr>
<tr>
<td>3</td>
<td>72 hrs.</td>
<td>30 c.c.</td>
<td>Sick 3rd day, died 4th</td>
</tr>
<tr>
<td>4</td>
<td>72 hrs. watered</td>
<td>30 c.c.</td>
<td>Lived, no illness</td>
</tr>
<tr>
<td>5</td>
<td>72 hrs</td>
<td>No culture</td>
<td>Lived, no illness</td>
</tr>
<tr>
<td>6</td>
<td>Fed and watered as usual</td>
<td>30 c.c.</td>
<td></td>
</tr>
</tbody>
</table>

Since 5 c. c. of a bouillon culture of the organism had been previously shown to be fatal to a lamb fasted for 48 hours, it will be seen that even six times this amount did not affect a lamb that had free access to alfalfa hay. That the organism was necessary in the production of the disease was shown by lamb No. 5 that withstood fasting for 72 hours without showing signs of illness. It appears, therefore, quite firmly established that two causes operate—

first the organism and second, fasting. Neither is sufficient in itself to cause the disease but both operating together may result in serious outbreaks.

**Symptoms.**—Affected animals became dull, refused food, the ears drooped, the head hung, the temperature was increased from 2 to 4 degrees and a diarrhoea manifested itself which later became bloody. Some lambs died quickly showing only a little scouring.
Others showed profuse scouring and recovered. The outbreak came on very suddenly and was over within 10 days or 2 weeks, only a few stragglers dying after that time.

Inflammation of the fourth stomach and small intestines was fairly constant on post-mortem examination. In a very few cases small pneumonic areas were found in the lung.

This disease is rather easily differentiated from hemorrhagic septicemia by its being confined almost entirely to the digestive tract, whereas in hemorrhagic septicemia the localization takes place in the lungs. It could be separated from other diarrhoeas only by isolation and determination of the organism.

**Treatment.**—As with all other contagious diseases the well animals should be separated from the sick and should be given a wide range to prevent the spread of the disease. The sick should be individually treated with a dose of castor oil followed by intestinal antiseptics. They should have a light laxative diet of alfalfa and oats or bran. Stimulants may be used but their value is questionable.

**Prevention.**—Assuming that an organism of the paratyphoid group is present in many flocks, little can be done to prevent exposure. Since animals can withstand considerable doses of the organism, if fed regularly, prevention seems to be a simple procedure. Animals kept in good condition and fed regularly during transit should not develop this malady to a serious degree. When animals are unavoidably delayed in transit, every possible effort should be made to see that they are fed at frequent intervals, at least every 24 hours.

**Relation to Food Poisoning in Man.**—In 1919, in an outbreak of paratyphoid dysentery in Germany, a number of the sick animals were slaughtered and used for human food. This resulted in over a thousand cases of food poisoning (so-called ptomaine) and caused three deaths. Since this organism is a serious offender as a cause of disease in man, it seems wise to caution people against eating carcasses of sheep that showed any scouring during life.

**Coccidial Dysentery**  
(Coccidiosis)

This disease has increased to such an extent during the last 5 years that it now annually makes serious inroads on the feeding industry. It is classed with the shipping diseases because it usually develops within the first 2 weeks after arrival in the feedlots, and practically always within the first month. A table is introduced showing its prevalence in Northern Colorado during each of 5 years. Our records show that the mortality runs from less than 1 percent to more than 17 percent in the most serious outbreak recorded.
Coccidial dysentery. Bloody diarrhea is the most prominent symptom.

**Cause.**—A protozoan parasite (Eimeria faurei) that is taken in thru the mouth and develops especially in the large intestines. It has been our experience that this organism can be demonstrated in practically all lots of feeder lambs but just why it should produce a serious disease in some instances and not in others no one has yet determined. Possibly crowding the lambs together in shipping allows greater opportunity for the ingestion of large numbers of the coccidia. Since in chickens it has been shown that infection is dependent upon the number ingested, it seems probable that shipping and penning the lambs furnishes the opportunity to take in more than the customary number. If this be the case, then running the lambs over as wide an area as possible on first arrival ought to be helpful in preventing serious infection. It is also possible that the depleting influences incident to shipping may render animals more susceptible. At any rate, the average time between the arrival of the animals in the lots and the development of the disease was in our whole series of outbreaks, 15 days.

The question also arises whether the coccidia live over in the feedlots from one year to another. There is one instance in our series where the disease occurred in the same lot during 4 successive years. A complete change of pens, using entirely new material, was followed by cessation of the disease but the coccidia could be readily demonstrated in the lambs of that year altho there was no evidence that they were producing trouble. In one other instance in our series the disease developed in a feeding pen in one year, failed to develop the following year, and then caused considerable loss for 2 successive years thereafter. For the most part, however,
the outbreaks have been single, neither being preceded nor followed by outbreaks on the same place.

While it seems possible that the coccidia might live over in the soil, especially if kept moist and away from the direct sunlight, it does not seem that such an explanation is necessary because undoubtedly the lambs bring in the coccidia with them.

The real question to be settled then is not how they get the disease organisms but what it is that makes them virulent. Probably this is to be sought, as indicated above, in the number of organisms taken into the mouth or in the predisposing influences incident to shipping.

It might be added that during the past 12 or 15 years we have never failed to demonstrate the presence of coccidia in the droppings from our college flock but never, at any time, has this flock suffered from coccidiosis.

**FIVE YEARS OF COCCIDIAL DYSENTERY IN NORTHERN COLORADO FEEDER LAMBS**

<table>
<thead>
<tr>
<th>Year</th>
<th>No. Lots</th>
<th>No. Lambs</th>
<th>No. Sick</th>
<th>Percentage</th>
<th>No. Died</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>10</td>
<td>14,447</td>
<td>3,533</td>
<td>24.4</td>
<td>416</td>
<td>2.9</td>
</tr>
<tr>
<td>1930</td>
<td>6</td>
<td>9,956</td>
<td>2,434</td>
<td>24.0</td>
<td>274</td>
<td>2.8</td>
</tr>
<tr>
<td>1931</td>
<td>5</td>
<td>9,936</td>
<td>790</td>
<td>7.0</td>
<td>116</td>
<td>1.2</td>
</tr>
<tr>
<td>1932</td>
<td>8</td>
<td>18,963</td>
<td>4,244</td>
<td>22.4</td>
<td>1,123</td>
<td>5.9</td>
</tr>
<tr>
<td>1933</td>
<td>6</td>
<td>10,061</td>
<td>1,030</td>
<td>10.2</td>
<td>319</td>
<td>3.2</td>
</tr>
</tbody>
</table>
Symptoms.—The symptoms of the acute type are not different from those described for paratyphoid dysentery, except that rise of temperature is not so constant in coccidiosis. Bloody diarrhea, great depression and loss of appetite are prominent. Deaths may take place in considerable numbers during the first few days of the outbreak. Bloody diarrhea is continued for several days followed by emaciation, weakness and finally death—often only after a week or more of illness. The disease may continue in a flock for a considerable time, affecting only a few animals at a time or it may spread widely.

Postmortem Findings.—In the acute type severe enteritis is the only constant lesion. This enteritis is more commonly present in the large intestines but may also be seen in the small ones. In the cecum the mucus membrane is frequently streaked with gray which is fairly typical of the condition. In the more chronic cases the intestinal wall is much thickened.

Diagnosis.—This disease can be positively separated from the other dysenteries only by the finding of numerous coccidia in the affected animals. The mere finding of coccidia in the droppings from sheep, especially if the coccidia are concentrated in sugar solution by the flotation method, is not sufficient to constitute a diagnosis. Ordinarily when the disease exists the coccidia can be found in great numbers by microscopic methods without any concentration whatever.

Treatment.—Separate the healthy from the sick and let the healthy run over as wide an area as possible to prevent reinfection. If they must be kept in pens, then they should be changed every 2 or 3 days, the old pens being cleaned and disinfected each time. Cutting out all grain and placing the lambs on native hay instead of alfalfa has seemingly been helpful in our experience. Daily treatment of individual sick lambs with astringents, such as iron sulfate, bismuth and tannic acid has seemingly been of assistance. Each day the sick ones should be picked out from the healthy flock and those that have stopped scouring in the hospital pen can be returned to the main flock. Care must be used, however, in not crowding the hospital pens too much so that there is opportunity for a large consumption of coccidia, as it is believed that the size of the dose of these organisms has much to do with the state of infection.

Sore Mouth
(Contagious eczemia)
(Contagious pustular stomatitis)

Sore mouth is seen to some degree in nearly every lot of lambs coming to the feedlots. In some instances it is so wide-spread and so severe as to cause serious loss in weight and occasionally death. It is usually observed during the first week or 10 days after arrival
Lamb with sore mouth.

Sore mouth lesions on tongue and cheeks.
and may continue for as much as a month. Ordinarily the disease subsides without treatment, within 2 weeks after its appearance. Occasionally, however, the losses are severe, especially where complications develop.

**Cause.**—It is now generally believed that the cause of sore mouth is a filterable virus. This finding was first suggested in this country by Howarth at the University of California, who studied a disease of sucking lambs and nursing ewes and regarded it as the same disease as had been described by English and European authorities under the name of "contagious pustular dermatitis." The work at this station has demonstrated that sore mouth may be transmitted by filtered emulsions made from scabs and that the inoculated disease made from such material differs in no essential particular from the condition described by Howarth in California and Schmidt in Texas. The older conception that the disease was due to Actinomyces necrophorus must now be looked upon as erroneous and that organism regarded as a secondary invader, although not infrequently serious in its consequences.

![Sore mouth lesion seen in the rumen.](image)

**Symptoms.**—Small vesicles develop on both the inside and outside of the lips, on the gums and sometimes on the tip of the tongue. They are most constantly present at the commissure of the lips and are often revealed there on careful examination even when no external evidence is apparent. The vesicle soon turns to a pustule
Secondary lesions of sore mouth in the reticulum.

...and then ruptures. The lesion soon becomes raw and is covered with a thick grayish brown crust. The lips are now swollen and rigid, the ulcers bleed easily and the animal shows disinclination to eat. Recovery may follow after 1 or 2 weeks, or the ulcers may burrow more deeply into the tissues and the animal die from the elaboration of toxin. Sometimes a portion of the tongue is eaten away. Where crusted lips are seen in a fair percentage of the flock, a careful examination will reveal the disease in mild form at the commissure of the lips in nearly every lamb in the pen.

**Complications.**—The disease is seldom fatal when confined to the mouth. Unfortunately in some instances lesions develop in other organs of the body and may prove serious. Thus laryngeal lesions may be found which closely simulate the laryngeal form of calf diphtheria. Not infrequently ulcerations develop in the omasum near the outlet into the fourth stomach. These result in a great deal of swelling of the third stomach and sometimes the ulcers continue until the leaves are entirely disintegrated. Not infrequently these lesions cause death in lambs after the mouth lesions have entirely healed. Occasionally similar ulcers are found also in the rumen and the reticulum and may even extend into both the small and large intestines.

Pneumonia, which follows as a complication of this disease, is quite characteristic since the lesions are usually scattered thru the lung tissue as circular areas and are necrotic in character. This
Lung showing circular necrotic areas. The type of pneumonia that usually follows sore mouth.

differs from the more common type of pneumonia which is associated with hemorrhagic septicemia. Occasionally small necrotic areas may be scattered evenly thru the liver and result in a considerable mortality. In all of these complications it may be possible to find the secondary organism, Actinomyces necrophorus. In the pneumatic cases a bipolar organism may also be found associated.

**Vaccination.**—The workers at the Texas Experiment Station have devised a means of vaccination of lambs during the first few weeks of life which bids fair to be effective as a means of prevention. The vaccine is made from the scab taken from typical cases of sore mouth and is applied to a scratch on the skin similar to the method which is used for smallpox in the human being, and results in a "take" of the same kind. Several thousand lambs were vaccinated in Texas this year and so far the check-up on these lambs in the feedlots indicates that it was highly successful in the prevention of the disease. Should future work confirm these preliminary findings it is evident that vaccination of young lambs soon after birth should become universal. It is not feasible for the feeder to vaccinate the lambs after they are purchased, but he can demand lambs that were vaccinated early in life.

**Treatment.**—As indicated above, treatment is only called for in the most severe cases. These should be separated from the others, the scabs rubbed off and the raw surface treated with straight tincture of iodine or iodine and glycerine in equal parts. Zinc ointment has also been used with success. The ordinary sheep dips are not so serviceable. Sometimes only one treatment is required,
and at others, daily application may be necessary. In any case the alfalfa should be of the third cutting and some dry bran should be given with it. Water should be kept before the lambs at all times.

**Infectious Keratitis**

Apparently little study has been given to this important and at times serious inflammatory disease of the eyes. It occasionally breaks out in a flock of feeding lambs and spreads to a large percentage of the animals.

**Cause.**—The cause appears to be entirely unknown, altho it is probably a micro-organism of some kind.

**Symptoms.**—A grayish-white spot appears on the cornea and gradually spreads until the whole cornea is opaque. If both eyes are affected, which is usually the case, the lamb is blind at this stage and gropes for food. The conjunctiva is quite red and there is mucopurulent discharge from the eyes that runs down over the face. The cornea protrudes and appears as tho it would burst thru, but this rarely happens. The course is from 1 to 2 weeks, after which recovery takes place and the eyes clear in most cases. Only rarely is an animal left permanently blind. The disease is only fatal if during the stage of blindness the animal is unable to obtain sufficient food.

**Treatment.**—If the disease has not already spread widely thru the flock, it is wise to separate the sick from the others to limit the spread, if possible. Abundant feed should be provided as affected animals may have trouble in finding it. Each animal should then have its eyes treated daily with a warm 3 percent solution of boric acid or 2 and one-half percent solution of zinc sulphate.

**General Diseases**

**DISEASES OF THE DIGESTIVE TRACT**

**Overeating**

This seems a peculiar designation for a disease, and yet it probably causes more loss in the feedyards of Colorado than all other troubles combined. The disease was first called to the attention of scientific men by the investigations at the Cornell University Experiment Station under the title of "Apoplexy." Since that time it has been called by a great variety of names but the one at the head of this article seems to express the true condition as well as any. It might be called "indigestion," "gastroenteritis," "food intoxication," and various other names but the primary cause seems to be the consumption of too much concentrated food. There are three important concentrates fed in this state—corn, barley and peas—any one of which will cause the disease.
The trouble has practically balked the San Luis Valley pea-feeding industry, owing to the difficulty of controlling the amount of peas consumed. With the system of allowing the lambs to harvest the peas direct from the field it was found almost impossible to limit the consumption. Limiting the time only increased the appetite, so that engorgement was then possible in a very few minutes. After about 30 days on the peas or at any time when the animals begin to take on flesh, losses begin and may run to 10 or 15 percent. Often the lambs have been shipped in half-fat condition rather than allow the loss to continue. This one trouble has limited pea feeding to from 10,000 to 20,000 lambs each season, in an area where a quarter of a million should be fed.

In the northern district the trouble has become particularly acute in the last few years altho it has existed to some degree ever since the lamb-feeding industry began. There are a number of reasons why this trouble has become more prevalent in late years.

When lamb feeding began in the Fort Collins district, alfalfa hay was selling for $2.50 a ton. In recent years it has been much higher. In some years this made corn relatively cheaper than alfalfa. In the earlier years the feeding period was seldom less than 5 months, whereas now an attempt is made to fatten the lambs in 90 days. In recent years the markets have given preference to lambs.
weighing around 90 pounds. Lambs often come in from the range weighing 70 pounds or over. Consequently, the feeder has been caught between all these millstones of high alfalfa, large feeder lambs and the necessity of fattening them quickly, and whether he realized it or not he has forced the concentrates—corn or barley—often with disastrous results. Losses from 2 to 7 percent are not unusual.

"Lambing down" corn was thoroly tried in the northern area. Here the same troubles arise as in the pea field. For the first 2 or 3 weeks little difficulty is experienced but after the leaves are eaten off and the ears are bared thruout the field, then losses begin and often become so serious that the lambs have to be removed from the field. Losses up to 10 percent have occurred under these conditions. In the Fort Collins area the practice has now been entirely abandoned.

In recent years suspicion has been cast upon other starchy feeds. Beet pulp, beet crowns and tailings, when fed along with grain, are not without the possibility of serious consequences. The sorghums and ensilage contain much grain and must be considered in figuring the total ration. There is no evidence that alfalfa or oats alone will cause trouble but almost all of the other feedstuffs may play an important part. Where large amounts of these supplemental feeds are given it may also be necessary to reduce them.

Cause.—The actual cause of this loss is still undetermined. A definite amount of grain cannot be depended upon to kill a sheep.
It often happens that lambs will be taking a pound and a half, or even 2 pounds in exceptional cases, without showing any loss whatever, whereas on a neighboring farm lambs are dying on a pound. In most cases there is a demonstrable inflammation of the intestines and occasionally of the fourth stomach. This, with the scouring that may accompany the condition, leads to the view that an indigestion develops that allows the walls of the intestines to become permeable to the toxic products contained therein. Large quantities of grain then continue this inflammation after it has once developed and result in continued illness or death. Smaller quantities can be handled without serious disturbance. After the trouble once develops, the losses seem to be in proportion to the amount of grain fed as the chart on the opposite page will show. This chart was prepared from data kept by one of the prominent Northern Colorado feeders in 1924. That the trouble is intimately associated with the grain ration is still further proved by the fact that removal of the lambs from the pea field, the cornfields, or the grain in the pens, always results immediately in stopping the loss.

As early as 1926 we discovered sugar in the urine of the lambs dying suddenly from this condition. In those that are down for a day or two, or longer, before death takes place, it is absent. The sugar content will average about 2 percent but may run as high as 6 percent. This finding led to the supposition that the disease might be merely diabetic coma such as is frequently observed in man. Long-continued experiments conducted by us indicate, however, that the sugar appears in the urine only a few hours before symptoms develop and that the coma is not the result of a long-continued diabetes such as is observed in human medicine. However, since there is an intimate relationship between the sugar-producing feeds and the disease, this theory of diabetic coma needs further investigation.

Some years ago the resemblance between this disease and braxy, a disease of Scottish sheep, was pointed out and since braxy was at that time regarded as being due to the malignant edema bacillus it was only natural to assume that that organism played a part in this malady. Our work showed, however, that the malignant edema bacillus was present in the internal organs of most sheep regardless of the cause of death and that it was not more prevalent in those dying of overeating.

More recently work in England and Australia has shown that braxy-like diseases are associated with the presence of toxic substance in the intestinal tract which is produced by a member of the Cl. welchii group, a close relative of the malignant edema bacillus. We have demonstrated the presence of a toxin in intestinal filtrates made from sheep dead of overeating but it is not a constant finding and even tho it were it would still be necessary to prove that the toxin is actually absorbed into the circulation. Only one toxin has
In four other lots, aggregating 4,000 head, fed slowly under observation for 76 days, the total loss was 91 head, or at a rate less than a third of the heavy corn fed lot No. 1. When the corn ratio was lowered the death losses dropped off.

**SUMMARY**

Pen No. 1—1000 lambs sorted and fed out quickly—17 days.

Total loss, in time under observation, 18 head, 1 per 1000 per day.

Pens 2, 3, 4, 5, 4000 head fed slowly under observation for 76 days.

Total loss, 91 head; .3 per 1000 per day.

Loss in whole 5000 on different amounts of corn figured per 1000 per day.

<table>
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<tr>
<th>Amount</th>
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<td>.125</td>
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<td>.167</td>
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Or same figures in percentage loss for a feeding period of 100 days.

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<th>Amount</th>
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<th>1/2 lb.</th>
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<td>1/4</td>
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been shown to be poisonous when taken by the mouth (Cl. botulinus) and so far that has not been incriminated in this disease.

**Symptoms.**—The affected animals are almost invariably the largest, fattest, most vigorous and the greediest lambs in the lot. In a few instances the heads are thrown back, the lambs stagger, fall to the ground and die in convulsions as tho from an apoplectic stroke. More commonly, however, lambs live a few hours showing typical cerebral symptoms, such as the head being thrown back or running in a circle or pushing against a fence. In these cases some diarrhoea may be shown previous to death. In many instances lambs are merely found dead in the morning. In those living still longer some will vomit up grain, which can be seen on the ground in the pens. The lambs stop eating, a diarrhoea supervenes and may continue for several days. The animals then rapidly lose weight. In these cases death may occur after several days or the animals may recover. In a few cases lambs become paralyzed, go down and are unable to rise for weeks. If fed and watered these animals can be kept alive for a long time. Occasionally after recovery the affected lambs shed their wool.

**Post-Mortem Findings.**—The most constant lesion, altho not always seen, is an inflammation either in the fourth stomach or small intestines, more commonly the latter. This is particularly true of those living some time after showing symptoms. In the more acute cases there may be no observable lesions whatever and such carcasses if bled out would probably pass for food even under a critical

Diaphragm showing intermuscular hemorrhages characteristic of overeating.
eye. In fact many such carcasses are eaten, if the animal is seen and bled just before death would have taken place. Sometimes in the acute cases large hemorrhages are very numerous especially under the peritoneum, over the intestines and between the muscle fibres in the abdominal wall and diaphragm. Sometimes hemorrhages are also present under the epicardium and occasionally the lymph glands may be red and swollen. This latter lesion is, however, usually not present, or, if shown, it is confined to only one or a few of the glands. A straw-colored fluid—often coagulated—is present in the pericardium.

Diagnosis.—When fat lambs are dying on full feed, showing no pneumonia and with bacterial findings negative, this condition may be diagnosed. The presence of sugar in the urine of the acute cases is regarded as diagnostic. If further confirmation is desired, removal of the grain will always stop the loss.

Control.—At first thought, control seems to be easy, since the deaths can be stopped practically overnight by withholding grain, but actually the control has been most difficult because grain is essential to lamb fattening and a quickly fattened lamb is demanded by the market. Many feeders have found that the difference between a fattening ration and a killing ration is very slight, and in some instances they overlap. In the first place, the utmost care must be used to get the lambs onto a full feed without producing a digestive disturbance. Next, all possible measures should be taken to prevent gorging. In the feedlots the grain must be so distributed in the troughs that no lamb can get more than its share. Self-feeders, in which the grain and hay are ground together, are excellent, but care must be given to see that the grain is not only well mixed with the hay but that there is some binder present, such as molasses, to prevent the grain from sifting thru to the bottom. Even with self-feeders there is much loss when the proportion of grain to hay is too high, or when the grain ration is increased too rapidly. It is often possible to sort out the fat lambs and ship them to market, thus keeping down the loss. If this is done, care must be exercised in cutting down the grain on the balance as the larger feeders are being removed. Frequent sorting and shipping with reduction of the ration on the balance has allowed many feeders to get thru the season with a minimum of loss.

A variety of food is one of the best means of eliminating the trouble. The mere addition of succulent food such as ensilage or beet pulp will not avail, but if these are made to take the place of a part of the grain ration, then the amount of grain can be kept down to a safe quantity. Too many feeders forget that ensilage of good quality may itself contain as much as one-third of its weight of corn. Sorghums may also run high in grain content. Most lambs can be fed from three-quarters to a pound with safety. If the balance of the required grain ration can then be made up either with wet or
dry pulp, ensilage, or in fact almost anything except corn, barley or peas, then the lambs may often be fed out with safety. In the San Luis Valley, feeding alfalfa when the lambs are not on the peas has helped somewhat but the addition of cull potatoes, as shown by the animal husbandry section of this station, seems most likely to solve the problem.

Cornfield feeding, like the peafield, is at best a hazardous undertaking. Some have handled the problem by limiting the time on the field and feeding alfalfa in the pens or pasturing them on other feed. Others run temporary fences thru the field and clean up a small part at a time. Finally, however, it has, in many cases, been found necessary to harvest the corn and pen-feed the lambs in order to get away from excessive losses. As stated above, the practice has been abandoned in Northern Colorado.

Fattening lambs without loss requires the utmost attention and skill and should not be entered into lightly. Frequent observation is essential to see how the animals are taking the grain. Any tendency on the part of any of the lambs to hang back when turned into the grain pen should cause an immediate reduction.

Scouring is also a danger sign. It is much easier to prevent serious disaster by close attention than to correct the conditions after losses have developed. Once the lambs are thrown off feed they are always more difficult to handle.

**Treatment.**—Individual treatment is seldom of much value, and in many cases impossible, owing to death taking place so quickly. If a sick animal is seen, it should be removed from the flock and given a purge of Epsom salts possibly with stimulants if indicated.

**Emaciation**

Emaciation is merely a symptom of a variety of diseases and due to many causes, but because so many of these are unknown it seems wise to discuss it as a separate entity. When the lambs first come in, there is always a certain percentage of them classed as culls, and of these many die during the first month of the feeding period. On examination at post-mortem, extreme emaciation may be the only diagnosis that can be made. Often these weigh only a few pounds and lead to the assumption that they were late lambs and were removed from their mothers before they were able to survive on hay and grain. Many of them develop digestive disturbances and die thru inanition. Some are chilled or injured in transit. When a lamb becomes weak it may be crowded out by the others and thus get an insufficient amount of nourishment. In some, the cause of death is more apparent, since the liver may be speckled with small white spots, indicating a navel infection at the time of birth. Any dysentery or pneumonia will, if prolonged, lead to extreme emaciation. The post-mortem appearance merely shows entire absence of fat throughout the body which is replaced by a dirty slime.
Indigestion

Lambs are so sensitive that indigestion is one of the most common diseases in the feedlots. They often arrive with it and some form may be found in some of the lambs at almost any stage of the feeding period. When the lambs are just getting started on grain, indigestion is quite prevalent. Sometimes it may be very serious as when it results in bloating or still more so when it causes losses as described under overeating.

Cause.—Change of feed, or too much, easily fermentable, frozen, moldy or otherwise damaged food is the most frequent cause.

Symptoms.—These vary according to the severity of the disease, but generally the lamb appears dull, it refuses to feed, it may appear bloated and it may scour. Sometimes after a day or two “off feed” it recovers spontaneously and becomes normal. At other times scouring continues, emaciation follows and death may result.

Treatment.—As soon as a lamb is seen to be ill, it should be removed to a hospital pen, should receive a dose of from 1 to 4 ounces of Epsom salts or an ounce of castor oil and then should be given only third-cutting alfalfa and plenty of water. All grain should be withheld until convalescence is apparent, when a little oats, bran or oilmeal may be given.

Bloating

Bloating most commonly occurs when the lambs are run on the alfalfa fields in the fall. Sometimes it causes considerable loss, especially when the plants are wet. For this reason it is better not to turn the lambs out when the dew is still on in the morning, or just after a rain. Sometimes it occurs also on the third cutting, or even on grain, but this bloating is less apt to prove fatal.

Treatment.—On account of the rapidly fatal termination of alfalfa bloat in lambs, treatment can seldom be administered. The wool covers the evidence of bloating until death occurs, and, even if known, attention should first be given to the removal of the flock from the field. Tapping the affected animal as is done in cattle is not very satisfactory, but can be tried in an emergency. Unless the operation is done with a trocar it leaves an ugly wound around which the wool mats and prevents healing. Dosing with anti-ferment solutions, such as dilute solutions of formalin and creolin, is not very effective and may be quite dangerous unless it is put in with a funnel and tube. The proper way to handle bloat is by prevention.

Diarrhoea

Under the heading of infectious diseases there have already been discussed the specific diarrhoeas due to coccidia and to the paratyphoid bacteria. That this does not exhaust the discussion is apparent to anyone who makes a study of diseases of feeding lambs. This symptom is observable in connection with nearly all forms of
indigestion and with many of the infectious diseases. A non-infectious diarrhoea usually is the result of an indigestion and is Nature’s method of ridding the bowels of irritating and injurious material. Green, easily fermentable, frozen, spoiled or unnutritious food or gorging on perfectly good food will result in diarrhoea.

Consequently, in handling such a case, attention must first be given to the removal of the cause. When this is done the sick animals should be removed to a hospital pen and given special care. Each animal should receive a tablespoonful of castor oil and should be fed lightly on the best quality of alfalfa and a little oats. When recovery has taken place they can be returned to the flock. This system of handling all cases of diarrhoea would save many lambs and thereby much money. The time will come when a single sheep will be worth saving.

**DISEASES OF THE RESPIRATORY TRACT**

**Suffocation**

Great care must be exercised in feeding large numbers of lambs to see that they are not stampeded and pile up, thus suffocating those underneath. Sometimes this occurs when they are let out into the grain pen, if they become unduly excited or the opening is too narrow.

Dogs produce a great loss in the sheep pens, not so much in the number of sheep they actually kill as in the number that are suffocated by piling up.

**Inflammation of the Nasal Cavities (Rhinitis)**

Sheep seem to be particularly susceptible to an inflammation of the nasal mucous membrane and frequently manifest this by a mucopurulent discharge from the nose. It is sometimes associated with coughing and sneezing, especially on exercise. Dust, chilling, and "grub in the head" will cause this symptom. Little cognizance need be taken of it ordinarily, but when it becomes extreme, measures should be taken to eliminate the cause. No medicinal treatment is required but good, well-bedded pens and proper diet are helpful.

**Pneumonia**

Pneumonia, being merely inflammation of the lungs, is also due to a variety of causes. The most common cause when it appears in epidemic form is hemorrhagic septicemia. Occasionally it may be associated with other infectious diseases. The bacterial causes have not been fully determined, but it is assumed that chilling in transportation and confining in damp pens during cold rainy weather is the predisposing factor in the development of this malady. Whether it is transmitted from one to another is also an undetermined question. Its prevention lies in better care during shipping and during bad weather. Treatment consists in separation of the sick with proper housing, good nursing and light, easily digested diet.
DISEASES OF THE URINARY ORGANS

Urinary Calculi

This disease first received attention in Colorado feeding lambs due to an outbreak near Fort Morgan in 1923 in which, in a period of about 10 days, some 25 head were lost out of 2,100. Since that time it has been frequently reported. Nearly every winter there are some serious losses in various parts of the state attributable to this condition.

Cause.—A great deal of work has been done to determine the cause of this condition and suspicion has been cast upon water, feed and infection, but it cannot be said that the problem as yet is entirely clear. Work at the Iowa Station, covering a period of 5 years, seemed to incriminate beets and mangels as probable causes. Since it is well known that these increase the alkalinity of the urine, the assumption was that with the increase of alkalinity, the salts were precipitated out in the bladder. More recent work at the Indiana Station throws considerable doubt on this view, those workers going so far as to state that beets and mangels increase the amount of urine and consequently decrease the likelihood of the formation of calculi. Experimental work done with rats shows that lack of vitamin A is a factor in the production of urinary calculi. There is, however, little reason to apply this principle to sheep. It is also known that bladder irritation from any cause may result in

Greatly distended bladder of lamb with urinary calculi. The calculi are shown in the urethra near the end of the penis where they had lodged. The bladder is so distended that two large blood clots are seen on the surface.
the deposition of salts, but no correlation has been found between bladder infection and urinary calculi in sheep.

The most recent work, and that which seems to be most significant, was carried out at the Indiana Station. Feeding wether lambs on a variety of rations, they found that cereal grains, and especially wheat bran, were prone to produce concentrated urines, increase the amount of phosphates and thereby increase the probability of the formation of calculi. Some of our observations during the time when wheat was very cheap and was extensively used as a feed for lambs, indicated that urinary calculi were more frequent in such lots. In one very notable instance a heavy loss was experienced, but as soon as the grain was changed from wheat to corn the loss ceased almost immediately.

At our dryland experiment station at Akron, Colorado, we have had losses in our experimental feeding sheep nearly every winter. In February, 1933, the water supply froze up and the animals were without water for 2 days. Immediately following this, 7 lambs were lost out of the small number of 220 on feed. This seemed to indicate a direct relation between water supply and the formation of calculi. It can only be said that lowered water consumption and increased phosphatic content of the urine, due to the feeding of cereal grains, have at least a theoretical basis of causation. It must still be admitted that urinary calculi do form in sheep that have access to a plentiful water supply and are not on cereal grains.

Treatment.—Occasionally the urethra is blocked at the urethral process, and when that occurs that extension can be cut off and the condition relieved. More frequently, however, the urethra is plugged from end to end with small granules which cannot be dislodged. In this case the urethra may be opened at the ischial arch and the urine allowed to drain thru the artificial opening. Some lambs have been saved by this operation. If the disease is extensive in a flock and the animals are ready for market it may be better to send them to slaughter rather than allow the loss to continue.

Other Diseases

Suppurative Meningitis

This disease is more common than is generally realized. Practically all of the chronic cases, that by the feeder to be "grub," prove, on examination, to be either suppuration of the covering of the brain or of the brain itself. It seems quite probable, however, that grubs dying in the sinuses would set up an irritation that might result in this condition.

Cause.—The bacterial cause has not been determined. It is believed, however, to be due to a bacterial infection passing from the nose thru the openings in the ethmoid bone to the brain coverings. If this be true, then nasal inflammations that are so common in sheep are really at the bottom of this trouble.
Symptoms.—The animal becomes dull, holds the head to one side or throws it backward according to the seat of the suppurative process. Finally, after several days it staggers and falls to the ground, possibly lying in a comatose state for several more days, or even weeks, if fed and watered. It is believed that the disease is always fatal.

Post-Mortem Findings.—On removal of the skull an area of green pus is found somewhere on the surface of the brain, the more common seats being over the anterior part of the cerebrum or at the base of the brain. Occasionally an abscess is found in the cerebral substance proper.

Treatment.—No treatment is of any value. If the lamb goes down, destruction is advised.

Rheumatism (Arthritis)

Occasionally soon after arrival a large number of the lambs in a particular lot will be seen to be stiff. When down they do not like to rise and when up they hesitate to move about. One limb may be held up as tho painful. The animals keep off their feet as much as possible. Examination of the joints of the legs shows tenderness and pain on pressure. The lambs have a dejected appearance and do not eat readily. Post-mortem examination reveals an excessive amount of fluid in the joints mixed with flakes of fibrin and cells.
A similar disease has been described in Australia and in Montana as being due to the organism that causes swine erysipelas. Whether the disease as seen in the feedlots is due to the same organism has not been determined. In any event the disease rapidly passes thru a herd, the mortality is very low and the animals return to normal in from 1 to 3 weeks. No treatment has been attempted.

**PARASITES**

**Scab**

Some years ago this was the most important disease which the feeder had to combat. Owing to the stringent regulations it has almost disappeared from the feedlots.

![Sheep scab mite (Psoroptes communis ovis) (greatly enlarged).](image)

**Cause.**—The cause is a white, eight-legged mite, about one-fiftieth of an inch long, living on the skin and producing intense itching.

**Symptoms.**—The first symptom is manifested by the affected animal biting itself and pulling out tags of wool. The first lesion is often on the shoulder or hip. The wool is depressed or partly removed. The skin is reddened and scaly. As the disease progresses a bare area appears, seabs pile up and the animal loses the wool
from larger and larger areas. Itching is increased and the animal becomes emaciated. One seldom sees these advanced cases since it is the custom now to give early attention to scab.

Diagnosis.—The only positive diagnosis is the finding of the mite. This requires a magnifying lens and may take considerable time. The most satisfactory method is to use a hand lens and find the mite directly on the animal. Scrapings of wool sent to a laboratory are not very reliable as they may have come from a scabby sheep and still prove negative on examination. A single mite is sufficient to establish the presence of the disease.

Treatment.—As soon as the determination has been made the sheep should be dipped. Hand dressing is of no value and only prolongs the difficulty. The dips recognized by the United States Department of Agriculture are the lime-sulphur and the nicotine dips. These must be used warm and the sheep dipped twice, with a 10-day interval. The dip does not destroy the eggs, so the interval is allowed to give them time to hatch and yet not time to become mature and lay more eggs.

Ticks

True ticks are never seen on feeding lambs, but the so-called sheep tick, which is a degenerate fly, is without doubt the most common parasite. For practical purposes it may be said to be constantly present. Ordinarily it does little harm, but frequently it is present in such numbers as to cause a great deal of irritation with consequent loss of weight.

Cause.—The sheep tick is a six-legged fly without wings, reddish brown in color and about one-quarter of an inch long. It is easily seen by parting the wool in several places on the neck or shoulders.

Symptoms.—Lambs do not ordinarily exhibit any marked symptoms unless the infestation be heavy. In that case they bite themselves at various places on the body where the tick is producing the irritation. The ticks may cause such intense irritation as to check the normal gain or even cut the animals in weight. The ticks are often to be seen engorged with blood.

Treatment.—Where infestation is light no attention is paid to the condition, but where it is heavy, better gains will be made if the ticks are destroyed. This can be done by dipping twice in
coal-tar creosote, cresol, or nicotine dips. The interval between dippings is 25 days. The time may come when all feeder lambs will be dipped for ticks, much as was customary in former years for scab.

Lice

Lice are not commonly found on feeding lambs but occasionally they are present in such numbers as to call for remedial measures. Both the biting and the sucking lice are found and may produce much irritation and loss of flesh. The affected animals will be seen to show uneasiness and biting at the wool on various parts of the body. An inspection will reveal the lice as they are easily seen by the naked eye. They may be found along the back and sides, or, in the case of the foot louse, in the short hair below the knee or hock.

Treatment.—Hand treatment is never very satisfactory and in the case of feedlot lambs, the number precludes the possibility of handling them in this manner. Dipping twice with an interval of 15 days is the only effective method. Coal-tar creosote and cresol dips have been used with satisfaction but care must be used to see that they are properly mixed with water. Otherwise they may destroy animals. Nicotine and sulphur (nicotine .07 percent and sulphur 2 percent) is very effective.

Gid

This disease is rare and so far has been reported in only one lot of Colorado lambs. These cases were seen in March, 1919, and out of a lot of 1560 that had been shipped from Montana in December, some 20 or 25 were affected. Since the disease is known to exist in the Northwest it may occur in the feeders at any time.

Cause.—The cause is the development of the cystic form of a dog tape-worm in the brain of the sheep. The adult tape-worm lives in the intestine of the dog; the segments containing the eggs pass out with the feces and are taken into the mouth of the sheep in grazing. The eggs hatch out in the stomach, burrow thru the stomach wall and into the circulation. Only those lodging in the central nervous system develop. These form cysts that may become larger than hens' eggs. The wall has the tapeworm
heads attached and the content is composed of a clear fluid. These cysts usually develop until the pressure destroys the life of the animal. The further development of the parasite is, then, dependent upon the cyst wall being eaten by a dog or other similar animal, when the little tapeworm heads attach themselves to the lining of the intestine and begin to grow segments. The adult worm may then become 2 or 3 feet long.

Lamb affected with gid. Note the lowering of the head.

**Symptoms.**—Affected animals show spells of dizziness and staggering, holding the head in an unusual position according to the position of the cyst in the brain. Often sheep walk in a circle and finally go down and become comatose. They may lie in this position for as much as a month, at times regaining consciousness and taking water and food. More commonly, however, they die within a week or 2 after going down. The cyst is easily found on cutting into the brain.

**Treatment.**—Treatment is usually unsatisfactory, but since the animal will probably die anyway it should be tried. There is usually a soft place just over the parasite and if this can be found the cyst can be punctured with a trocar or removed surgically. In spite of treatment, most animals die.

**Control.**—The heads of all animals dying of this malady should be burned or buried deep so that there is no possibility of dogs getting to them. In regions where dogs are known to be infested with this tapeworm, they should be periodically (twice a year)
treated with medicinal agents that will expel the worms. During the time of treatment the dog should be confined and the feces destroyed to prevent the tapeworm eggs being consumed by sheep.

Tapeworms

The usual tapeworm in the feeding lambs is the Fringed tapeworm, (Thysanosoma actinioides). At times the infestation seems to be 100 percent in a flock while in other flocks there may be no tapeworms at all. Probably the origin of the lambs is the deciding factor.

The most common sheep tapeworm (Thysanosoma actinioides).

They are usually found in the small intestines near the point where the hepatic duct enters, and often ascend even into the smaller ducts of the liver itself. Sometimes they are present in such numbers as to clog the hepatic duct and in this case the walls of the duct are thickened and inflamed.

The damage that these worms do is still a moot question but those who have had most experience consider them of little significance. In very young lambs they do doubtless cause diarrhoea and emaciation but these conditions are seldom associated with the infestation in the feedlots. Since they are so frequently present, extensive losses have been attributed to their presence. They probably rarely cause death. Frequently fat lambs ready for the market are heavily infested.

The large tapeworm (Monezia expansa), which sometimes attains a length of several feet and which is the more common worm in breeding flocks, is now occasionally seen in feeders. So far it has not become a serious infestation but may increase to the point where it will require treatment. From our experience in breeding flocks we regard it with much more apprehension than the fringed variety.
The intermediate host has not been discovered for either of these worms.

**Treatment.**—No one has discovered a satisfactory treatment for the fringed tapeworm. The large worm can be expelled with either kamala or nicotine sulphate.

**Other Parasites**

"Grub in the head," the larval form of a fly (Oestrus ovis), that frequently infests the sinuses of the head and causes cerebral symptoms in breeding sheep, is seldom seen in feeding lambs. The symptoms commonly regarded by feeders as being due to this parasite are usually associated with suppurative meningitis and occasionally with some of the acute infectious diseases.

Stomach worms, the bane of the sheep industry on farms, are rare in range sheep. An increasing number is, however, found in our feeding lambs but as yet they have not produced sufficient disturbance to require attention.

The thin-necked bladderworm (Cysticercus tenuicollis) is frequently seen in the abdominal cavity attached to the peritoneum. It is a small white object surrounded by a cyst of clear fluid that may vary from the size of a pea to that of a hen's egg. The white object is a tapeworm head that if eaten by a dog may develop into an adult worm in that animal. These bladders may be numerous in some animals but they are believed to be of little significance.
Eggs of the common worms of feeder lambs.

1. Fringed tapeworm (Thysanosoma actinioides).
2. Large tapeworm (Monezia expansa).
3. Common stomach worm (Haemonchus contortus).
4. Slender necked stomach worm (Nematodirus filicolicus).
5. Whipworm (Trichuris ovis).
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