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Internal Parasite Control in Beef Cattle

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Internal parasites can cause significant production losses in cattle, resulting in substantial economic losses for owners. Often, parasite losses are subclinical and unnoticed but severe infestations can cause disease and even death. Subclinical production losses caused by internal parasites include reduced milk production, reduced weaning weights, delayed puberty and decreased fertility in replacement heifers, reduced pregnancy rates in mature cows, and reduced feed intake, reduced feed efficiency and immune suppression in all classes of cattle.

A parasitic relationship exists when one organism (the parasite) benefits at the expense of another organism (the host). The parasite may cause harm to the host -- enough to kill it if not properly controlled. Parasites can damage and irritate stomach and intestinal linings or mucosae, resulting in reduced digestion and absorption of nutrients from the intestine as well as bleeding and protein loss from the gut.

Parasites are normally host-specific, and cattle serve as hosts for a variety of parasites. The major threat to cattle health and performance comes from internal parasitic nematodes (worms), especially those found in the stomach and intestines (gastrointestinal parasites). Pasture management is a critical component of effective parasite control. Cattle production relies on the efficient use of grazing for cost-effective weight gains; however, grazing exposes young cattle to large numbers of parasite larvae if pasture parasite contamination isn't controlled.

Most of the internal parasites of cattle are found in the abomasum (true stomach) or small intestine (see Table 1). *Ostertagia* species are common internal parasites of cattle and can cause significant production losses, severe disease and even death in all classes of cattle. The typical *Ostertagia* spp. life cycles are direct. Infected cattle pass eggs in the manure, and with favorable weather conditions, the eggs hatch and develop into third-stage, infective larvae in about 14 days. These larvae move from the manure up moist grass blades and are eaten as the cattle graze. Under normal conditions they do not migrate more than a few feet from the manure pile where they hatched. They penetrate the lining of the abomasum, and mature into egg-laying adults two to four weeks after they're eaten.

The fourth stage of the *Ostertagia* life may vary. Sometimes, the immature larvae are able to stay in the stomach glands for up to six months. These are called inhibited or arrested larvae. The ability to inhibit and then leave the stomach glands seems to be triggered by weather, hormones or nutritional factors. This complex life cycle of *Ostertagia* has been divided into three types: Type 1 is when large numbers of infective larvae are eaten over a short time and quickly complete their life cycle to become adults.

A Pre-Type 2 stage happens when the fourth-stage larvae interrupt development and are inhibited. When favorable weather occurs, larvae will leave the stomach lining and become adults -- this is the fifth stage of development.

Type 2 *Ostertagia* infection occurs when the larvae leave the stomach lining. A few at a time may not cause many problems; however, severe symptoms can develop when large numbers of larvae emerge at the same time.

According to the 2008 NAHMS (National Animal Health Monitoring Survey), *Cooperia* spp. have be-

come the most prevalent internal parasite in U.S. beef cow/calf operations. This may be due in part to the widespread use of an inexpensive, pour-on macrocyclic lactone class of anthelmintics (dewormers), also called avermectins. This class of anthelmintics, which includes ivermectin, doramectin and eprinomectin, has been shown to have reduced effectiveness against *Cooperia* spp.

Symptoms

The symptoms of Type 1 *Ostertagia* clinical disease may include diarrhea, reduced appetite, anemia, swelling under the jaw (bottle jaw) or rapid weight loss, with young or malnourished animals being the most susceptible. The symptoms may worsen and even lead to death unless they are treated. Animals of all ages may show symptoms, especially weight loss.

Pre-Type 2 *Ostertagia* infection doesn't normally produce any damage or symptoms when the larvae enter the stomach glands. They're arrested or inhibited until weather changes trigger their release.

Type 2 *Ostertagia* disease is caused when the larvae suddenly emerge from the stomach glands. Their emergence may be gradual or in a sudden burst. With gradual releasing of the adults, the symptoms are similar to those exhibited in Type 1, but a sudden weather change may trigger the release of all inhibited worms and cause acute symptoms with high death loss.

The other internal parasites are normally a mixed infection with *Ostertagia* and cause similar symptoms. Calves infected with *Cooperia* have been shown to have reduced feed intake, reduced average daily gain and reduced feed efficiency compared to uninfected calves.

With *Haemonchus*, both the larvae and adults feed on the blood in the stomach. Small numbers can cause acute symptoms with blood and protein loss and can cause severe anemia or sudden death.

Diagnosis

Clinical signs, grazing history and season may give a presumptive diagnosis of internal parasite infection in cattle. The diagnosis may be confirmed by finding worm eggs on a fecal exam.

Eggs per gram (EPG) of manure is the numerical value used in egg counts. The EPG count is mainly made up of the *Haemonchus*, *Ostertagia* and *Trichostrongylus* complex (HOT complex). The numbers are not given but are rated low, moderate or high, depending on the EPG.

The EPG is not always an accurate indication of the number of adult worms present because egg production varies. Fecal egg counts may be negative or low in the presence of large numbers of immature worms or even many adult worms due to host immunity or previous low-dose anthelmintic treatment.

Where internal parasite infestations are severe enough to cause death, a postmortem examination by a veterinarian may be helpful to determine the cause of death and determine treatment for other affected animals and a parasite control strategy for the remainder of the herd. Postmortem examinations of dead animals should always be done when the cause of death is not known. Other diseases and conditions may complicate the case, and a postmortem may help determine the primary cause. Some diseases such as shipping fever, digestive disturbances, salmonella infection and viral diarrhea may have symptoms similar to internal parasite infection.

Some larger worms, such as *Haemonchus*, may be easily seen, but *Ostertagia* or *Trichostrongylus* are smaller and more difficult to see unless they're alive and swimming in the stomach fluid. Stomach and intestinal contents can be scraped, washed and examined microscopically to identify specific types of worms and get accurate counts.

Cattle that die from Type 2 *Ostertagia* infection may have what is referred to as a "Moroccan leather" appearance of the lining of the stomach due to the damage caused by the emergence of the larvae. The stomach fluid will have a high pH, and a blood test may help make the diagnosis. Determining which type of *Ostertagia* infection is present is important because not all dewormers are effective in treating Type 2 infections.

Control

To be effective, a parasite control program must reduce the numbers of worms in all classes of cattle and control the number of worms on the pasture.

Pasture Control

Pasture control must be directed at controlling the free-living stage of internal parasites in cattle. To do this, keep large numbers of infective larvae from accumulating by reducing contamination of pastures at critical times during the grazing season. By predicting these times during which large numbers normally occur, you can reduce intake of large numbers of infective larvae by removing susceptible cattle and not placing them on potentially contaminated pastures. Strategic pasture rotation is beneficial to the health of the pasture as well as an important part of an effective parasite management program.

Clean and safe pastures are terms used to designate pastures with a low parasite burden. Examples of clean pastures would be those permanent pastures not grazed for a long time. In the southeastern U.S., larvae may live in the soil for extended periods in winter and summer if the weather is favorable. Temporary grazing, both summer and winter, where extensive tillage is carried out would be classified as clean pastures.

Safe pastures are described as those with low enough infective worm larvae numbers to cause a low adult worm load. Permanent pastures that have been used for hay should be safe pastures.

Permanent pastures with high contamination in the spring may become safe in hot, dry weather.

Management practices used to break up and scatter manure piles will allow worm larvae and eggs to be exposed to heat and dry conditions, thus reducing contamination. However, this practice may spread the free-living larvae and infect susceptible cattle.

Continual grazing seasons and extended larvae survival in the southeastern U.S. complicate pasture control. Though the cooler temperatures over winter are not favorable for development, the mild Southern winters allow parasite larvae to survive until spring when conditions improve for development to the infective stage. Young cattle may be more susceptible to infection at this time and should be moved to pastures not grazed over winter. In this case it may be beneficial to deworm at-risk cattle 10-14 days after introduction onto contaminated pastures. Dung beetles are beneficial in pasture management because they break down the manure piles that protect the eggs and immature larvae and recycle manure nitrogen. Excessive use of the avermectin class of dewormers has been shown to kill dung beetles.

Feedlot Control

According to the life cycle where infective larvae are being picked up on blades of grass in moisture drops, re-infection in grassless pens should be unlikely. The performance of these cattle can still be reduced and they should be treated on entry.

Inhibited *Ostertagia* may sometimes show symptoms in the feedlot and should be treated with an effective dewormer. The dry lot can be effective following anthelmintic treatment to prevent recontamination before placing treated cattle on clean or safe pastures.

Animal Control

Control of internal parasites in cattle must kill all stages in the animal and help control the number of larvae and eggs on pastures.

Adult cattle usually have more resistance to internal parasites than younger cattle, but deworming older cattle can help reduce pasture contamination. Strategic parasite control has been recommended by parasitologists and dewormer manufacturers. Strategic deworming is effective because the risk of re-infection is reduced. Examples of strategic deworming include deworming prior to entering dry-lot conditions, prior to introduction on clean pastures and prior to seasonal reduction in infective larvae.

January or mid-winter treatment may be effective if cattle are stressed by weather and possibly by poor nutrition, pregnancy or nursing a young calf. These conditions may reduce the brood cow's resistance to internal parasites. This treatment will also reduce pasture contamination, and calves should be exposed to fewer infective larvae.

Early spring (mid-April) treatment is recommended because pasture larvae populations peak at this time. As weather conditions get warmer and dryer, infective larvae are less likely to complete their life cycle and many will be killed. This decrease in pasture contamination helps make a safe pasture.

The mid-summer treatment given in mid-July can be very effective. Life cycle activity of the larvae on

pasture is very low, cows and calves are dewormed, and pastures should remain safe until cooler, wet weather. This is also a good time to treat for inhibited (Pre-Type 2) *Ostertagia*. Grub treatment can also be given at this time.

Often, controlling parasites in cattle is done at the convenience of the producer. Most cattle aren't dewormed because of the trouble of penning and working, which is a big part of the cost. The producer who has adequate, convenient facilities can do a better job of internal parasite control in cattle. Combining the deworming with other health and management practices will make it more cost effective, as long as cattle are not overly stressed.

In cow/calf operations, calving season will determine when cattle are worked. Deworming treatment should be an important part of the process.

Deworming lightweight, high-risk stocker calves has been shown to improve calf health and response to vaccination.

Dairy calves raised in dry-lot conditions, having not been exposed to infective larvae, should be almost free of internal parasites. Not being exposed, they would have no immunity and, therefore, no resistance. A negative fecal check may show that calves are free and, if placed on clean pasture, may not need deworming. If there is any question, deworm calves three weeks after turnout and, if the pasture is not safe, again in three to five weeks.

Anthelmintics (Dewormers)

Many effective anthelmintics are approved and available for treating internal parasites in cattle (see Table 2). Their effectiveness against the different species of parasites as well as the adult and immature stages varies. Methods of dosing vary, and this gives the cattleman a choice as to how he may treat the cattle. Anthelmintic products come in oral, injectable and pour-on forms. It is recommended to change products and forms at least every two to three years. The pour-on forms are popular because they have been effective against intestinal parasites as well as biting and chewing lice. When using an injectable or oral product another pour-on insecticide is needed to control lice. Oral products provide a high concentration of dewormer directly in the gut where the parasites reside. Read label instructions to see what species each product has been proven to control.

For convenience, several products are available where working and handling the cattle are not required. These dewormers, in blocks, cubes, pellets and mineral mixtures, are convenient to use, especially in adult cows; however, effective dosing cannot be controlled. For these products to be effective when cattle are not being fed, the cattle need to be conditioned to the feeds carrying the dewormer. This allows the cows to adjust so their consumption will be sufficient. This is especially true where the dewormer is given in a single dose.

When cattle are dewormed individually, accurate weight determinations are critical to proper dosage. It is not necessary to weigh every animal, but spot weighing reduces guesswork. If weight estimates are being used, be sure to use the heaviest weight if there is not a big difference in the weight of the cows.

Equipment to administer the individual dewormers should be accurate and working properly. Carefully check settings and calibrations before starting and periodically check while treating the cattle.

Injectable dewormers are given subcutaneously (SQ) in the neck. Use a short needle, 3/4 inch long or shorter, no more than 16 gauge. Check the needles often for burrs or dullness, which may cause abscesses. Changing needles often will help prevent this and also lessen the chance of passing infections between animals. Early local reactions may occur, but most are temporary.

Boluses or pills have been used for some dewormers. Use caution when using these in calves since choking or lodging in the oral cavity may occur.

Paste dewormers are convenient when small numbers of cattle are being dewormed. Place the product well into the back of the mouth on the base of the tongue. Don't force the dewormer into the mouth because it might physically damage the upper throat or be forced into the lungs.

Where larger numbers of cattle are to be dewormed, automatic drench guns are used. A curved hook is available and it is not necessary to grab the mouth as in the case with straight dose syringes, balling guns or

paste guns. Use care in giving the drench dewormer to prevent spitting out or injury as with the paste dewormers. The drench gun should be adjusted and calibrated before beginning and checked periodically for dose accuracy. Some drenches must be mixed before using; follow directions closely. Periodic shaking or agitating will guarantee a consistent mixture. Although many anthelimintics have a margin of safety, overdosing does not increase efficacy. It does, however, increase the expense deworming.

Anthelmintics should be stored according to the label directions. Some dewormers must be refrigerated or kept out of sunlight. All dewormers have an expiration date -- check this when buying the product and when using it. Expired products should be disposed of properly. Review and follow label directions.

Resistance to anthelmintics is becoming a worldwide problem in several species of livestock. In some regions of the U.S. the overuse of ivermectin has rendered the once highly touted product nearly ineffective. In sheep and goats, it appears that once the intestinal parasites acquire resistance it may be irreversible. The careful use of dewormers combined with effective pasture management will ensure the continued effectiveness of our parasite management tools.

Facilities

When individual deworming treatment is used to rid cattle of internal parasites, good facilities and adequate restraint are a must. Working cattle in an efficient, stress-free manner is determined by the adequacy, design and convenience of the working facilities.

Working facilities should be in a convenient area where cattle are pastured or kept. For convenience, facilities should be in the center of the area using lanes or traps so cattle can be easily penned.

Pens and handling areas should be large enough to hold the herd, both in size and strength of structure, and may including shade or covering. Pens should be laid out so that sorting and movement can be done with the least stress on animals and men.

Crowding pens and chutes should be adequate to handle all size cattle with minimum turning around and piling on. Small crowding pens with short lanes leading to the chute or head catch work best. Proper restraint is necessary for accurate and safe dosing when boluses, drenches or injections are used. Open areas along the neck make subcutaneous injections easier and safer. All cattle injections should be administered SQ in the neck in front of the shoulders according to label directions. Be aware that human arms can be injured when performing injections between boards or bars.

When pour-on dewormers are used, cattle don't need to be restrained in a head catch but should be run into a chute where accurate dosage can be poured on the back.

Coccidiosis

Coccidiosis is a disease affecting the intestinal tract of cattle. It is caused by a tiny, one-celled organism and is a very serious parasitic problem in cattle under one year old. The parasites can damage intestinal epithelial cells, thereby causing blood and tissue loss and reducing food absorption and the ability to resist other infections. It can cause death in young cattle.

Life Cycle

The life cycle of the parasite is very complex, short and fast-spreading. *Coccidia* produce eggs (oocysts) in very large numbers, and the complete life cycle takes only 21 days.

The important things to know regarding the life cycle of *Coccidia* are:

1. Calves ingest *Coccidia* "eggs" (called oocysts).
2. The eggs hatch inside the animal and the *Coccidia* develop through several life stages during which they damage the digestive tract.
3. Mature *Coccidia* produce eggs that continue the life cycle.

By the time symptoms are noticed in calves, the disease is already widespread. Unlike other internal parasites, eggs may be picked up by cattle in contaminated forage, water or by licking themselves or other cattle soiled with contaminated manure.

Eggs are very hardy and will contaminate premises for a long time. *Coccidiosis* may strike any time of year, but most severe outbreaks occur in stressful weather, especially cool, wet months of fall, winter and early spring.

Symptoms

Clinical signs of *Coccidiosis* include diarrhea tinged with blood and mucus. As the condition progresses, dehydration, anemia and general loss of condition becomes evident. With continued diarrhea, soiled hindquarters are evident. The calves may continue straining to have bowel movements. Weakened calves are very susceptible to other diseases and may die without treatment.

Diagnosis

Young cattle with bloody diarrhea may be infected with *Coccidia*, especially if they are under stress conditions, in feedlots or close confinement, or living in cold, wet weather. Check stool samples for eggs (oocysts). The number of eggs is influenced by eggs ingested, stage of infection, age and condition of the animal and consistency of the fecal sample. Post-mortem examination of dead animals may reveal intestinal lesions and possibly eggs on scrapings.

Treatment

Some infections may be self-limiting and go away within a week if reinfection does not take place. Cattle should be treated early to keep contamination down and shorten the course and seriousness of the disease before secondary infections occur.

Early-treated calves have less chance of permanent damage to the intestinal tract, which can cause calves to be stunted.

Sulfonamides, Amprolium (Corid[R]) and Decoquinate (Decox[R]) are approved for treatment and prevention. In severe infections, fluids and other supportive treatment may be necessary.

Prevention

Good management and prompt diagnosis and treatment are essential to control *Coccidiosis*. Prevention is based on controlling the intake of the eggs by young animals. Some exposure may be beneficial since the calf may develop immunity without having clinical signs of the disease. Keep young cattle in large, clean, dry areas and keep feed and water clean and free from manure contamination. Keep stress from weaning, shipping and sudden feed changes to a minimum, especially in young calves in wet, cool weather.

The products mentioned for treatment may be used at preventative levels, especially during stress times. Ionophores, Monensin (Rumensin[R]) and Lasalocid (Bovatec[R]) have been shown to prevent *Coccidiosis*.

Table 1. Common Internal Parasites of Cattle

	Common Name	Scientific Name	Infective Stages
STOMACH WORMS	Brown Stomach Worms	*Ostertagia ostertagi*	Adults, Fourth Stage Larvae, Inhibited Fourth Stage Larvae
	Barberpole Worms	*Haemonchus contortus; H. placei*	Adults, Fourth Stage Larvae
	Small Stomach Worms	*Trichostrongylus axei*	Adults, Fourth Stage Larvae
INTESTINAL WORMS	Threadnecked Intestinal Worms	*Nematodirus spathiger; N. helvetianua*	Adults, Fourth Stage Larvae
	Small Intestinal Worms	*Cooperia punctata; C. oncophora*	Adults, Fourth Stage Larvae
	Hookworms	*Bunostomum phlebotomum*	Adults
	Bankrupt Worms	*Trichostrongylus colubriformis*	Adults
	Nodular Worms	*Oesophagostomum radiatum*	Adults
LUNGWORMS		*Dictyocaulus viviparus*	Adults, Fourth Stage Larvae
LIVER FLUKES		*Fasciola hepatica*	Adults
TAPEWORMS		*Moniezia benedeni; M. expansa*	Heads, Segments

Table 2. Approved Anthelmintics for Cattle

Generic Names	Avermectins	Levamisol	Moxidectin	Albendazole	Fenbenda-zole	Morantel tartrate	Oxfendazole
Trade Names	Ivomec, Eprinex, Dec-tomax	Levasole Tramisol Ripercol Totalon	Cydectin	Valbazen	Panacur* Safe-Guard	Rumatel, Nematal	Synanthic
Manufacturer	Merial, Pfizer, generics	Merck	Boehringer Ingelheim	Pfizer	Merck	Pfizer	Boehringer Ingelheim
Dosage Forms	Injectable; pour on	Drench, bolus, paste, injectable pour-on, feed cube	Pour on, injectable	Drench paste	Liquid drench, paste, feed block, bolus, minerals	Bolus, feed pre-mix	Drench 22.5%, 9.06%
Slaughter Width-drawal	35-48 Days	2-9 days	21 days (injectable)	27 days	13 days	14 days	7 days
Effective Stomach and Intestinal Roundworms							
Adults	ALL	ALL	ALL	ALL	ALL	ALL	ALL
Young							
Immature	ALL	Varies	MOST	ALL	ALL	MOST	MOST
Ostertagia Type 2	ALL	NONE	NONE	ALL	Panacur* 10 mg level	SOME	ALL
Cooperia	Varies		ALL	ALL	ALL		ALL
Lungworms	ALL	ALL	FEW	ALL	ALL	NONE	ALL
Tapeworms	NONE	NONE	NONE	ALL	ALL	NONE	ALL
Flukes	** NONE	NONE	NONE	ALL	NONE	NONE	NONE
Comments	Has a 2 wk. residual effect. Some exter-nal parasite control	** When combined with clorsulon will control flukes			*requires veterinarian's prescription	Approved lactating dairy cattle	22.5% prescription drench or injected into rumen

Learning for Life

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