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INTERNAL PARASITES of cattle

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INTRODUCTION

How much money do you spend each year growing internal parasites in your cattle?

You might show me a herd of apparently healthy, well-fed cattle and answer, "Nothing, or at least not enough to be concerned about. If some of my cattle had worms, I would be able to see them."

However, if your cattle had died or made poor weight gains because of severe parasitism, then you might have an idea of how much it costs to grow worms.

Economic loss due to internal parasites may be sizable. These losses are not easily detected because they are well hidden.

In cattle the effects of internal parasites will be well camouflaged. However, additional feed will be required to reach market weight. Parasitologists have estimated that subclinical infections of internal parasites may reduce weight gains in cattle as much as 10 to 20 percent. Contrary to popular opinion, worms do grow best in healthy, well-fed cattle.

Surveys conducted by the Department of Veterinary Science, University of Nebraska, have shown that a high percentage of native Nebraska cattle are infected with internal parasites. These surveys were made by examining cattle manure for coccidial oocysts and worm eggs.

During a three-year period (1965-1968) fecal samples were examined from 50 Nebraska counties; 89% of the fecal samples examined contained roundworm eggs and 67% contained coccidia. A number of internal parasites were present, but in the majority of the animals the parasites were at a subclinical or low level of infection.

Under certain environmental conditions subclinical worm infections can develop into severe worm problems. Therefore, it is important that each cattle owner be aware of these problems and constantly watch for signs of internal parasites in his cattle.

DIAGNOSIS OF WORMS

To determine if an animal is infected with worms, a fresh fecal sample is collected. A weighed amount of the fecal material is mixed with a salt or sugar solution that causes the worm eggs to float. The eggs are then collected on a glass slide and counted. This procedure shows the number of worm eggs per gram (EPG) of feces. The larger the number of adult female worms inside an animal, the greater the concentration of eggs in the feces. Accurate identification of the numerous species is accomplished by microscopic examination of the eggs.

Accurate diagnosis of gastrointestinal parasitism requires training and proper equipment. Clinical signs may be observed in animals which are heavily infected with larval worms. Examination of the feces of these animals might not detect infection since the immature worms have not produced eggs.

Necropsy (complete examination of the animal after death) is the most accurate method of diagnosis. For example, *Trichostrongylus axei* is a stomach worm of cattle that is found buried in the wall of the abomasum (fourth stomach). Because of its small size (1/8 to 1/4 inch in length), reddish brown color, and being buried in the mucosa of the stomach it is difficult to see at necropsy. The gross appearance of the stomach lining may give some clue to the presence of these worms. Microscopic tissue sections may have to be made to find the parasites.

The problems encountered in the diagnosis of parasitism and accompanying disease require the skill, judgment, and trained eye of a veterinarian. It is necessary that disease, nutrition, and parasitism be put in proper perspective so that the best treatment and management methods may be used to overcome the problem. Veterinarians are by training best qualified to diagnose disease, prescribe treatment and to help cattlemen plan and operate disease prevention programs.

CONTROL OF INTERNAL PARASITES

Treating cattle with an anthelmintic drug is generally recommended when fecal examinations indicate that a large number of worms are present. Counts of 300 worm eggs per gram of feces constitute a level for differentiating between clinical and subclinical parasitism. Using this as a guide, it is recommended that cattle with egg counts of 300 or more be treated.

Since moisture favors development of free-living stages of infective larvae and dryness kills them, practices that reduce moisture on pasture will decrease parasitic contamination. Pastures should be well drained, watering troughs raised above ground, and grazing should be kept to a minimum on the lush grass along the edges of ponds and streams. In areas where cattle congregate, overgrazing should be avoided, otherwise, the cattle will be forced to graze to the base of the roots of plants where they may ingest large numbers of infective larvae.

TYPES OF INTERNAL PARASITES

Three common stomach worms are found in Nebraska cattle: The large stomach, barberpole or wire worm—*Haemonchus*, medium or brown stomach worm—*Ostertagia*, and small stomach or bankrupt worm—*Trichostrongylus*.

Haemonchus - Barberpole or Wire Worm

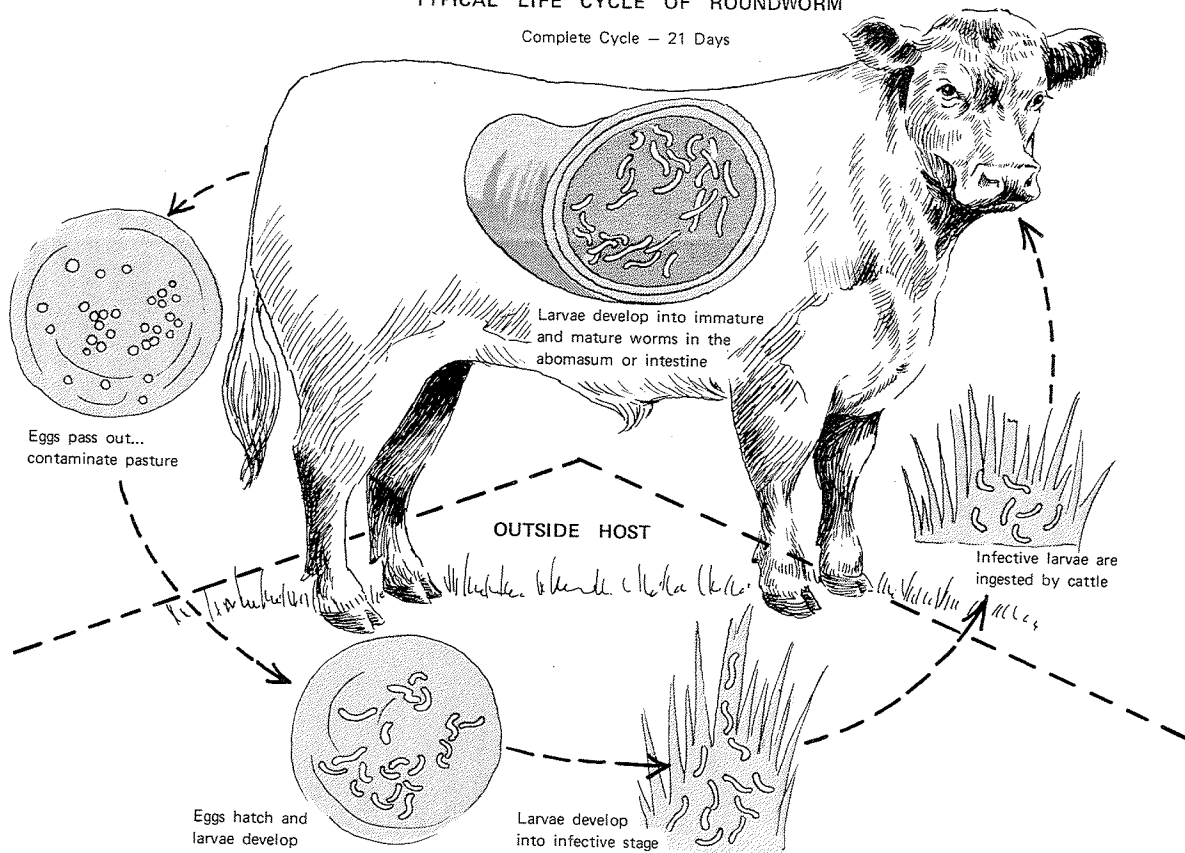
Adult female worms measure 1/2 to 1/4 inches in length. Males are 1/2 to 1 inch long. The common name arises from the fact that in the female worm the white ovaries are twisted round the red intestine.

Life Cycle

A mature female stomach worm will lay about 10,000 eggs per day. These eggs are deposited within the manure on the pasture. Under favorable conditions of temperature and moisture, eggs hatch and develop into infective larvae within five days.

TYPICAL LIFE CYCLE OF ROUNDWORM

Complete Cycle — 21 Days



The infective larvae are swallowed by the cattle with the pasture foliage. The larvae then burrow into the lining of the fourth stomach (abomasum) to develop. When the larvae emerge from the lining of the stomach, they attach to the stomach wall and begin to suck blood. It takes about 21 days for the female worms to reach maturity and start laying eggs which are deposited on the pasture to begin the cycle again.

If weather conditions are dry and cold, worm eggs may remain dormant for weeks, with the subsequent emergence of large numbers of larvae when conditions become favorable (warm and wet).

Clinical Signs

Both young and mature cattle are affected by stomach worms. Since the worms live on blood, anemia may become a problem. Anemia is indicated by paleness of membranes or lining of the mouth. Loss of appetite, loss of weight, rough hair coat, and listlessness frequently accompany anemia.

Young worms are very active and heavy infections may cause digestive disturbances. There may be a mild diarrhea, with intermittent periods of constipation. "Bottle jaw" or swelling under the lower jaw is frequently a sign of infection.

***Ostertagia* - Medium or Brown Stomach Worm**

These worms are much smaller than the large stomach worm. Adult females measure about 1/2 inch in length and males are slightly smaller.

Life Cycle

The life cycle of *Ostertagia*, medium stomach worm, is almost identical to that of *Haemonchus*, the large stomach worm. The larvae burrow into glandular areas of the lining of the fourth stomach, where they produce small nodules that are readily seen on post mortem examination. *Ostertagia* larvae are also more resistant to cold than the other two kinds of stomach worms.

Clinical Signs

Ostertagia infections resemble those produced by *Haemonchus*, with one exception—*Ostertagia* produces a severe, persistent diarrhea.

***Trichostrongylus* - Small Stomach or Bankrupt Worm**

Adults are reddish brown and measure from 1/8 to 1/4 inch in length. The life cycle is similar to that of the large and medium stomach worms.

Clinical Signs

Like the medium stomach worm, *Trichostrongylus* produces a profuse, watery diarrhea. The lining of the fourth stomach in infected animals is often greatly congested or reddened and may be entirely or partially covered with a stringy exudate.

Treatment of Stomach Worms

Phenothiazine will effectively remove adult *Haemonchus*, but is less effective in removing *Trichostrongylus* and least effective against *Ostertagia*. It is relatively ineffective against immature stages of all three stomach worms. Toxic reactions following phenothiazine treatment are unusual in ruminants, but keratitis may result from photosensitization of the cornea. To avoid this, treatment should be given in the afternoon and the animals kept in the shade for the following day.

All worms will not be removed by the treatment. However, contamination of the pasture with worm eggs will be reduced. By lowering the number of hatchable worm eggs on pasture, the incidence of worms infecting the cattle will be effectively reduced. Low level treatment with phenothiazine helps check worms during this adult stage. Phenothiazine given as a free-choice salt mixture containing 1 part phenothiazine to 9 parts salt will help keep some of the worm eggs from hatching and reduce contamination of pasture.

Thiabendazole is more effective against the immature larvae and adults of stomach and intestinal worms than phenothiazine. It is recommended in treating heavy mixed infections.

Several organic phosphates are effective against adult stomach worms. Trichlorfon (Neguvon) is effective against *Haemonchus* when administered subcutaneously.

Intestinal Worms

Three species of *Cooperia*—small intestinal worm—occur in the small intestine of cattle; *Cooperia punctata*, *Cooperia onchophora*, and *Cooperia pectinata*. These small, reddish worms are difficult to see without a microscope. The adult worms measure 1/5 to 2/5 inch in length.

Life Cycle

The life cycle is essentially the same as for the large stomach worm, *Haemonchus*. It requires 12-15 days for the ingested larvae to reach maturity in the small intestine and start producing fertile worm eggs. These worms apparently do not suck blood.

Clinical Signs

In heavy infections with *Cooperia sp.*, there is a profuse diarrhea, loss of appetite and weight, but no anemia. Necropsy shows a severe congestion of the small intestine.

Treatment of *Cooperia*

Piperazine, thiabendazole, and ruelene are usually effective in removing adult worms. Continuous low level administration of phenothiazine aids in preventing larval development if sufficient drug is ingested from a salt mixture containing 1 part phenothiazine to 9 parts salt.

Nematodirus - Thread-necked Intestinal Worm

Nematodirus is a common parasite of young calves and occurs in the small intestine. Adult females measure 3/4 to 1 inch in length and males are 1/2 to 3/4 inch long.

Life Cycle

After being deposited on pasture with the manure, worm eggs develop slowly, the infective third stage being reached within the egg shell in 2 to 4 weeks. Even after the infective stage has been reached, larvae may remain within the egg shell for some time. Twenty-one days after ingestion of infective larvae by cattle, mature female worms start laying eggs.

Clinical Signs

Severe infection can cause diarrhea, loss of appetite, and weakness. These signs usually develop during the third week of infection. Resistance to reinfection develops rapidly and the adult worms are mostly eliminated within 2 to 3 months.

Treatment

Thiabendazole is the drug of choice.

Oesophagostomum - Nodular Worm

Nodular worms live in the large intestine of cattle. Adult worms measure 3/8 to 5/8 inch in length.

Life Cycle

It is essentially the same as the large stomach worm—*Haemonchus*. Within 24 hours after ingestion, larvae enter the intestinal mucosa where they remain for 5 to 10 days. Then they return to the lumen of the large intestine as fourth-stage larvae. After an animal has swallowed infective larvae, it takes about 42 days for the female worms to reach maturity and start laying fertile eggs.

Clinical Signs

In severe infections the appetite may be affected in 2 to 3 days and diarrhea may develop in 7 to 15 days. Loss of weight, severe emaciation and general weakness are associated with the disease. As a result of the larval damage, small nodules are produced in the wall of the intestine. At first, these are only slightly raised areas, but later the nodules increase appreciably in size and often are filled with pus.

Treatment of Nodular Worms

Phenothiazine, ruelene, trichlorfon, and thiabendazole are all effective against the adults; no treatment is available which will destroy the larvae in the mucosa. Continuous administration of low levels of phenothiazine—2 gm. per day—will cause a marked drop in egg production by the female worms.

Tapeworms

The common tapeworms of cattle are *Moniezia expansa* and *Moniezia benedeni*. The life cycle includes a small soil mite as an intermediate host. Tapeworm eggs are ingested by the free-living mites which live in soil and on grass. The young tapeworms develop for 6 to 16 weeks inside the body of the mite. Cattle are infected by ingestion of infected mites. Adult tapeworms develop in about 35 days.

Clinical Signs

Moniezia is commonly considered nonpathogenic in cattle, but occasionally in young calves the worms may cause diarrhea.

Treatment

Lead arsenate appears to be the most effective drug currently used against these worms. *Caution:* Wormers containing lead must be properly used. Lead is a poison which may cause chronic illness or death. Study the directions and use only as indicated.

Bovine Coccidiosis

Coccidiosis is caused by microscopic, one-celled parasites of the genus *Eimeria*. Fifteen species of *Eimeria* have been reported in cattle. Only three of these, *Eimeria zurnii*, *Eimeria bovis*, and *Eimeria ellipsoidalis* are regularly associated with clinical infections in the field.

Coccidiosis usually affects calves between 3 weeks to 6 months of age when they are placed in lots contaminated by older cattle or other infected calves. Occasionally, mature cattle are infected when they are brought in from large pastures and crowded into small feedlots or barns. It is extremely rare to find cattle manure entirely free of these parasites.

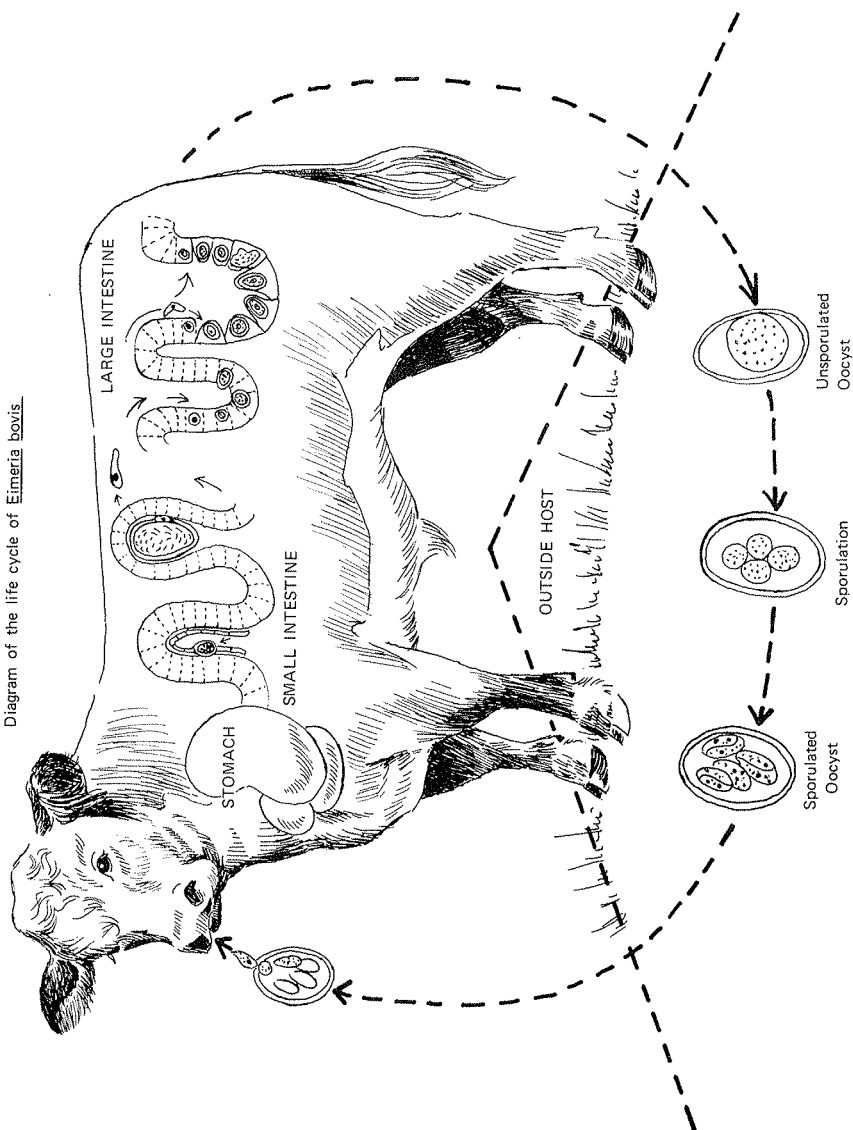
Life Cycle

The stage found in the feces is the oocyst. It is covered by a protective shell, resistant to physical, chemical, and bacterial action. Oocysts freshly discharged in the feces must undergo a development process called sporulation, before they become infective to other animals. This process, occurring outside of the animal, requires 2 to 14 days and results in the formation within each oocyst of 8 infective bodies called sporozoites.

When a susceptible calf swallows the infective oocysts, the sporozoites are released, penetrate the cells lining the intestine, and begin to divide into many intermediate stages. The stages continue to divide, and each division produces parasitic stages that cause damage to the host cells in which each lives.

Both male and female parasites unite to produce the oocyst which is then passed out of the animal's body in the feces. The life cycle is started again after sporulation occurs and the oocyst is swallowed by a susceptible calf.

Diagram of the life cycle of Eimeria bovis.



Signs of Coccidiosis

Typical signs of coccidiosis are diarrhea, rough coat, loss of appetite and weight, weakness, and a general emaciation. The general weakness may cause the calf to defecate without rising, thus soiling its tail and hindquarters. In more severe cases, the feces may contain blood, mucus, and stringy masses of tissue. Straining may be observed in the more advanced cases.

Diagnosis

Outbreaks of bovine coccidiosis frequently are not correctly diagnosed. Diagnosis can be made by finding oocysts of *Eimeria* on microscopic examination of feces but they are commonly overlooked because of their small size and color. However, the presence of oocysts in feces from animals with diarrhea is not necessarily proof that the signs are due to coccidia and not to some other agent.

Certain coccidia may cause severe illness and even death before any oocysts have been produced. This occurs quite commonly with *Eimeria zurnii* in calves. Consequently, failure to find oocysts in the feces in a diarrheal disease does not necessarily mean the disease is not coccidiosis.

The only positive way to diagnose coccidiosis is to examine material at necropsy from suspicious areas in the small intestine or colon under a microscope. To do this, scrapings of these areas are mixed on a glass slide with physiological saline solution and examined for oocysts.

Treatment and Control

Treatment of bovine coccidiosis is difficult because clinical signs of the disease do not become noticeable until the disease is advanced. The first signs in coccidiosis caused by *E. bovis*, usually occurs about 17 or 18 days after ingestion of oocysts. At this time, the portion of the life cycle within the host has been nearly or entirely completed, and much of the invasion of intestinal mucosa has already occurred. Thus, treatment administered at this time can at best result in a lessening of the signs of coccidiosis. However, if drugs are given at an earlier stage of the disease, the clinical signs of infection can be largely or entirely prevented.

Sulfonamides remain the drugs of choice in treatment of coccidiosis. While most clinical infections are self-limiting and will subside within a few days without medication, sulfonamide therapy, if started early, will reduce oocyst production, hemorrhage and diarrhea, shorten the course of chronic disease and lower the mortality, and reduce the chances for secondary infection. Sulfaquinoxaline and sulfamethazine have given excellent clinical results in beef and dairy calves.

Of the newer drugs, amprolium, which has been highly effective in avian coccidiosis, has recently been found to be of value in controlling coccidiosis in cattle. Amprolium is an antagonist of thiamine, one of the essential vitamins, and thus interferes with the metabolism of the parasites.

As in many diseases, it is easier to prevent coccidiosis than it is to treat it. Because several days are required for sporulation, the oocyst stage is the weakest link in the life cycle of the parasite. Separating a cow and calf from a contaminated lot interrupts the life cycle and helps control the disease.