Diagnosis and Control of Intestinal Parasites in Alpacas

By Stephen R. Purdy, DVM

Prevention is the key to intestinal parasite control

Overcrowding and poor sanitation must be addressed to overcome parasite infestations and to minimize the potential for reinfection. Parasite control programs must be easily implemented, and must rely heavily on good management practices and lightly on use of drugs. It is not possible, and may not be desirable, to remove all of the parasites from the herd. Intestinal parasites should be managed to avoid clinical disease through a combination of practices, including feces removal, pasture rotation, interspecies grazing, and lastly, use of medication.

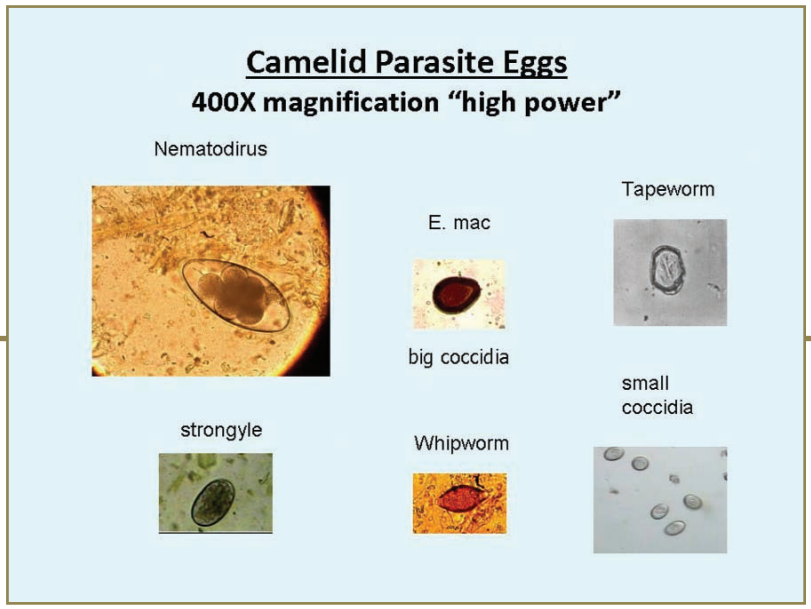
Most scientists believe that 20 percent of the animals in a group harbor 70 to 80 percent of the parasites. We must identify that group, treat them only if absolutely necessary, and keep them away from the rest of the herd. This is especially true for crias, which have lower resistance to intestinal parasites because of their relatively immature immune systems. You should give strong consideration to removing animals with low resistance to parasites from the breeding herd. Good nutrition is the basis for being able to fight off any immune system challenge, including intestinal parasites. It is very important to keep the herd well-fed, with minimal competition for food. When I get a call about wanting a new medication to treat an intestinal parasite problem, I immediately start to investigate the management and housing situation. Most farms with large parasite problems are overcrowded or have underfed animals.

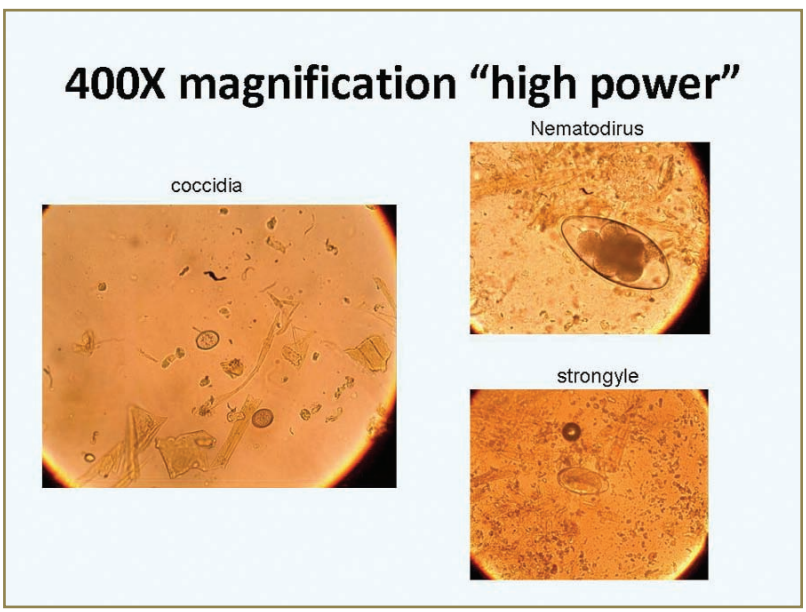
The best way to investigate the level of parasitism in the herd is through periodic performance of fecal exams. There are multiple methods of analyzing feces, but it is important to use a consistent, easily performed technique. I usually suggest individual sampling of all suspected animals, particularly those with poor body condition, poor growth rates, or those with diarrhea or loose stools. A herd screening test should include approximately 25 percent of the animals in each group.

The following is the procedure I use, which I feel is accurate and easily performed.

- Collect fresh feces – use 1 or 2 lubricated, gloved fingers in the rectum or ground collection immediately after defecation.
- Mix feces – add 10 mL of concentrated sugar solution (specific gravity 1.33, made by adding 2.75 cups of sugar to 1 pint of very hot or boiling water) to a 15 mL tube. Add feces to raise the level to 12 mL (approximately 2 grams of feces). Pour entire mixture into a cup and mix well to release eggs/oocysts from the feces. Filter out the big pieces through a gauze pad or tea strainer and add back into a centrifuge tube.
- If you are using a swinging bucket centrifuge, fill the tube to the top and centrifuge for 10 minutes with a slide cover slip on.
- If using a fixed rotor centrifuge, fill tube to approximately ¼ inch below the top and centrifuge for 10 minutes; top off tube with sugar solution, add cover slip, and wait 10 more minutes.
- Apply the cover slip to a glass slide and view.
- The total number of eggs/oocysts counted is per 2 grams of feces. Divide the final number by 2 to calculate the EPG (egg per gram) or OPG (oocyst per gram for coccidia) count.

A few tips for viewing parasite eggs will make the process less daunting when you are first starting to look at slides. Start by viewing slides on low power (10X objective – yellow). If you are having trouble finding the proper focus depth, move the slide so that the edge of the cover slip is directly under the lens (directly above the center of the light) and focus on that, using the coarse and then the fine focus knob. When you have this initial focusing done, you next focus at the level of the air bubbles. That is where the parasite eggs and coccidia oocysts will be found. Adjust the light inten-





Photos courtesy of Dr. Stephen Purdy

sity so that you can easily see the slide without being blinded or without peering into the darkness. Do not get discouraged at first – *everyone* needs to practice to learn this. Repetition is the key here.

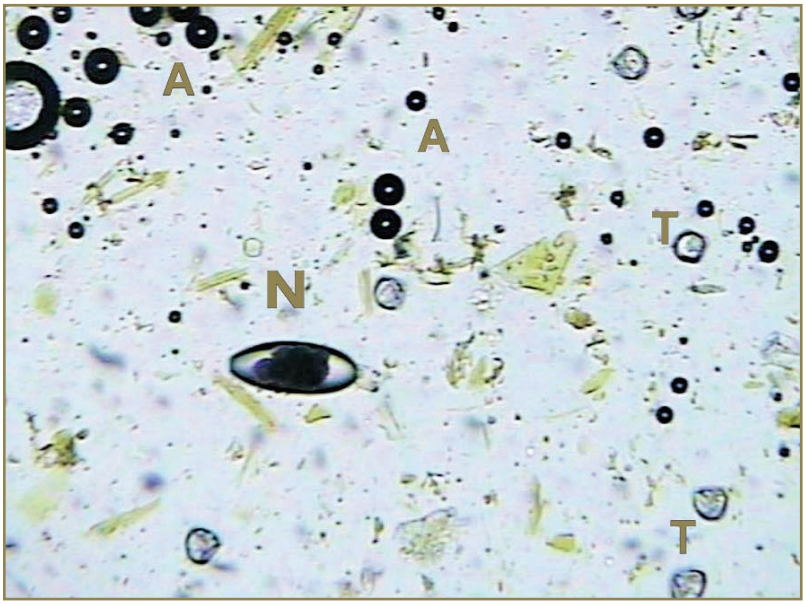
A few words on **parasite terminology** will help to alleviate confusion. These are generally accepted terms used by veterinary parasitologists.

- **Nematode –** roundworm, non-segmented; microscopic:
  - **Strongyles** – eggs all look the same, can be differentiated by growing larvae but not usually done
  - ***Nematodirus*** – largest egg; distinctive "shell"; can survive on pasture over winter to hatch in the spring
  - **Whipworms** *(Trichuris)* – oval eggs with "doors" on the ends
- **Cestode:** tapeworm:
  - *Monezia;* eggs often not seen in fecals as they are passed as white segments which are visible on feces
- **Coccidia** are not worms but are protozoa; microscopic:
  - **Small coccidia** – *Eimeria* species; oval-shaped, like a fried egg with a big yolk
  - *Eimeria macusaniensis (E. mac*) – the big one; five times larger than small coccidia; pear shaped and two-toned brown in color.

As you see from the picture on the following pages, there are three size groups when we look at parasite eggs/ova. The large one is *Nematodirus.* The medium-size group has strongyles, *E. mac,* whipworms, and tapeworms. All have distinctive shapes to differentiate which one you are looking at. The small one is the small coccidia. It is the parasite that takes the most time to get used to finding at low power magnification. If you find something that is not one of these six, it is most likely not a parasite egg. If you are unsure of what you are looking at, move it to the center of the visual field and look at it under higher magnification to decide.

Specific Intestinal Parasites

The **strongyles** are the most common intestinal parasites of alpacas on most farms. Their eggs are passed in the feces, and under the right conditions of temperature and moisture, they hatch into larvae. The larvae mature into the infective L3 stage, which are found primarily in the first two inches of the plants on pasture. Alpacas get infected with parasites while consuming these plants. If we keep our pastures from becoming too short due to overgrazing, then the infection rate will be low. Remove animals before all of the pasture is eaten down. Also, turn older animals out on pasture first, before young animals, so that they can eat the parasites to minimize damage to young animals with immature immune systems.



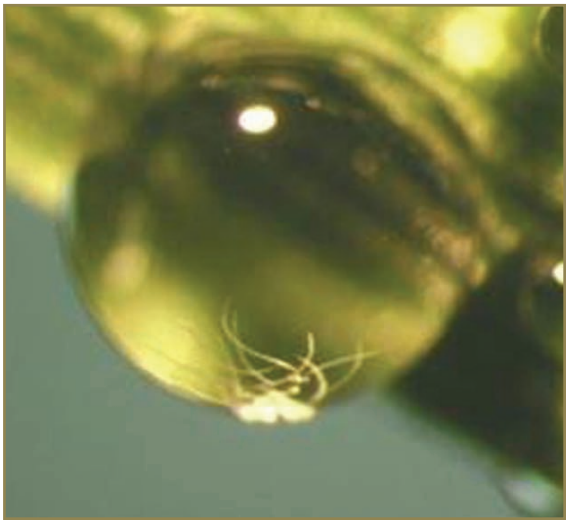
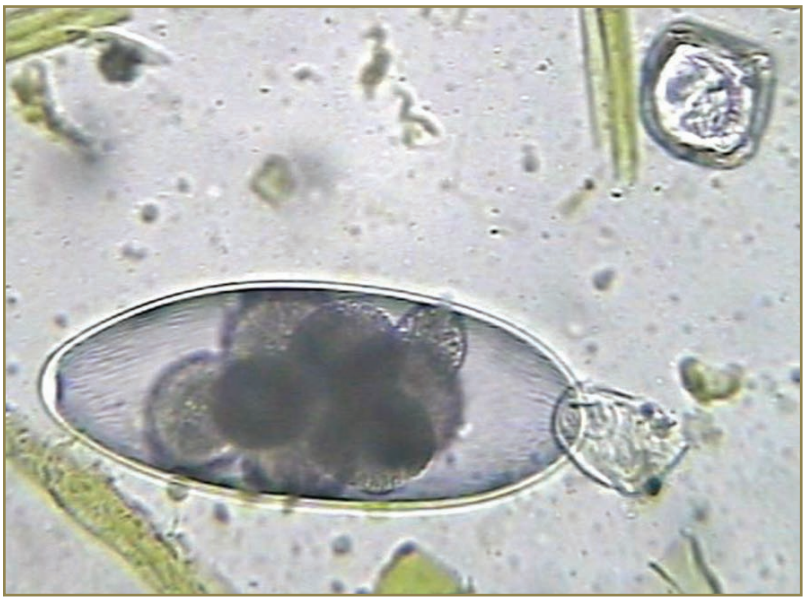


Photo courtesy of www.florida-cracker.com/worm_management.htm

Strongyle infective L3 stage in a water droplet on a blade of grass.



Top, Nematodirus **(N) and** ***Monezia*** **(tapeworm) (T) eggs; air bubbles (A) (100x magnification)**

Above, Nematodirus **and** ***Monezia*** **(tapeworm) eggs (1000x magnification)**

Small coccidia *(Eimeria* species) cause problems primarily under conditions of overcrowding and fecal contamination of food. They are animal species-specific, meaning sheep, goat, camelid, and bovine coccidia are different, and will not cross-infect other species. The infective stage is consumed on pasture or by animals eating off of ground which has been contaminated by infected feces. You will see this in the winter when animals are not on pasture, as well as in other times of the year. Small coccidia are usually not a significant clinical problem in adults, so do not medically treat animals if they are asymptomatic. Infected crias can show signs of diarrhea and poor weight gain.

Look for small coccidia oocysts in fecals, but they can take several days to show up after the diarrhea starts. My rule for diarrhea in a cria without a fever is to treat for coccidia, even if the fecal is negative. Emphasize cleanliness in the herd to prevent reinfection. Do not treat all of the crias in the group, but do monitor feces, growth rate, and body condition, and run periodic fecals to decide which alpacas to treat with medication, if any.

Young animals at shows are subject to diarrhea on occasion. This may be due to a viral intestinal infection, but the stress of an unfamiliar situation, with many new animals and sounds, may also cause a subclinical coccidia infection to become active and overt. The animals did not pick up the coccidia at the show. They were already carrying it, and their immune system was keeping it under control, until the show stress weakened their immune response.

E. mac *(Eimeria macusaniensis)* was thought of as always being a deadly parasite before we started using more accurate techniques to diagnose it, and then realized that it is very common in animals with no clinical signs of disease. It should be thought of just like small coccidia, in my opinion. Infection can result in fatalities, but this is most often in poor-doer adults with chronic disease problems.

Clinical signs of *E. mac* infection in poor-doer adults or young animals include transient or rare diarrhea, poor appetite, weakness, swallowing problems, and rarely, even neurologic signs. Low blood protein (low albumin) disproportionate to the anemia is seen in chronic disease situations in adult alpacas. Consider treating poor-doer adults of unknown diagnosis with low protein, poor appetite, etc., for *E. mac*.

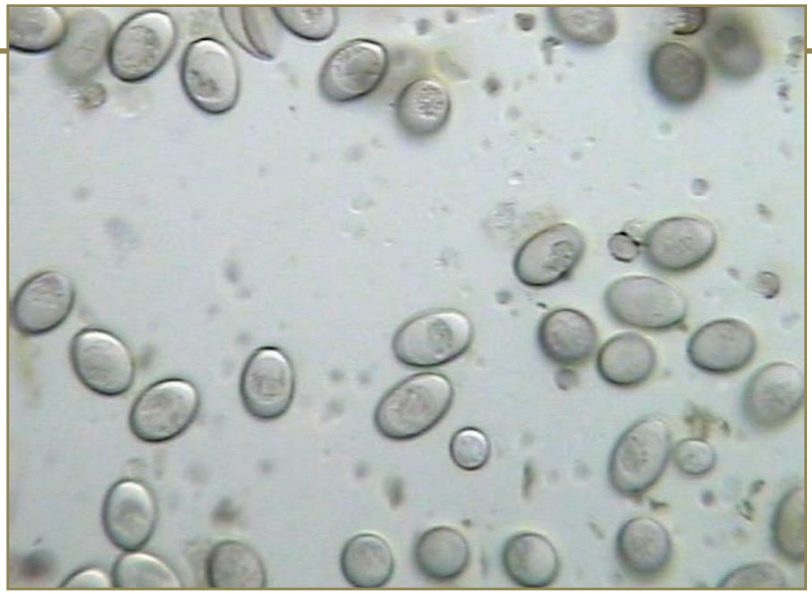
However, most *E. mac* infections are not symptomatic! The oocysts are intermittently shed, and they are not evenly distributed in the feces.

Oocysts can take weeks (up to 30 to 40 days) to show up on a fecal. You can thus miss them in a single sample from an infected animal, so serial sampling is the best strategy. Animals in good body condition with normal feces consistency can have high numbers of oocysts. Stresses such as shows and transportation can cause increased shedding. It appears that all farms will see *E. mac,* similar to the situation with the small coccidia. Emphasis must be on cleanliness and not overcrowding animals. Overuse of drugs will lead to the emergence of drug-resistant parasites!

Tapeworm infestation (most often *Monezia* species) is not usually an important clinical problem in alpacas. These worms can cause diarrhea or loose stools, but not very often. Infection occurs sporadically in certain geographic locations, even on the same farm, and usually in individual animals. Owners see segments on the manure pile. It is best to wait and see if the problem clears itself. I suggest to recheck the feces grossly and microscopically to look for clearing of the parasite.

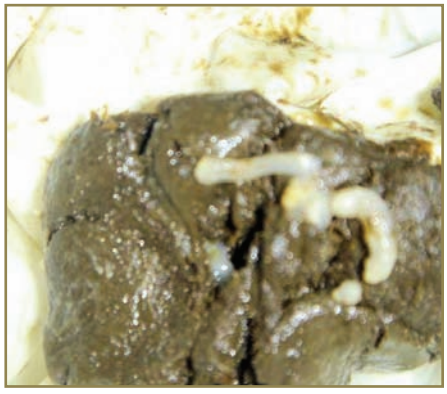
Liver fluke infections are not a case of intestinal parasitism, but rather cause liver dysfunction and even death. They are associated primarily with *Fasciola hepatica* here in the U.S. This parasite is mainly a problem in the mid-, far-west, and southeast in the U.S. We are seeing them in non-traditional areas in the U.S., as animals from other parts of the country move around. A snail or slug intermediate host is involved in transmission, and wet conditions predispose herds to infection as animals consume the infective larvae on plants, particularly in wet or swampy areas. *(See photo on the following page.)*

Liver fluke infection should be suspected in endemic areas, or in animals traveling from those areas, if alpacas have clinical signs of liver disease such as weight loss, poor appetite, and jaundice. Fecal flotation or centrifugation tests are not accurate for finding fluke eggs; they do not float in sugar or salt solutions. A blood serum ELISA test for *Fasciola hepatica* is the most accurate diagnostic test at present. This test is currently run at Oregon State and Colorado State Universities. Treatment is with Ivomec Plus® – ivermectin and chlorsulon, and as with other parasites, it is important to avoid re-exposure.



Small coccidia *(Eimeria)* (greatly magnified)

***E. macusaniensis* (approximately 1000X magnification)**



Monezia eggs and segments on feces

Photos courtesy of Dr. Stephen Purdy, unless otherwise marked

Adult Fasciola hepatica liver flukes

Photos courtesy of Dr. Stephen Purdy

Whipworm (Trichuris) egg (1000x magnification)

How many parasite eggs or oocysts in a fecal are significant?

- **Small coccidia**
  - Crias with diarrhea: any are significant; treat individual animals and watch the entire group, especially crias.
  - Adults or crias with good growth rates and no diarrhea: do not treat; emphasize cleanliness and other management methods of control.
- ***E. mac*** – same as small coccidia
  - Intermittently shed in feces with a long period of time from infection to shedding.
  - Adults with poor body condition and low protein without low red blood cell count (without anemia) = treat.
- **Strongyles**
  - 25 or more per slide is significant, but only if the animal has clinical signs of parasitism; review management and watch for disease.
- ***Nematodirus***
  - Any may be significant because it is a low shedder; look for clinical signs of disease before medicating.
- **Tapeworms**
  - May not want to treat the affected animal as they may expel tapes on their own; watch the feces to see if segments disappear.
  - Expect reoccurrence in the area, but not always right away.
- **Whipworms**
  - Treat any amount found if the animal has clinical signs of infection; a tough parasite to get rid of in the environment.

Should you treat animals diagnosed with intestinal parasites of any kind with no clinical signs of disease? I would suggest no, you should not. Use the results of fecal exams to decide if your parasite management practices are adequate and make the appropriate changes. Do not look first for a different medication! The adverse clinical signs I look for when deciding to medicate alpacas include: poor body condition, failure to grow at a normal rate in young animals, weight loss, and diarrhea.

Deworming medications are poisons – they kill worms, and worms are animals. Some medications have been associated with problems in camelids. Valbazen® has been reported to cause abortion in pregnant camelids. Ivermectin (Ivomec®) and doramectin (Dectomax®) should be considered as environmental contaminants, as they pass out of treated animals in their feces and urine in active form. They can kill beneficial insects, such as dung beetles and worms, in the soil around manure piles and where fecal, and thus drug, runoff occurs.

Work done at the University of Massachusetts, Amherst proved that animals treated with one subcutaneous injection of ivermectin had detectable levels of the active drug in the feces for at least two months! (Purdy, unpublished data, 2006). It is not known whether composting will break down these drugs in feces to make them inactive. Thus, it may not be a good idea to put composted alpaca manure from animals treated

with ivermectin or doramectin on gardens, to prevent ingestion of these compounds in the vegetables. There are also no regulations against using this manure on organic vegetables.

If you are using medication to treat parasites, dose animals based on the largest animal in each age group (adults, yearlings, crias, or neonates). Be careful not to overdose neonates, as some drugs have narrow safety margins; weigh each neonate for most accurate dosing. Insure adequate dosing with oral medications, as some animals may spit them out. In general, injectable drug dosing is more accurate.

"Natural" treatments for parasites include onions, garlic, cranberries, and diatomaceous earth. There is no scientific evidence to date that any of these are effective.

Drug Resistant Intestinal Parasites

In many areas of the country, farms are faced with intestinal parasites that have developed resistance to most or all medications. We can slow down the emergence of drug-resistant intestinal parasites by selective medical treatment, ***not*** by blanket treatment of the entire herd. We must reduce the number of animals treated, and reduce the number of times we treat them, to prevent resistance from occurring. Meningeal worm disease prevention programs rely heavily on drug treatments in the eastern U.S. Animals are injected with ivermectin or doramectin at monthly intervals, depending on the local climate in the winter. Over time, this has resulted in development of drug resistant nematodes in alpacas. Other methods of producing drug resistance include underdosing medication, so that worms are not killed, but are exposed to the drug and survive.

How is parasite resistance detected? A fecal egg or fecal oocyst count reduction test is performed, comparing levels before treating with a specific product with those measured ten days after administering medication. If there is less than a 90 percent reduction in the egg per gram (EPG) or oocyst per gram (OPG) count, you are dealing with parasites with resistance to the drugs you are using.

Management; not medicine alone!

You most likely cannot eliminate all the parasites in your animals. Do you even want to? Continual use of drugs will make the overall problem worse! If you medicate animals and then turn them out on clean pasture, it will become contaminated with the drug resistant parasites. There should be a small population of non-drug resistant parasites in your animals. The alpacas' immune systems should be able to keep them in check, depending primarily on genetic and nutritional factors. They will compete with drug resistant parasites, and keep them in small numbers. Non-resistant parasites could be eliminated in the future by medication, if that is warranted.

You should continually evaluate your parasite prevention program to check its effectiveness. Prevention of infection relies heavily on cleanliness. Manure should be removed from piles at least twice daily. The alpacas are kind enough to pile it up for us so we should be kind enough to remove it for them. Do not overcrowd animals! In addition to the fecal contamination, it causes stress on the animals, which will suppress their immune systems, and thus make them less able to keep parasites under control.

Bio-security is very important in parasite control. You should always keep transient animals away from the resident herd, in particular away from crias, which all have immature immune systems initially. Outside males and females should ***never*** be mixed in with your herd. The stress they undergo when moving may cause them to start shedding parasites that will contaminate your property. You should isolate returning show animals or new arrivals for at least two weeks, and run fecals on them, regardless of past medical history. Intestinal parasitism can be managed in alpacas with careful attention to good management.

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