From the Goat Handbook

Author   M. C. Smith; Cornell U., Ithaca, NY

Coccidiosis is a contagious disease of goats, especially young kids, throughout the world. The disease is caused by one or more of approximately 12 different species of protozoa, called Eimeria, which parasitize and destroy cells lining the intestinal tract of the goat. Sheep are also very susceptible to coccidiosis, but even though the sheep forms may share the same names with goat coccidia, many parasitologists believe that the disease cannot be spread from goats to sheep or from sheep to goats.

 An infected goat sheds thousands of microscopic coccidial oocysts in its feces every day. When first passed, the oocysts are harmless to another goat. However, under favorable conditions of warmth and
mositure, each oocyst matures (sporulates) in 1 to 3 days to form 8 infective sporozoites. If a young kid swallows the sporulated oocyst, the sporozoites are released and rapidly penetrate the intestinal cells. From here on, the life cycle gets very complicated. The coccidia pass through several periods of multiplication during which large schizonts are formed. The intestinal cell of the goat is destroyed and thousands of small forms called merozoites break out and invade other intestinal cells. Eventually sexual stages are reached and new oocysts are produced. The entire life cycle from oocyst to new oocyst takes 2-3 weeks.

If a young kid is suddenly exposed to many sporulated oocysts, it may become severely ill 1-2 weeks later. It will be off feed, listless, and weak. It may show abdominal pain by crying or getting up again as soon as it lies down. At first, the kid might have a fever, but later the body temperature is normal or even below normal. Diarrhea begins pastey, then becomes watery. The kid may dehydrate rapidly. Contrary to various reports written by people more accustomed to calves than kids, the diarrhea is only rarely bloody. Neither is straining common. Signs often show 2-3 weeks after the kids are weaned, because the lactic acid
produced by the digestion of milk helps to inhibit occidia in the nursing kid.

Young kids may be killed quickly by a severe attack of coccidiosis. Others - those initially stronger or less heavily infected - will develop a chronic disease characterized by intermittent diarrhea and poor growth. Tails and hocks are dirty. The kid with chronic coccidiosis cannot digest its feed properly because the intestines have been severely damaged. As a consequence, such a kid will be a potbellied poor-doer for months afterwards. Frequently, such a stunted kid will be too small to breed it's first winter.

Even though coccidiosis is typically a disease of the young growing kid, most adults are mildly infected and continuously shed oocysts which serve to infect young kids. Occasionally an adult goat shows temporary
diarrhea when stressed or exposed to a new species of coccidia. This is especially common after the doe has been boarded on another farm for breeding.

Diagnosis of coccidiosis can be based on clinical signs or microscopic fecal exams. Coccidiosis is so common that it should be suspected whenever kids older than about 2 weeks of age are scouring.
Sudden dietary changes can also cause diarrhea, but these make the kid more susceptible to coccidiosis. Thus diarrhea that begins with the consumption of too much milk, grain, or lush grass may drag on for days
because of coccidiosis. Older kids and adults with diarrhea may have worms rather than coccidiosis, or they may have both problems together. Oocysts can be identified if the feces are mixed with a concentrated sugar solution. The oocysts float to the top, along with larger worm eggs. They are collected and examined with a microscope.

Oocysts may be shed in the feces as early as 10 days after a kid is infected, but often the first attack of diarrhea occurs before oocysts are available to be identified. In these cases, the trained technician
can do a direct fecal smear to look for smaller merozoites, which do not float in the sugar solution.

If a kid dies of coccidiosis, post-mortem examination will quickly give the diagnosis. The small intestine will have many irregular raised white areas, often about 1/8 to 1/4 inch in diameter. A smear taken
from these white spots will show many coccidial forms if examined under a microscope.

Whether or not a goat gets sick with coccidiosis depends on several factors. One is the number of oocysts swallowed at one time. Small exposures, frequently repeated, lead to immunity. Large exposures
destroy all the intestinal cells at one time and kill the kid. The age of the goat is also important. This is partly because the older animal has usually had time to develop some immunity. Also, very young kids are more fragile creatures. Good nutrition (including vitamin E-selenium supplementation in selenium deficient areas) helps the goat to defend itself against coccidiosis. Immunity to coccidiosis is rarely complete. This means that the healthy adult goat continues to pass many oocysts in her fecal pellets. However, most of her intestinal cells are safe from invading coccidia. As each of the 12 or so coccidia species is completely independent from the others, with no cross immunity, a goat that is happily living with one type of coccidia may develop diarrhea when exposed to a different type.

Prevention of coccidiosis is very important in larger herds if young kids are to thrive. Once diarrhea has developed, most of the damage to the intestine that leads to stunting has already occurred. Sick kids are treated to save their lives and to limit contamination of the pens, but the owner has already lost control of this contagious disease. Several key facts will help to design a prevention program. The first is that the adult goats are the original source of infection for young kids, because they shed oocysts constantly. All old bedding and manure should be removed from the kidding pens before the new kids are born. Sporulated oocysts are commonly present on the skin of the udder; thus the kid may become infected at the same time as it takes its first drink of colostrum. The doe's udder should be washed and dried before the kid nurses or else the kid should be removed from its dam at once and bottle or pan fed the colostrum.

If only one doe and her kid are present on a farm, and the pens are dry and spacious, coccidiosis is not apt to be a problem. The kids may be safely left with the doe. In larger herds, it is best to raise kids completely separate from the adults until they are ready to breed. Even when rushed from the doe to a clean barn, kids still manage to pick up a few coccidia. As multiplication is rapid, a few can become many very quickly unless good sanitation is stressed. Fecal contamination of feed and water must be prevented. This means that feeders and waterers should be outside the pen whenever possible, and arranged so that fecal pellets can't fall in. Grain should be put in keyhole creep feeders rather than the open troughs that kids love to play and sleep in. Hay racks also must be covered to keep kids out.

Because oocysts have to sporulate to become infective, exposure can be reduced by cleaning the pens daily. Slotted floors are helpful. However, daily cleaning entails a vast amount of work and give disappointing results, if used alone. Ordinary disinfectants don't destroy oocysts. Even to concentrate on keeping the pens very dry, as moisture is necessary for sporulation. Leaking waterers should be fixed at once. Otherwise, the wet ground or floor around the water source is a perfect environment for oocyst sporulation. Small grassy ''exercise lots'' are also very dangerous and should not be used. It is very important to avoid overcrowding; spreading the kids out decreases the number of oocysts on any given square inch of pen floor or pasture. If many kids are present on the same farm, they should be grouped by age. Putting a 2-week-old innocent kid into a pen with kids 2 months old, where coccidial numbers and immunity have been building up for some time, is to invite disaster for the newcomer. Oocysts are killed by very cold temperatures (far below zero) or by hot dry conditions above 104. Thus, at the end of the kidding season, pens and feeders should be moved out into the hot sunshine for natural sterilization.

A variety of drugs may be given orally to treat the kid sick with coccidiosis. These include sulfa drugs such as sulfaguanidine and sulfamethazine, tetracyclines (aureomycin or terramycin), and amprolium
(Corid R). Each of these has associated dangers if overdosed. Sulfas can cause kidney damage in the kid that is dehydrated. Tetracyclines will interfere with rumen function in older kids and adults. Very high
levels of amprolium may lead to a fatal nervous disease, called polioencephalomalacia, because of a thiamin deficiency. Usually treatment is continued for about 5 days. Labels and veterinary instructions should be followed. If the diagnosis is not certain, and the kid may have bacterial enteritis or pneumonia rather than
coccidiosis, sulfamethazine or tetracycline is usually given instead of amprolium.

All of these drugs are coccidiostats, which means that they slow down rather than kill the coccidia. Thus, if a kid is very heavily infected when treatment is begun, medication may not help that kid much. The drugs will greatly reduce the contamination of the environment, and thereby give other kids time to develop immunity. After kids have become immune to the disease they still continue to shed oocysts. Fecal exams may reveal thousands of coccidia per gram of feces. Medicating these older kids or adults will temporarily reduce the passage of oocysts but will not improve growth rate. Within 2 or 3 weeks after medication is stopped, coccidial levels will return to pretreatment values. Thus, except for protection of younger kids, it is
a waste of time and money to treat older apparently healthy animals that don't show diarrhea. It is far better to separate the young kids from these older carriers.

 Medication of apparently healthy animals is necessary for kids on large farms with previous problems with coccidiosis. The aim is to prevent damage to the intestines rather than waiting for diarrhea to occur. For instance, it may help to treat the kids with anticoccidial drugs on a daily basis for a week or more before stressing them by weaning or moving onto pasture. In some herds, a drug such as amprolium
may have to be given daily beginning at 2 weeks of age and continuing until the kids are several months old. Amprolium levels of 25-50 mg/kg daily should be used. This is approximately 10-20 mg per round, and is
21/2-5 times the treatment level recommended for calves. Amprolium is not approved for use in goats in this country. It can be given to each kid individually or it can be mixed with the food or water. As an
example, if there are 50 pounds of small kids in a pen, 500 mg of amprolium is mixed with the water, milk or feed that they will consume in one day. The larger kids, by eating more, get more of the drug than
do the smaller kids.

Other newer coccidiostats may be mixed with the feed, but most of them have not yet been adequately tested on goats. Rumensin R (Monensin) at 15 ppm in the starter grain has eliminated the coccidiosis problem on at least one large goat farm. This drug is very toxic to horses, so the medicated feed should not be left where a horse can eat it. Another potentially useful coccidiostat, now available only for poultry, is lasalocid. This drug has protected experimental lambs at 2-4 mg/kg/day. The poultry industry has found that the coccidia often become resistant to a drug after 1 or 2 years. Goat owners may also need to change drugs if the one in use ceases to be effective in controlling coccidiosis.

 In summary, although most goats carry coccidia and will have positive fecal exams, normally only the young kids become sick with coccidiosis. Deaths and stunted kids result. Raising kids separately
from adults, keeping pens clean and dry, preventing fecal contamination of water or feed, and, in some herds, continuous preventative medication are necessary to prevent the disease. It is neither possible
nor desirable to completely eradicate coccidia from the adult goats. A low level infection with the parasite serves to keep these goats immune to the disease.