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CONTROLLING Internal Parasites of Sheep



Figure 3. Range lambs which have been injured by internal parasites. Loss of weight and scouring were the symptoms shown.

VETERINARY DEPARTMENT
Agricultural Experiment Station
SOUTH DAKOTA STATE COLLEGE - BROOKINGS

Controlling Internal Parasites of Sheep

By G. S. HARSHFIELD AND F. N. CARLSON¹

Parasitism is the worst hazard in the raising of sheep. This is true in South Dakota and is generally true in other sheep-raising areas. No accurate figure of the cost of worm infestations can be given. The cost includes the loss in deaths, the lowered values of the unthrifty, light-weight lambs which survive, the added expense in feed and time in making such lambs salable, the cost of worm treatments and time in administering them. To these costs should be added the weight loss by sheep, resulting from moving them from range for treatments, and the handling of the flock incident to treatment. If figures were available, the total annual loss to sheep growers would certainly be many thousands of dollars in South Dakota alone.

There has been a marked increase in numbers of sheep in the state in the past twenty-year period, from 682,000 in 1925 to a high of 2,300,000 in 1944. An increase in numbers on some farms and ranches without corresponding increase in acreage for pasture has no doubt contributed greatly to the seriousness of the parasite problem. There was a decline of 26 per cent in numbers of sheep in the two years preceding January 1, 1946.² Difficulty experienced in controlling internal parasites is undoubtedly one of the factors responsible for the decrease. Some flocks were reduced in numbers and some were sold, entirely because of this difficulty.

A study was undertaken in 1943 with the ultimate purpose of finding means of reducing the loss from parasites.³ The work has been confined largely to the range areas of the northwestern counties. It has included field observations of flock and range management methods, examination of sheep for evidence of parasitic infestations, and postmortem examinations for the various kinds of worms. During the 1945 grazing season an experimental flock was maintained under range conditions for study of the parasite problems.

Distribution of Parasites

Not all the different species of worms which have been found in South Dakota sheep are present in numbers sufficient to warrant suspicion. Those which are most frequently present are the common or twisted stomach worms (*Haemonchus contortus*) Figure 1, medium or brown stomach worms (*Ostertagia circumcincta*), bankrupt worms (*Trichostrongylus* species) Figure 2, thread-necked strongyles (*Nematodirus* species), nodular worms (*Oesophagostomum*

¹G. S. Harshfield, Experiment Station Veterinarian; F. N. Carlson, Assistant Extension Veterinarian and Field Veterinarian for the South Dakota Livestock Sanitary Board on sheep parasite control.

²The figures on sheep population are taken from reports prepared by the South Dakota Crop and Livestock Reporting Service, U. S. Bureau of Agricultural Economics.

³The study is a project of the South Dakota Agricultural Experiment Station with the following cooperating agencies: South Dakota Livestock Sanitary Board, Zoological Division of the U. S. Bureau of Animal Industry, U. S. Bureau of Plant Industry, Extension Division of South Dakota State College, and the Western South Dakota Wool Growers Association



Figure 1. The common or twisted stomach worms, *Haemonchus contortus*, (approximately normal size). This is the most injurious of the sheep round worms.

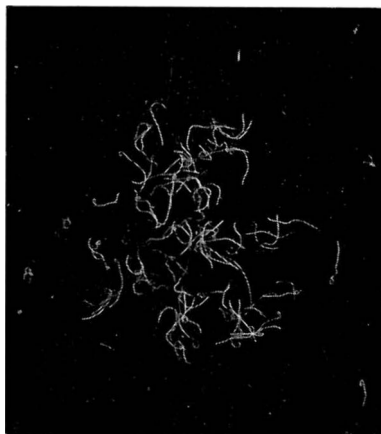


Figure 2. Bankrupt worms, *Trichostrongylus* species, (approximately normal size). These small worms have been found in large numbers in the small intestine of sheep.

species), broad tapeworms (*Moniezia* species) and fringe-tapeworms (*Thysanosoma actinoides*). These parasites can be grouped into two main classes, round worms and tapeworms. All excepting nodular worms and fringe-tapeworms are common in sheep over the entire state. Fringe-tapeworms have not been found except in sheep raised in the western counties and nodular worms have been found only in sheep raised in counties near the eastern border.

Life Cycle of Round Worms

All round worms of sheep have a similar direct life cycle. Female parasites in the stomach and intestine produce eggs which pass in the feces. These eggs require warmth and moisture for development. On hatching, larvae are liberated which molt before reaching the stage that is infective for sheep. The time required to complete larval development may, under most favorable conditions, be as short as four days for the common stomach worm. With other species, or under less favorable conditions, it may be much longer. The infective larvae migrate upon blades of grass and are eaten with the grass by grazing sheep. It requires about 15 to 21 days to reach maturity in the stomach and intestine, when eggs are produced by these new worms.

Life Cycle of Tapeworms

Tapeworms have an indirect life cycle. They require an intermediate host for completion of their cycle. Eggs of the tapeworm are contained in the segments of the worm which are passed in the feces of the infested animal. These eggs are eaten by small pasture mites and cysts containing the future tapeworm heads develop in their body cavities. These mites are eaten with the forage. The cysts are digested, liberating the tapeworm heads which rapidly grow into mature worms by developing numerous segments. This cycle has been determined for the broad

tapeworm, but the intermediate host of the fringe-tapeworm has not yet been discovered.

Symptoms of Parasitism

The most injurious effects of worm infestations are seen in lambs, but older sheep with heavy infestations also are damaged. Common stomach worms, when present in large numbers, result in marked anemia, even before unthriftiness is observed by the owner. The skin and membranes of the mouth and eyes of such animals lack the normal pink color. Flock owners generally recognize parasite injury in their flocks only when unthriftiness, loss of flesh, diarrhea and weakness are evident in several animals. (Figure 3.) Much damage may already have been done by the time these symptoms appear. In ewes, anemia and unthriftiness associated with worm infestations may result in decreased milk for the lambs. It is seldom that an infestation with a single species of worm is found and such damage may be the combined effects of several species.

How to Determine the Presence of Worm Infestations

When any of the symptoms indicated above are observed in a flock, it is important to determine immediately whether they are the result of injury by parasites. Unthriftiness, loss of flesh, diarrhea and weakness may also be associated with nutritional disturbances in lambs without significant parasite infestations. Treatment of such lambs for removal of worms does not correct such difficulties.

The determination of parasitism may be made either by post-mortem examination of suspicious cases or by counts of worm eggs in a measured amount of fresh feces. The post-mortem examination must be made carefully, and both the stomach and intestine should be searched for parasites. Some species are very small and can easily escape detection.

In the studies conducted during the past two years, the count of worm eggs in a measured amount of composite sample of feces from several ewes and lambs has been very satisfactory in determining the status of a flock. In ranch flocks, nearly equal amounts of fresh feces (two or three pellets or the equivalent) are collected from at least 20 different lambs, and if the ewes are to be checked, 20 different ewes. These are kept cool and submitted to the laboratory in glass vials. At the laboratory each of the composite samples is mixed and the number of worm eggs in one gram of feces determined. Counts of around 2000 eggs per gram indicate a dangerous infestation and counts as high as 20,000 eggs per gram have been found in individual parasitized sheep.

Factors Affecting Parasitic Infestations

Among the more important factors affecting the extent of parasite damage in sheep are age, nutrition of the flock, and the practices followed in changing of range or pastures during the grazing season.

Age. In many flocks which have a heavy infestation of worms, definite symptoms may not be observed in the ewes, while lambs show distinct evidence of parasitism. This situation may exist even though the ewes are carrying as many worms as the lambs, as indicated by worm egg counts. Mature sheep have developed greater resistance to the parasites. In studying the development of parasitism in farm and ranch flocks, it is observed that late lambs born after warm weather

are more readily damaged than early lambs. Early lambs have a period of one to three months before becoming infested on range and are better able to withstand the ravages than the late lambs which rapidly build up an infestation as soon as they start grazing.

Nutrition. Poor or faulty nutrition of the flock increases the extent of injury by worms. On the ranges of western South Dakota flocks moved at sufficient intervals so that they always have abundant desirable grasses as forage thrive better throughout the summer than do flocks maintained on less desirable grasses, or where ranges are overgrazed. This was observed to be true in some flocks despite the fact that periodic parasite egg counts indicated a steadily increasing number of parasites. The varying nutritional value of grasses at different seasons or in different years may partly explain why the ravages of parasites are more severe in certain years than others. Numerous flock observations indicate that sheep can tolerate moderate worm infestations if they are always well fed.

Range Rotation. The frequent moving of sheep flocks from pasture to pasture, or the continuous moving about on the range have two advantages. One is the avoidance of overgrazing, allowing the animals a better choice of the available grasses. The other is the provision of a rest period for the range during which a large percentage of infective larvae die. Serious infestations are prevented.

Range rotation is of particular value in the control of the round worms of sheep, which have a direct life cycle. In order to make rotation effective, flocks need to be moved to clean areas before many of the larvae hatching from worm eggs have had time to reach an infective stage. As indicated, the shortest interval required is about four days under conditions most favorable for their development.

The length of time that infective larvae can remain alive on pastures varies. Cloudy weather and abundant moisture favor greater longevity. During the warm, drier months of summer, larvae of the common stomach worm are greatly reduced in numbers within a month by the drying of the sun and wind. Larvae of some of the less injurious round worms may live a longer period. After vacating a pasture or piece of range, it should not be used again for at least a month. Preferably a longer period should be allowed.

Range rotation is much less successful in the control of tapeworms because of the protection afforded by the grass mites which act as intermediate hosts. Other means are necessary in combating these parasites if they become a problem in flocks.

A survey of 19 range flocks in which diarrhea and deaths in lambs was reported in 1944, illustrates the relation of range acreage and rotation practices to lamb losses. Eight of the flocks with an average acreage of 6.16 acres per ewe had an average death loss of 6.8 per cent of the lambs, when moved at intervals of a few days to two weeks. A second group of four flocks with an average acreage of 4.0 acres per ewe, suffered a lamb loss of 19.5 per cent on a monthly rotation. Seven flocks which were not moved, or at most, moved only twice during the summer, had an average death loss of lambs of 57 per cent. This group averaged only 2.77 acres per ewe for grazing.

Reports received from 104 flock owners in western counties regarding their management practices in 1945, indicate that many ranges are overstocked for

satisfactory pasture rotation. Over 35 per cent of the flocks had less than five acres per ewe. Fifty-four per cent of the flocks of less than 300 ewes, 31 per cent of the flocks of 300 to 700 ewes and 29 per cent of the flocks of over 700 ewes fell in this group. It is noted in these reports that pasture acreage increases with increase of flock size, averaging 3.44 acres, 5.29 acres, and 6.48 acres, respectively for the three groups. Almost half of the range flocks of 700 ewes or more followed a plan of rotation at weekly intervals or oftener, while only 13 per cent and 16 per cent respectively of the first two groups were moved that frequently.

On ranges in western counties of South Dakota, many flock owners are successfully handling the parasite problem strictly by range rotation. The surveys indicate that when acreage of range equals or surpasses six acres per ewe and lamb, and when the band is moved at weekly intervals or less, and used portions of the range are left vacated for at least a month, losses from parasites are not a problem and good lambs are produced. Less acreage available for rotation results in over grazing, poorer nutrition of the lambs, and greater concentration of parasite larvae on the range. Parasite injury to the flock is more apt to occur under such conditions. In smaller flocks with limited acreage of pasture, control of parasites by rotation needs to be supplemented with other procedures for best results.

Use of Winter Ranges for Summer Grazing

Few, if any, of the most damaging of the sheep parasites, the common stomach worms, live over winter as eggs or larvae in the pastures under the climatic conditions existing in South Dakota. Several of the other round worms of South Dakota sheep either do not live over winter on pastures, or survive in such small numbers that winter carry-over on vacated ranges does not constitute a serious problem. During open winters, grazing is practiced the year round by many sheep men but usually the flock is not moved as frequently in winter as in summer. Unless separate winter and summer ranges are provided, the contamination of the range which occurs in late winter and early spring can be an important source of infestation of the lambs. For example, on June 11, 1945, a part of the experimental flock consisting of 105 ewes, each with a lamb, was started on a four-day rotation on range which had been used for about 500 head of ewes and lambs from November until in April. The ewes of the experimental flock were treated with phenothiazine immediately prior to placing on the pasture, with 96 per cent removal of stomach worms. Only two of their lambs were found to be infested at that time. Five weeks later all of the lambs were harboring stomach worms and the infestation was severe enough in half of them to warrant immediate treatment of the group. The source of the infestation for the lambs was the contaminated range. Another group of 60 ewes with their lambs was placed in another pasture on the same day in June. In this case the ewes were not treated. Only three of the lambs were infested with stomach worms at that time. This range had remained vacated during the winter. After a similar interval 48 lambs were infested with stomach worms but none acquired an infestation that would require treatment.

Winter Treatment of the Breeding Flock

The greatest source of infestation of the round worms for the lambs is the winter carryover in the ewes. These parasites are present, at least in small numbers, in all flocks, and eggs of the worms are passed in the feces. The larvae from

these eggs infest the sheep grazing over the contaminated range. The numbers of worms which produce the eggs can be greatly reduced by proper treatment of the breeding flock during the cold months when reinfestation is not a problem. A treatment in the late fall after onset of cold weather should contribute to more favorable wintering of the flock, in addition to eliminating a source of infestation for the next crop of lambs. In the more heavily infested flocks a second treatment in the spring immediately before turning to summer range is advisable. It is desirable to have ewes as nearly worm-free as possible at that time to prevent excessive range contamination.

Treatments

The more commonly used drugs for the removal of parasites from sheep are phenothiazine, tetrachlorethylene and copper sulfate-nicotine solution. For the administration of any treatment, professional assistance should be obtained if one is not familiar with the techniques involved. Many lambs are lost each year as a result of improper drenching.

Phenothiazine. This drug is available as a powder, suspension in water, or as compressed bolets or capsules. For individual dosing, most sheepmen prefer the suspension, which is given as a drench by dose syringe. Dosages of 25 grams for mature sheep and 12½ grams for lambs are recommended. Suspensions are prepared so that this dosage is contained in two ounces or one ounce respectively. Phenothiazine is very effective for the removal of stomach worms and nodular worms and is considered reasonably effective for removal of other round worms.

Tetrachlorethylene. This drug is a liquid and is obtainable in elastic gelatin capsules of 2½ cc and 5 cc sizes for lambs and mature sheep respectively. The capsules are administered with forceps. It is considered an effective treatment for the removal of many of the round worms of sheep.

Copper Sulfate—Nicotine Solution. This treatment has been in use for many years and is still preferred by some sheepmen. To prepare the solution, six ounces of copper sulfate are dissolved in a quart of boiling water. Cold water is added to make a total of three gallons, and three ounces of a 40 per cent solution of nicotine sulfate are added to this volume. Commonly used dosages are three ounces for mature sheep and one to two ounces for lambs, depending on the size. This treatment is reasonably effective in removing tapeworms as well as stomach worms and is the one of choice when tapeworm infestations are present as a contributing factor in parasitism.

Phenothiazine-Salt. Phenothiazine-salt mixture has been widely advertised as a flock treatment. One part of phenothiazine powder is thoroughly mixed with nine parts of loose stock salt for this purpose. The mixture is kept before the flock without interruption as the only source of salt. This method of administration of the drug should not be depended on for the removal of parasites from badly infested sheep. If the mixture is eaten by sheep in amounts that each animal consumes at least an ounce in six days, the phenothiazine checks the development of larvae which hatch from eggs passed in the feces. On some ranges in western South Dakota the mixture is not consumed in amounts sufficient to accomplish this because of the high salt content of the available forage. For the smaller farm

flocks with limited acreage for rotation, phenothiazine-salt mixture is a valuable aid to the control of round worm infestations, if given throughout the grazing season.

A Program of Parasite Control

Based on studies of parasitism in sheep in South Dakota, and observations of the effects of various methods of management of flocks in the control of internal parasites, the following program is outlined as a guide for handling flocks with the minimum of parasite damage resulting:

1. Be sure that the flock is receiving ample nourishment at all times. This applies to the sheep and lambs on pasture or range as well as the breeding flock on dry feed. Sheep that are well fed can better tolerate moderate worm infestations.

2. Treat the breeding flock during the winter months to eliminate so far as possible the winter carryover of parasites. A treatment administered after the onset of cold weather in early winter is advisable and a second treatment before the flock goes to summer range is a good practice in flocks which have been seriously infested.

3. Have the lambs come as early in the spring as they can be conveniently cared for. Keep the lambs as nearly uniform as possible with a short breeding season.

4. When the ewes and lambs are turned to grass, use range or pasture which has been vacated by sheep during the winter and early spring. If it is necessary to use winter range for summer grazing, use only in the latter part of the summer.

5. Move the flock on range, or change pastures at intervals of not longer than one week. Allow a used range to remain vacated for at least one month.

6. For the smaller farm flocks which cannot be moved regularly, keep phenothiazine-salt mixture (one pound of phenothiazine to nine pounds of salt) accessible to the ewes and lambs throughout the grazing season. It is well to start the feeding of phenothiazine-salt immediately following the spring treatment of the breeding flock, or with the appearance of the first warm days of spring.

7. Individual treatments for the round worm parasites through the summer months should be necessary only if the management procedures as outlined are not strictly followed. Should trouble be experienced, have a fecal worm egg count or post-mortem examination made for a correct diagnosis. If treatment is advisable, both ewes and lambs of the flock should be treated and moved to clean pasture or range.