UNIVERSITY OF MINNESOTA
Extension
SERVICE

PARASITE CONTROL

Lesson 4

Introduction

Specific estimates of losses due to parasites in beef cattle are difficult to estimate, but it has been reported that costs to producers from absent or inadequate parasite control programs can be as high as $200 per head per grazing season. Most losses from parasites go unnoticed by producers because the infections are subclinical. Although unnoticed, they result in below normal performance, increased days to market, greater susceptibility to disease, and longer postpartum intervals. By the time parasites result in clinical infection with symptoms that are easily noticed, such as diarrhea, rough hair coats, and bottle jaw, the parasites have already caused significant production and economic losses. Internal parasitic nematodes (worms) cause the greatest threat to cattle health and performance. This lesson of the beef home study course will concentrate on the life cycles, strategic control programs, and currently available anthelmintics (dewormers) for beef cattle to control internal nematodes.

Importance of a Deworming Program

Table 1 on the following page shows the increased weight gain and increased body condition score of cows that were dewormed in an Oklahoma field trial. Lactating cows that were dewormed gained an average of 23 pounds more than untreated cows, and also gained more body condition from July 16 to September 29. Dewormed calves in this trial gained an average 21 pounds more during that same time period than calves that were not treated. If 500-pound calves are selling for $75 per hundred weight, dewormed calves would bring an average of $15.75 (21 lbs. x .75/lb.) more per head than the untreated calves.

Table 1. Effect of deworming on cow and calf performance

Item	Untreated Control	Dewormed	Prob.[a]
Lactating cows:			
Wt., July 16 (lbs.)	908	943	
Wt. change to Sept. 29	68	91	<.04
BCS[b], July 16	4.9	4.9	
BCS change to Sept. 26	.07	.34	<.01
Calves:			
Wt., July 16 (lbs.)	359	365	
Wt. gain to Sept. 29	122	143	<.01

Adapted from Oklahoma State Univ. Extension Publication E-944.
[a]Probability that the difference between the averages could occur by chance.
[b]Body condition score: 1=very thin to 9=very fat.

Internal Parasites of Concern

The lungs, abomasum (true stomach), small intestine, and large intestine are all sites that can be infected with worm parasites (Table 2). The brown stomach worm, Ostertagia, is the most common internal parasite in cattle, and also causes the highest economic losses and most severe symptoms. Ostertagia, as well as the other stomach worms, are bloodsuckers that cause irritation and inflammation to the stomach and intestinal linings. Cattle normally absorb nutrients, such as protein and energy, across the linings of the stomach and intestinal walls. However, as a result of the inflamed and irritated linings caused by parasites, infected cattle are not able to properly absorb nutrients.

Table 2. Common internal parasites of cattle

Common Name	Scientific Name	Infective Stages
Stomach (Abomasum) Worms:		
Brown Stomach Worm	*Ostertagia ostertagia*	Adults, Fourth Stage Larvae Inhibited Fourth Stage larvae
Barberpole Worm	*Haemonchus contortus*, *Haemonchus placei*	Adults, Fourth Stage Larvae
Small Stomach Worm (Hairworm)	*Trichostrongylus axei*	Adults, Fourth Stage Larvae
Small Intestinal Worms:		
Threadnecked Intestinal Worm	*Nematodirus helvetianua*	Adults, Fourth Stage Larvae
Small Intestinal Worm	*Cooperia punctata*, *Cooperia oncophora*	Adults, Fourth Stage Larvae
Hookworm	*Bunostomum phlebotomum*	Adults
Bankrupt Worm	*Trichostrongylus colubriformis*	Adults
Colon Worms:		
Nodular Worm	*Oesophagostomum radiatum*	Adults
Lungworm	*Dictyocaulus viviparus*	Adults, Fourth Stage Larvae
Liver Fluke	*Fasciola hepatica*	Adults
Tapeworms	*Moniezia benedeni*	Heads, Segments

Source: University of Georgia Cooperative Extension Service Bulletin 1086

In order to determine when and how to treat cattle for worm parasites, it is important to understand the life cycles of the various parasites, as well as factors that affect their lifecycles. The roundworm parasites of concern in cattle all have similar life cycles (Diagram 1). Cattle infected with adult worms shed eggs in their feces. With optimum environmental conditions - moisture and warm temperatures - the eggs develop into infective larvae in two weeks or less, and move from the fecal pats onto surrounding vegetation. It may take several months for eggs to develop into infective larvae in cooler weather. However, without moisture, larvae will dry out and die. Using droplets of moisture, larvae move up blades of grass and are ingested by grazing cattle. Feedbunks or waterers contaminated with feces are other possible sources of parasite infection.

Once ingested, larvae develop to mature egg-laying adults in 3 to 6 weeks and the cycle starts over again. The length of time for larvae to develop into mature adults is dependent on the age of the animal and environmental conditions. Larvae are able to develop into egg-laying adults sooner in younger animals (about 3 weeks) than in mature cows (about 6 weeks). Ostertagia have developed a unique characteristic to adapt to the environment. In early fall when temperature and day length decrease, Ostertagia larvae inside the animal become arrested or inhibited, also called hypobiotic, in the abomasum for the winter. Once warmer temperatures of spring arrive, larvae proceed with development into egg-layers adults and begin infecting pastures again.

When large numbers of Ostertagia larvae are ingested during a short time period and then quickly develop into adults, severe greenish diarrhea, swelling under the jaw (bottle jaw) and rapid weight loss are the characteristic symptoms. The length of time for larvae to develop into adults inside the animal, and Ostertagia's ability to become inhibited are important criteria for choosing which anthelmintic to use and when to treat animals.

Diagram 1. Lifecycle of stomach roundworm parasites in cattle

Parasite Survival Through Winter in Minnesota

A study conducted in 1991 by Dr. Bert Stromberg and colleagues of the University of Minnesota College of Veterinary Medicine, found that infective larvae are able to survive on pastures during Minnesota winters. Infective larvae were found on pastures in April even though the pastures had not been grazed since the previous July. Winters with extremely cold temperatures and little snow cover will usually result in poor survival, while more mild temperatures and more snow cover will result in better survival. Observations made at the Grand Rapids Experiment Station found that tracer calves became infected in pens throughout the winter.

Effects of Grazing Management on Parasite Infection

Grazing management can have an impact on parasite transmission. The majority of larvae will rarely migrate more than 2 to 3 inches from the edge of the fecal pat in which they were deposited as eggs. Under a continuous grazing system, cattle will normally avoid grazing close to manure pats until forage becomes limiting. However, in an intensive rotational grazing system cattle are often forced to eat closer to fecal pats, resulting in an increased transmission rate of infective larvae.

This point is made not to discourage producers from practicing rotational grazing systems, but rather to keep in mind when designing a parasite control program. Research in Minnesota and other states has proven the benefits of increased beef production per acre from rotational grazing. Another parasite management benefit that may occur with intensive rotational grazing and higher stocking densities is increased trampling and scattering of manure pats, resulting in exposure to the sun and drying out and death of larvae and eggs.

Diagnosis

Clinical signs such as those previously mentioned are an indication of parasite infections in the herd. When an animal dies without any known cause, a postmortem examination by a veterinarian should be done to determine if worms were a possible cause of death. If so, a parasite treatment and control program should then be established around the type of parasites present. Another way to determine the presence of parasite worms in the herd is to analyze fecal samples. Veterinarians and independent parasite consultants offer this service. The veterinarian, consultant, or technician will determine the eggs per gram (EPG) of feces with the analysis technique. The numbers are rated as low, moderate or high based on the EPG. The EPG may not be an accurate indicator of the quantity of adult worms in the animals, because a low or negative EPG may result even when there is a large number of immature worms present in the animal. However, the fecal exam will at least give an indication of the presence and type of parasites that may be infecting a herd.

Selecting an Anthelmintic

There are three important considerations when selecting an anthelmintic - delivery methods, spectrum of parasite control, and duration of activity. Many different *delivery methods* are available for anthelmintic products, which allows producers to select a product that fits their particular operation. Anthelmintics are available as injectables, pour-ons, molasses blocks, crumbles, mineral formulations, boluses, pastes, and drenches. When using some of these products, such as an injectable or pour-on, the animals usually consistently receive the proper dosage. However, good management must be practiced when using products that are fed to ensure that each animal receives the required dosage levels. Dominant animals often times will consume more than they need, while more timid cattle will not consume enough.

The *spectrum of parasite control* that each product provides is one of the most important criteria when selecting an anthelmintic. Spectrum of control refers to how many different parasites and which stages of each parasite are controlled by a product. For example, when deworming cattle in the spring before turnout to pasture, a broad spectrum product should be used that kills the majority of adult and larval nematodes, as well as inhibited larvae. Many anthelmintics also control external parasites such as lice, mites, and grubs. This should be taken into account if these are a problem. The table at the end of this lesson provides a guide to the spectrum of internal and external parasite control of anthelmintics currently available for beef cattle.

Perhaps just as important as spectrum of control is the *duration of activity* of the anthelmintic. This refers to how long a product will remain active killing parasites in the animal after treatment, which provides protection from reinfection. Products such as Valbazen, Safeguard/Panacur, and Synanthic are effective, but short-acting. These anthelmintics kill worms for about 2 to 3 days after treatment, but then any infective larvae that are eaten after this time will develop into adults and begin laying eggs. Some of the newer products, such as Dectomax, Ivomec, Ivomec-Eprinex, and Cydectin, have extended activity. These will kill not only parasites in the animal at the time of treatment, but also larvae that are ingested for 14 to 28 days after treatment, depending on the product and parasite.

Regardless of the product selected, always read the label for proper dosage and administration, slaughter withdrawal time, storage, and any precautions.

Strategic Parasite Control Programs

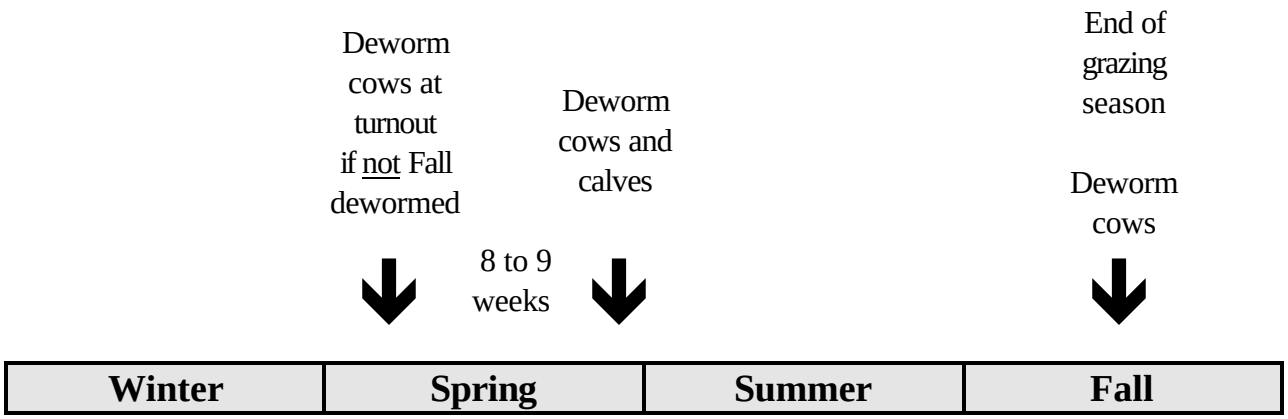
During the grazing season, only about 5 percent of the worm population are in the animals, while the other 95 percent of the population are on the pastures. So the goal of a strategic parasite control program is to not only kill the parasites in the animals, but to also control the number of parasitic eggs deposited on the pasture. Keep in mind we do not want to completely eliminate all of the parasites because we want the cattle to build some immunity to the nematodes.

Cow-Calf Herds

The diagram which follows shows a strategic deworming program for a cow-calf herd. Cows should be dewormed in the fall as they come off pasture to prevent any parasite burdens through the winter that could have the potential to reduce weight and body condition before calving. If cows are not dewormed in the fall, they should be dewormed prior to pasture turnout in the spring with a broad spectrum anthelmintic that kills adults, larvae, and inhibited Ostertagia larvae. Treatment at pasture turnout will kill any worms the cows have carried from the previous grazing season and prevent contamination of pastures with eggs. If an anthelmintic with a long duration of activity is used, the cows will be protected for 21+ days (depending on the product used) from any infective larvae they ingest. Then any infective larvae cows ingest after this 3 week period will take 5 to 6 weeks to mature into egg-laying adults. Another deworming 8 to 9 weeks after treating at turnout will kill the parasites that have been ingested, and kill any larvae ingested for the next 21+ days. By using this program, we have theoretically prevented egg shedding onto pastures by the cows for the first 11 to 12 weeks of the grazing season. Since calves are grazing by late spring/early summer, they should also be dewormed at this time.

If the decision is made to only deworm the cow herd one time, it should be done in the fall as cows come off grass. Treating at this time will kill any parasites picked up during the grazing season, help the cows get through winter without the physical stress of worms, and prevent egg shedding for the first part of the next grazing season.

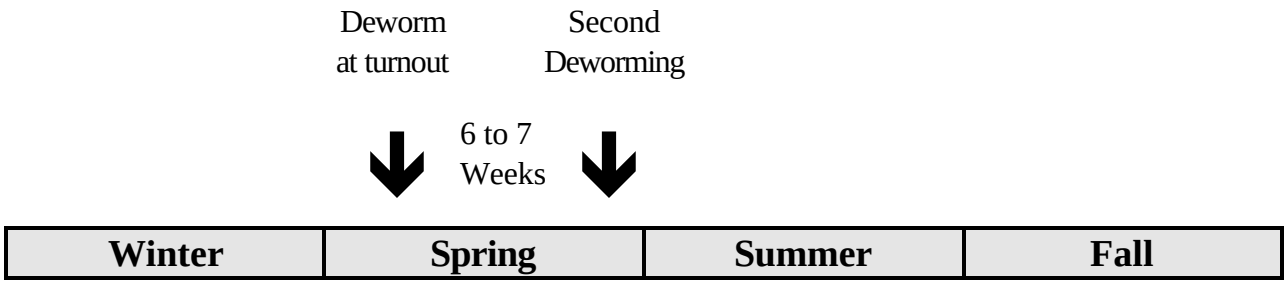
Strategic Deworming Program for Cow-Calf Farms



Stocker Cattle Operations

Illustrated below is a deworming program for a stocker cattle operation. Research has shown that stocker cattle that have been strategically dewormed will gain an extra 40 to 60 pounds over stockers that have not been dewormed. The cattle should be dewormed at the time of pasture turnout to prevent shedding of eggs from worms picked up the previous grazing season. Assuming a long acting anthelmintic is used, any ingested larvae will be killed for the next 21+ days. It will then take about 3 to 4 weeks for any larvae eaten to mature into egg-laying adults in these younger animals. A second treatment 6 to 7 weeks after the deworming at turnout will kill the nematodes ingested from the previous 3 to 4 weeks, as well as kill any newly ingested larvae for the next 21+ days. If the stocker cattle are in a rotational grazing system, the second treatment should coincide with the rotation to prevent contamination of the new pasture. Similar to the deworming program for the cow herd, this program essentially prevents egg-shedding onto pastures for the first 9 to 10 weeks of the grazing season, assuming a long-acting anthelmintic is used.

Strategic Deworming Program for Stocker Cattle



Cattle Grubs

Two species of cattle grubs can infect cattle, the common grub (heel fly) and the northern cattle grub (bomb fly). Grubs, also known as warbles, are noticed visually when they reach the layer of tissue under the skin on the backs of cattle. Grubs result in reduced milk production and average daily gains, injury to hides, and damage to muscle, or meat, that must be trimmed at the time of processing. Damage to the hide is caused by the breathing holes cut in the skin by the grubs.

The diagram below shows the life cycle of the cattle grub. One difference between the common grub and the northern cattle grub is their pattern of migration to the back of the animal. Common grubs travel through tissue along the esophagus and trachea, while the northern cattle grub migrates along the spinal column before reaching the back. This migration pattern is critical when determining when to treat the cattle with a dewormer. If cattle are treated while grubs are migrating along the esophagus, it may cause swelling which can result in difficulty in swallowing and belching. This will cause the animal to bloat. If grubs are killed while near the spinal column, the animal may become partially paralyzed. The time of proper treatment for grubs is dependent on the geographic location of the cattle during egg-laying season. For example, if stocker cattle were shipped in from another state, the correct time to treat them for grubs may be different than the time to treat native Minnesota cattle. Therefore, check with your local veterinarian on the proper time to treat your cattle for grubs.

Diagram 2. Lifecycle of the cattle grub

Summary

Parasite control in beef cattle is an economically significant management decision. Losses and diseases due to parasites are often an invisible drain on cattle operation profits. While some geographic areas have specific, severe infections of "minor" parasites, the most common and economically important internal parasite is the brown stomach worm (Ostertagia). Strategic control programs for Ostertagia using products with a broad spectrum of control will usually provide adequate control of other internal and external parasites. Always consult a veterinarian when designing a parasite control program.

Rules of Thumb

- Deworming programs in cow-calf operations can increase gross returns by $15 per calf at weaning time.
- Fall treatment of the cow herd is the most critical first step in parasite control.
- Consider deworming both cows and calves at pasture turnout time.
- Don't assume that parasites are controlled by Minnesota winter weather.
- Intensive rotational grazing may require increased management to control the transmission of worm larvae.

Additional References and Further Reading

- Bliss, D.H. The cattle producer's handbook for strategic parasite control.

- Ivens, V.R., D.L. Mark and N.D. Levine. 1978. Principle parasites of domestic animals in the United States; Biological and diagnostic information. 2nd Ed.

- Smith, S.C., K.C. Barnes and K.S. Lusby. Effect of deworming on performance of grazing cows and their calves in Eastern Oklahoma. Oklahoma State University Cooperative Extension Service publication E-944.

- Strickland, J.E. 1992. Internal parasite control in cattle. University of Georgia Cooperative Extension Service Bulletin 1086.

- Stromberg, B.E. and G.A. Averbeck. What's new for parasite control in cattle. In: Proceedings of 1997 Minnesota Dairy Health Conference. pp. 38-45.

- Williams, R.E. 1992. Cattle grubs. Purdue University Cooperative Extension Service Fact Sheet E-14.

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