Some Common Intestinal Parasites of Sheep in Wyoming

Robert C. Bergstrom*

Most sheep and other animals have parasites, but Wyoming sheep are usually not as heavily infested as are sheep in some other states. Lambs pick up the infestation as soon as they begin to graze. From this time on the number of intestinal roundworms increase in proportion to the number of larvae (immature forms) eaten with the grass. Young animals, especially lambs, are quite susceptible to the worms. Parasitological terms which may need to be defined are:

Arthropod—Small animals such as insects, ticks, and lice with jointed feet.

Asexual—A type of reproduction in which no fertilization process is necessary for multiplication.

Coccidial oocysts—A stage in the life cycle of small, single-celled organisms larger than bacteria but still microscopic.

Infestation—Presence of parasites within the body of a host. These parasites do not multiply asexually in the host.

Infection—Presence of parasitic organisms which multiply asexually in the host.

Contagion—Disease communicated through other animals or by immediate contact.

Intestinal roundworms and tapeworms affect the host animal’s health but are not contagious; nor do they multiply within the host’s body. The kinds of roundworms mentioned in this bulletin have a direct life cycle, meaning that no other animal host is necessary except the sheep. Tapeworms, on the other hand, have two hosts, the sheep and an arthropod. Intelligent plans for controlling these worms are based on knowledge of their life cycles.

It is difficult to measure the amount of damage caused by internal parasites in clinical cases, and even more so where the degree of parasitism does not cause signs of damage. Injury is manifested by weakness, weight loss, depressed rate of gain, lack of “bloom”, or size in the case of the so-called “pee-wee” lambs.

As an example of depressed weight gains, one group of Columbia lambs selected from a flock in Washakie County had lungworms as well as small stomach and intestinal worms. The lambs weighed from 48 to 60 lb. in September 1962. By January 1963 these lambs averaged only 80 lb., while similar unparasitized lambs would have reached 80 lb. by September or October of the previous fall. **Wool from these

*Assistant Professor of Parasitology.

**Wool analyses were made by the staff of the Wool Section, Division of Animal Science, Wyoming Agricultural Experiment Station, University of Wyoming, Laramie.
parasitized lambs graded ½ to “fine” with fiber diameters considerably smaller than those of unparasitized lambs. (Most Columbia lambs produce wool which grades from ¼ to ½ blood). Fiber tensile strength was low in the wool from the parasitized lambs. Fiber length was only 1 to 2 in. in January; unparasitized lambs at that time of year carry wool with fiber lengths of 2 to 3½ in. Wool fibers from the parasitized lambs showed conspicuous “windows” or clear, weak areas at or near the fiber’s base.

Factors Contributing to Internal Parasitism in Sheep

1. Continuous pasture stocking with sheep. If no long-term grazing rotation plan is used, continuous stocking can lead to parasite problems.
2. Overstocking. Overstocking not only aids parasites in completing their life cycle but also cuts down the sheep’s food supply. A poorly nourished sheep cannot resist parasites as effectively as a well-nourished one.
3. Lack of a proper diet. An incorrect balance of proteins, carbohydrates, fats, and minerals lowers nutritional levels. Lack of vitamins and trace elements also adversely affects the animal and makes a poor condition worse.
4. Poor watering facilities. Unpalatable or dirty water, which animals hesitate to drink, can damage the animal’s nutritional state. Sheep will not drink enough water for good health under such conditions.
5. Failure to recognize symptoms of parasitism. Long-term, low-level infestations are especially difficult to diagnose.
6. Failure to carry out adequate control programs. Adequate programs include management practices which decrease worm numbers, as well as the use of drugs.

Life Cycle of Some Common Stomach, Intestinal, and Lung Roundworms

Many operators always associate parasites with moist, temperate conditions. These conditions are required by many parasitic roundworm species such as the twisted stomach worm, Haemonchus sp. Some roundworm genera, however, such as the thread-necked intestinal worm, Nematodirus sp., and a stomach worm, Marshallagia sp., can complete their life cycles under dry conditions and at relatively low temperatures.

The life cycle of most stomach and intestinal worms is not complex, and no intermediate host is necessary (Figure 1). Adult female worms in
Fig. 1—Life cycle of the small stomach and intestinal worms of sheep. Those stages to the right of the straight line are found in grass or soil; those to the left of the line are stages of the worm's life cycle where the parasite interacts with its host in the stomach or intestine.
the stomach or intestine lay eggs which pass from the sheep with the fecal matter. The eggs hatch at suitable temperatures and the tiny, immature worms (larvae) develop in three stages. The larvae develop in feces, in soil, and on the grass. In the third stage, larvae are capable of infesting another host sheep. The sheep picks up the third or infective stage larvae with grass or other vegetation. The fourth and adult stages develop in the sheep stomach or intestine.

Species of Stomach and Intestinal Worms Common in Wyoming Sheep

Roundworm Parasites

1. Twisted stomachworms, also called "barberpole" worms because of their conspicuous, twisted intestinal tract, are approximately 1/2 to 1 inch long and threadlike. They are pink when in the ruminant's stomach. Female worms can produce up to 20,000 eggs per fecal pellet, but in Wyoming this species usually is not found as frequently as other parasites.

2. Medium stomachworms are found in the abomasum or fourth stomach of sheep. They are small and threadlike, ranging from 3/8 to 3/4 inch long. Their small size and brownish-pink color make them difficult to see. Immature forms may be found in small nodules in the stomach lining. A large collection of these worms can cause diarrhea. This species is common in Wyoming (Figure 2C and Figure 3B).

3. Hairworms or "bankrupt" worms are found in the small intestine, especially in the first 30 feet. Male worms are about 1/4 inch long; female worms are about 3/8 inch long. They are (scarcey visible).

Fig. 2.—Common roundworm parasites found in Wyoming sheep. A. Female twisted stomach worm, Haemonchus contortus. B. Female thread-necked intestinal worm, Nematodirus sp. C. Female medium stomach worm, Ostertagia sp. D. Hairworm or "bankrupt" worm, Trichostrongylus sp. (scarcey visible).

Metric scale to the left of the worms helps to show the worms' length in millimeters. All worms are shown at approximately natural size.
Fig. 3.—Anterior portion or "head" end of three species of internal parasites frequently found in Wyoming sheep. Drawing (A) is of the thread-necked intestinal worm, (B) is a part of the medium stomach worm, and (C) is a drawing of the "head" end of the "bankrupt" worm.

All drawings were made with the aid of the camera lucida and magnified 150 diameters.

pink but turn yellow or white quickly when removed from the intestine. These worms feed in or near the small intestinal lining. In sufficient numbers the species cause "black scours" or diarrhea. The small size may be noted in Figure 2D; the shape of the "head" end is shown in Figure 3C.

4. Thread-necked intestinal worms of sheep are common in Wyoming. Two or three species are often present in one host animal or in one flock. Male worms are $\frac{1}{2}$ to $\frac{3}{4}$ inch long and as wide as a thick thread. The female worms measure $\frac{3}{4}$ to $1\frac{1}{4}$ inches long.

This kind of worm is almost always found in lambs and may cause diarrhea. The species is well adapted to the dry Wyoming summers and cold winters. (Figure 2B and Figure 3A).

5. Another important roundworm of the stomach and intestines is Marshall's worm, Marshallagia (Ostertagia) marshalli. These worms are also common in deer, antelope, and bighorn sheep. They are effective and persistent in Wyoming because their eggs and free-living larvae can tolerate the dry, cold climate. The "tail" end or
bursa of a male worm of this species is shown in Figure 4.

6. Small intestinal threadworms, *Strongyloides* sp., develop from larvae which are somewhat unusual in that the first stage may develop into (a) infective larvae, in which the females outnumber the males by six to one, or (b) free-living forms with nearly equal numbers of males and females. Eggs of this species are embryonated or contain a small worm by the time they leave the host animal and are only about 50 by 30 micra in size. The adult worms are approximately $\frac{1}{4}$ inch long. The species appears to be only slightly pathogenic. It is an important species, however, in sheep kept in stalls and pens.

7. Common whipworms are somewhat larger than the previously listed species, 2 to 2$\frac{1}{2}$ in. long and threadlike. They are found in the small intestines and cecum. The anterior two-thirds is very thin and resembles a miniature "whip". The worms are common in Wyoming sheep but are usually few in number. They are less important than the previously mentioned parasites.

8. Large-mouthed bowel worms, found in the large intestine, are frequently noted in winter, when many adult worms are discharged with the feces. Males are about $\frac{3}{4}$ inch long and females measure $\frac{3}{4}$ inch or more. The mouth opening is conspicuously large and surrounded by "leaf" crowns.

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Fig. 4.—The "tail" end or bursa of a male Marshall's worm, *Marshallagia marshalli*, as one would see it through the microscope magnified more than 100 diameters.
9. Sheep lungworms are found only occasionally. The creamy-white adults are found in the trachea and its divisions in the host animal's lungs. They are from 1½ to 3 in. long. The females lay well-developed eggs, which become embryonated by the time they pass through the intestinal tract and are expelled on the surface of the fecal pellets. Sheep affected with this parasite cough frequently and often gurgle or "rattle" in breathing. Bacterial diseases and emphysema (distension of the air sacs of the lungs) frequently accompany infestation of this parasite. Sheep on irrigated pastures acquire these parasites especially if the pasture is overstocked.

Flat-worm Parasites

Liver Fluke

The sheep liver fluke is shaped like a flattened leaf. On the front end a slight projection or head-like structure carries the anterior sucker. Adult flukes are usually rusty-red or brown and are found in the bile ducts of the liver. They vary in length from 3/4 to 1 1/4 in. They can kill sheep, especially mature ewes, in irrigated areas.

Tapeworm

Eggs of the common tapeworm, Moniezia expansa, and the fringed tapeworm, Thysanosoma actinioides, are frequently noted in fecal samples from Wyoming sheep. Eggs of the common tapeworm are seen in feces from sheep on both dry and moist pastures and range. Only in relatively large numbers or sizes do these worms damage sheep.

Symptoms and Diagnoses of Internal Parasitism in Sheep

Unfortunately the symptoms of parasitism are not specific and are often confused with symptoms of other diseases. Symptoms most commonly observed are:

1. Lack of "bloom", especially in lambs.
2. Unthriftiness
3. Loss of weight or slow weight gain. This insidious loss is difficult to measure unless scales are available and are used frequently.
4. Anemia
Membranes of the eyes, lips, and tongue change from normal pink to white or yellow, especially if twisted stomach-worms (Haemonchus) are present.

5. Diarrhea
Fecal matter, which is fluid, brown or black, may indicate the presence of worms like the medium stomachworm (Ostertagia), bankrupt worm (Trichostrongylus), and the thread-necked intestinal worm (Nematodirus). However, if the feces shows bloody mucus along with other material, the cause may be coccidial organisms. Many times diarrhea is in no way connected with parasites.
6. Animals eat dirt or show other abnormal behavior. Unfortunately animals with bacterial infections also show these symptoms.

7. "Bottle Jaw"
A soft swelling between and under the lower jaw is infrequent in Wyoming sheep. It occurs after a long-standing parasitic infestation, usually only in old ewes.

To confirm a diagnosis made by observing some of the symptoms listed above, collect fecal samples from at least five sheep suspected of carrying parasites. Send or take the samples to a local veterinarian, to parasitologists in the Division of Veterinary Science, University of Wyoming, Laramie 82071, or to the Wyoming State Veterinary Laboratory, Laramie 82070. Samples will be analyzed to determine if worm eggs or coccidial oocysts are present. Samples of sheep feces may be taken from the rectum or from freshly dropped pellets on the snow or grass. Use individual containers for each sheep sampled and collect from one to three oz. (two or three teaspoonfuls) for each sample. A small, tightly capped jar is good for mailing samples. If samples become dry and old, parasite eggs will be lost or hatched and the analysis will be inaccurate.

**Management Practices to Help Control Internal Worms**

1. Keep sheep in good physiological condition and well nourished. Many potential parasite problems are eliminated by correct feeding. Proper stocking rates are important here.
   A. Young animals are more susceptible to many parasites.
   B. Take special care of immature animals at weaning or at other times of stress.
   C. The condition of ewes before lambing cannot be overemphasized. Supplementary feeding should be started a month or more before lambing.
   D. Regular feeding is more important than time of feeding.
2. Rotational grazing
   It is easier to combat parasite infestations by rotating pastures every two to four months rather than every two to three weeks. Parasites reach the infective stage during a short-term rotation, but if the period is extended, the parasites will die as the grass and soil dry out in summer or as they freeze in winter. It is also wise to use cattle or other stock in the rotation plan. Sheep and cattle eat some, but not all, of the same foods, and many parasites which affect cattle do not affect sheep, and vice versa.
3. Supplemental Pastures
   If sheep are pastured temporarily on small-grain stubble, beet tops, or alfalfa stubble, the grasses on native range will have time to seed or maintain foliage. Thus, undesirable vegetation such as cheatgrass or annual forbs cannot "take-over" the sheep range.
4. Isolation of heavily parasitized animals.

Egg counts in fecal samples show that a large percent of the parasites are carried by only a small percent of the sheep. (See Wyoming Agricultural Experiment Station Bulletin No. 410). Therefore, if heavily infested animals are identified, isolated, and treated, parasites can be controlled effectively at moderate cost.

Control Measures: Drugs and Treatment

USE DRUGS ONLY AS A LAST RESORT AND ONLY WHERE THE SHEEP CANNOT BE MOVED TO SUPPLEMENTARY PASTURE OR WHERE OTHER DESIRABLE MANAGEMENT PRACTICES CANNOT BE EMPLOYED.

An imposing array of drugs is available to treat sheep and other animals for worms and other parasites. Here one can list only a few drugs that have been used with varying degrees of success in Wyoming:

1. Phenothiazine--A frequently used drug which is good for treating sheep parasitized by Haemonchus sp. The drug will not kill tapeworms unless an arsenical is added. A drench (liquid solution) is frequently used and appears to be somewhat safer than boluses of the same material. Wool staining is often noted after the use of this drug.

2. Thiabendazole--(Commonly called Thibenzone or T. B. Z.)--A drug used in Wyoming for a year or more and one that has shown good results against infestations of Nematodirus, Ostertagia, and Trichostrongylus--common Wyoming parasites. The drug is not as effective against the intestinal worms, Cooperia, and does not kill the common tapeworm, Moniezia, or the coccidial parasites.

3. Franten--A drug that has treated successfully the thread-necked intestinal worms common in Wyoming lambs. The drug has not been as effective on other species of worms.

4. Trivermol--A trade name for a drug used for many years with slight formula variations. It is composed of nicotine sulfate-copper sulfate plus an arsenical to destroy tapeworms, and it comes in a liquid solution for use as a drench. Some veterinarians report good results with this drug at reasonable cost.

5. Bithionol--A trade name for a relatively new drug used to remove fringed tapeworms in sheep.
Precautions: MOST DRUGS CAN BE HIGHLY TOXIC TO SHEEP. EXTREME CARE SHOULD BE USED AT ALL TIMES. NEVER USE A STRONGER DOSE THAN THAT RECOMMENDED BY THE DRUG COMPANY. NO DRUG SHOULD BE USED WITHIN 45 DAYS OF LAMBING. WEIGHT-GAIN SUPPRESSION FOR 1 TO 5 DAYS IS TO BE EXPECTED AFTER TREATMENT.

If any one drug is used repeatedly it gradually loses its effectiveness. Drugs that now look promising may be ineffective within a few years, if used repeatedly. When treating sheep annually, vary the drugs each time so the worms do not have a good chance to build up an immunity to any one drug. Rotating such drugs as Thibenzoie, Trivermol, Phenothiazine and Franten would be a better treatment plan than repeated use of only one or two drugs.

Drenching procedures: If the operator uses a drenching gun, a good practice is to attach a 2 to 4-inch piece of rubber tubing to the lower end of the delivery tube to protect the animal’s mouth and throat during treatment. Elevate sheep’s head only slightly or the drug may flow into the lungs rather than into the gullet and stomach.
### Table 1.—Sheep Worms in Wyoming.

<table>
<thead>
<tr>
<th>Scientific Name</th>
<th>Common Name</th>
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<tbody>
<tr>
<td><strong>Roundworms</strong></td>
<td></td>
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<tr>
<td>Haemonchus contortus</td>
<td>Twisted stomachworm or “barberpole” worm</td>
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<tr>
<td>Ostertagia occidentalis</td>
<td>Entire group—medium stomachworms</td>
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<td>Marshallagia marshalli</td>
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<tr>
<td><em>O. (ostertagia) circuncincta</em></td>
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<tr>
<td><em>O. (ostertagia) trifurcata</em></td>
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<tr>
<td><em>Pseudostertagia bullosa</em></td>
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<tr>
<td>Nematodirus spathiger</td>
<td>Threadnecked intestinal worm for entire group</td>
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<tr>
<td><em>N. lanceolatus</em></td>
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<tr>
<td><em>N. filicollis</em></td>
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<tr>
<td><em>N. abnormalis</em></td>
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<tr>
<td>Nematodirus rufaevastitatis</td>
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<tr>
<td>Nematodirella longissimesspiculata</td>
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<tr>
<td>Trichostrongylus colubriformis</td>
<td>“Bankrupt” worm or small intestinal worm</td>
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<tr>
<td>T. vitrinus</td>
<td>Small intestinal worm</td>
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<tr>
<td>Cooperia onchophora</td>
<td>Cooper’s intestinal worm</td>
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<tr>
<td>Bunostrongum trigonocephalum</td>
<td>Sheep hookworm</td>
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<tr>
<td>Strongyloides papillosus</td>
<td>Intestinal threadworm</td>
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<tr>
<td>Trichuris ovis</td>
<td>Common whipworm</td>
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<tr>
<td>Chabertia ovina</td>
<td>Large-mouthed bowel worm</td>
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<tr>
<td>Dictyocaulus filaria</td>
<td>Sheep lungworm</td>
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<tr>
<td>Protostrongylus rufescens</td>
<td>Red lung worm</td>
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<tr>
<td><strong>Tapeworms</strong></td>
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<tr>
<td>Moniezia expansa</td>
<td>Common tapeworm</td>
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<tr>
<td>M. benedeni</td>
<td>Fringed tapeworm</td>
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<tr>
<td>Thysanosoma actinioides</td>
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<tr>
<td><strong>Flukes</strong></td>
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<tr>
<td>Fasciola hepatica</td>
<td>Sheep liver fluke</td>
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PREPARATION OF HAY AND GRAIN FOR LAMB FATTENING RATIONS

A. P. Botkin
L. J. Karcher
H. J. Paulson

The grad committee

University of Wyoming

Agricultural Experiment Station
University of Wyoming, Laramie
When using drugs to control parasites in sheep, use extreme care. Most drugs can be highly toxic to sheep. Never use a stronger dose than that recommended by the drug company.

For another publication on livestock parasites, ask your local county agricultural agent for Bulletin 410, “Intestinal Round Worm of Cattle in Wyoming,” or write for a copy from Bulletin Room, College of Agriculture, University of Wyoming, University Station, Box 3354, Laramie, Wyoming 82071.