

After all the rains in Texas this year, I thought this older article was worth including.

Fighting Parasites Through Better Management

By Jack Mauldin
September 16, 2007

I decided to do research and write this article shortly after the severe parasite storm that hit many areas in 2007. Six months after the parasite storm, we were still feeling the affects of it and heard the same from many other breeders across the country.

I want to make it clear to all readers that we are not experts in the goat or parasite field. So everything stated in this is my opinion and understanding from the experience we have had over the last 10 years plus the information I have found on research about better management to help fight against parasites in the industry. Take every thing you read here with a grain of salt and decide what you believe. I now have a religious belief that breeders have to change their approach from "de-worming their way out of problems" to "managing their way out of problems".

Also let me make it perfectly clear that most of the text in this article is coming directly out of the research reports or I have cut and pasted their information. I am not trying to claim the majority of this information just came out of my head. If it did, it would be a very short article and not worth reading.

A Possible Road to Better Management of Internal Parasites:

Understanding the Stomach Worm Problem

Current Industry Status

Internal parasites are a major threat to the meat goats breeders today. Problems associated with the internal parasites include:

- Irreversible damage or death to the goats
- Reduced growth rates
- Less productive
- Hinder goats reproductive performance
- Expense to the breeder in money and labor

Cause of the Problems

Trying to prevent or control the parasites in goats is increasingly difficult due to generations of overuse and improper use of the de-wormers available to the breeders. This has resulted in increasing resistance by parasites to the de-wormers. This resistance to the de-wormers has now been identified worldwide and no new de-wormers are in the pipeline to save the industry.

Factors that contribute to parasites in goats

- Overstocking pastures – maintaining as many as 40 goats per acre
- Environment with high temperatures, humidity, and rainfall
- Resistance to drugs as a result of excessive usage
- Frequent drug treatments per year without a positive fecal sample exam to validate if the dewormer is actually working
- Genetic make-up of goats

Signs of the parasite

- Dehydration
- Unthrifty appearance, rough hair coat, depressed, low energy, lethargic, and uncoordinated
- Significantly reduced growth and reproductive performance
- Fluid accumulation in sub-mandibular tissues (bottle jaw), abdomen, thoracic cavity, and gut wall
- Blood loss, white mucous membranes, anemic

Summary of Controlling Stomach Worm Problems

Internal parasites are a part of the natural goat world. We can't eradicate them as long as goats are on pasture. The goal is to maintain the parasites at a level that will not produce any illness or economic loss. Remember, anytime the industry relies on a single product or method of control, the worms will eventually adapt and outwit us.

There are four basic tools that are available for the breeder to use in fighting the internal parasites.

- Understand the parasite's life cycle and break it.
- Drug Management to fight the parasites
- Animal Management to help reduce the parasites in them.
- Pasture Management to help minimize the main source of internal parasites in goats

The more of these you use together, the better your chances are for minimizing the impact of internal parasites on your herd and improving your profits.

Understanding the Most Dangerous Parasite

Gastrointestinal Round Worm (Barber Pole Worm) – *Haemonchus Contortus*

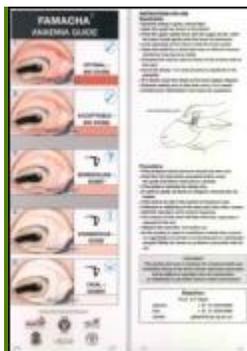
The round worm is a blood sucking parasite that can cause severe anemia, protein loss and death. It causes lower growth rates, reduced reproductive performance and higher rates of illness and

death in the goats in infects. This parasite can consume up to 10% of an animals total blood volume in a day and easily cause them to quickly become anemic.

Lifecycle takes approx 21 days to complete

- Larvae in L3 stage of development are ingested by goats mainly while grazing in a pasture, generally grass or hay, where infected goat pellets had been dropped earlier. The larvae go to the true stomach of the goat.
- One of two things can happen then.
- The larvae may proceed in developing into further larval stages moving toward becoming an adult.
- The other option is for the larvae to go into a state called hypobiosis or arrested development. This is similar to a bear going into hibernation for the winter.. This situation occurs when the larvae in the stomach determine that conditions may not be right for it to successfully complete the growth to an adult at that time. This may occur when the winter is too cold or in the summer when it is too hot and dry to survive. In arrested development stage they sit quietly in the stomach following infection and don't become adults until several months later. This is an important adaptation for keeping the worm around through cold winters when eggs and larvae don't survive well on pasture. The worms that became arrested in the fall resume development in the spring and reproduce. When the worm comes out of the arrested development and resumes growth, massive numbers become mature adults over a short period of time and the resultant egg production and deposition in the feces can be very high as well as having severe adverse effects on the animal
- For the larvae that do not go into arrested development, they will transform to a L4 stage into an adult which can be up to $\frac{3}{4}$ of an inch in size. The signs that indicate to not go into arrested development can be green grass coming through the system, an increase in the temperature such as coming out of winter, rainy weather following a drought period or increased estrogen levels in the goat.
- Once they reach the adult stage, in about 14 days the female begins to lay eggs in the true stomach.. The female can lay up to 5,000 to 10,000 eggs per day. Egg laying will stop in very hot/dry environments.
- The eggs laid in the true stomach are passed out of the body through goat feces (goat pellets)..
- When the environment is right, the eggs in the droppings will hatch into larvae. The pellet has to be moist, soft and a warm temperature for the eggs to hatch. That can occur from a rain, a leaking water tank or similar things. Spring is a common time for this to occur.
- After hatching, they move through several stages of development (L1, L2, L3) until they become the same type of larvae that were eaten earlier that started this life cycle. This can be as short as 7-10 days of going from egg to L3 larvae. During the colder months, larvae development on the pasture is delayed and may take up to a month or two to reach the L3 stage.

- The L3 larvae have a protective sheath making them relatively resistant to adverse environmental conditions and can survive for months.
- The L3 larvae climb up on blades of grass and wait to be taken in by your goats so that starts the life cycle all over again.
- The L3 larvae can live in the pasture for up to 90 days in the summer and 180 days in the fall/winter. They love an environment where the temperature is between 70-80 degrees and there is an average of 2 inches of rain a month. . But at very high temperatures, larvae may only survive for 30 days.
- The larvae can live in temperatures below freezing, but may die off during hard freezes.
- Moisture is crucial for development and survival. Because the initial development and survival occurs within the feces, moisture is usually adequate to complete development to the L3 larvae, however if the feces dries out quickly, due to high temperatures and/or physical disruption, the L1/L2 stage larvae are susceptible to desiccation and will die. If feces remain intact, retain some moisture and do not get too hot or too cold, the L3 larvae may remain alive for months.
- Sustained temperatures above 95% are usually lethal.
- The moisture conditions at ground level under forage cover usually is adequate for larvae to move around and survive.
- Since the larvae don't feed, their length of survival depends on how fast they use up their energy reserves. So the hotter it is, the faster they move and use up energy stores and survival is shorter.
- Eventually, larvae move up and down the forage when there is moisture medium such as dew or rain. For the most part, larvae do not move past 12-24 inches from feces or 2-4 inches up the forage
- As long as the temperature and moisture conditions remain warm and wet, development and survival continues and pasture contamination accumulates. If the temperature gets too hot/cold and/or the moisture conditions become dry, development and survival are threatened and pasture contamination dissipates.



Which Goats to De-worm and When?

The best way to determine if a goat needs to be wormed is by checking their inner eyelid for the color. The darker pink the inner eyelid is, the fewer worms they have. The whiter the inner eyelid is, the bigger the worm problem and the more anemic the goat is which means they need worming. This basically comes from part of the FAMACHA method that is described in the picture to the right.

However, we have customized the FAMACHA system and don't use their color chart or completely follow their required actions for each color. Here are the reasons why we don't follow the FAMACHA system.

- It requires a person to attend an education program before getting the chart and the majority of the education has nothing to do with the chart. It covers management options that can be put into a book or pamphlet without requiring a person to attend the class.
- It is difficult to tell the difference between most of the color levels other than 5, which is white.
- The color on the chart can fade and no longer be useful as a reference.
- We have seen different levels of color from those shown on the chart.
- A person using the FAMACHA system does not understand the relationship between the amount of eggs in the fecal compared to the color of the inner eyelid until they actually do fecal testing to equate the number

We decided to develop our own approach that would lead us to the same results. We started out by going through all of our herd, looking at their inner eyelids and collecting fecal samples from the goats that had significantly different color in their inner eyelid. Then we did fecal tests of the samples to get an idea of the worm load and try to relate it to the color we saw in the inner eyelid.

The results were dramatic. It went from one fecal sample having worm eggs all over the place to having to look around the slide to find any worm eggs. All of a sudden, it became very clear what the different colors meant related to the load of worm eggs they had. We don't calculate specific egg counts. We can understand the difference between lots of eggs and very few eggs seen in the test.

Although, earlier I said it is difficult to differentiate the color seen in the inner eyelid to a 1 through 5 color, we did come up with 5 different choices to document the eyelid color as we examined each goat. At first we used a 1-3 system with 1 being dark pink and 3 being white. But as I would go through checking the inner eyelids, I concluded that sometimes the color of one eyelid was darker than the ones I had been calling a 2 but it was not as dark as the ones listed as a 1. The same thing occurred between 2 and 3.

What we ended up doing was adding a plus and minus to eyelids identified as a 2 if it seemed to be a little darker or lighter than the normal 2. So we label the eyelid colors as 1, 2+, 2, 2-, 3. And the end result is that only the 2- makes any difference. We will never worm an animal that is labeled as a 1, 2+ or 2. They have good blood flow through the eyelid, are not anemic and will

not receive any worming medicine. If the animal is labeled as a 3, it is wormed no matter what. The 2- makes us look at the rest of the body and if a doe is close to kidding. If an animal is labeled as 2- but has good body and hair condition, we will not worm it unless it is a doe close to kidding. When a doe kids, her immunities are lowered and she is more susceptible to the worms and can cause harm to her health.

The 1, 2+, and 2 are only to allow us to look at the records to see how strong the blood flow was and see if we can relate it to their offspring. Resistance to worms can be passed along in the gene pool and we want to find genetics that pass along the ability to be resistance to the worms. We have found several different does with resistance to worms and it showed up in their offspring also. That is a big plus to us.

Overcrowding in Pastures

Goats and their parasites have evolved over a long period of time and under more primitive conditions the level of parasitism in animals would probably be limited by their tendency to roam over greater areas. Now, breeders often collect up the animals and restrict them to small pastures where the numbers of parasite larvae can build up to dramatic numbers leading to frequent drug treatments leading to resistance

The more animals you have in one pasture, the closer your goats graze to the ground and the more likely they will ingest larvae. The question we always have asked to us is "how many goats can I run in my pasture?". There is no general, correct answer of that question. Some people will quote that a breeder can run 6-8 goats where one cow can run. That may or may not be correct but if it is, it is only correct on what may be available to eat in the pasture. A cow generally does not have problems consuming parasite larvae while eating close to the ground but that is exactly where the goats get infected. There is nothing I have found on the internet that will tell a breeder how to identify the number of goats they can run on their pastures.

I know that we have too many goats for the acreage we have fenced for them. Here is how we are trying to estimate how many goats per acre without increasing the risk of parasite infection.

- What is the smallest pasture your goats will be rotated through and how long will they need to be in that smallest pasture? We have four small pastures that are fenced for our does/kids and they range from 1.5-4 acres each. So our smallest pasture is 1.5 acres. From reading the info on the life cycle of the round worm, I know that the larvae in a pasture can survive any where between 1-3 months in hot weather and 6-10 months in cool/cold weather. So we are likely to schedule our herd to move into the smallest pasture after 1-3 months of the hottest/driest weather. That would be the best chance that the pasture has the least number of larvae still alive in it.
- What are the typical number of animals you will have at the time you would move them to the smallest pasture? We keep our bucks separate so we are looking at the number of does/kids we would have towards September. If all animals are removed from the small pasture by the end of June, that would give the pasture 3 months of hot weather before we put animals back in it. We may have 30-35 breeding does. They would have generally had 75 kids between November and April. Hopefully at least half of those kids will be gone before September so that gives us around 30 kids plus the 30-35 does for a total of 60-70 animals on 1.5 acres. That is way too many.

- How long can you run the animals on your smallest pasture? This depends upon what browse is in the pasture, how much and the height of the browse the goats eat. When you put your animals in a pasture, look to see what percent of the pasture they are covering while they are browsing at any one point of time. In our smallest pasture, the herd looks like it is covering about ten percent of the pasture at any point of time. That means, if the goats ate everything they could, within one day, in that one spot, in 10 days, they would eat everything in the pasture and would have dropped pellets across nearly 100% of the pasture. If you have lots of browse for them to eat, then that can be extended BUT the life cycle of the parasite worm is around 21 days and shorter if the environment is right for hatching the eggs. The drier the weather during this time, the longer I may be able to stretch the grazing in this pasture but any good moisture during this time starts the hatching life cycle and starts the infestation of larvae in the pasture. Since I am putting animals in this small pasture in September, we will still be having some hot weather but the temperature will start dropping soon and that means it will be a longer time before I can bring animals back into the pasture. The fewer animals you have in your pastures, the fewer larvae they will be picking up.
- Consider all of the pastures and determine if you can safely rotate your herd through them for a year considering the size of the pasture, the weather environment and the potential life expectancy of the larvae during all seasons. With our having four small pastures and the number of animals in the herd, we have determined we have too many animals for the available pasture space and we will have to reduce our herd significantly and/or take some other steps to help manage the parasite problems.

Reduce the worm potential by 80% & Cull Smarter

There are three major activities that you can do to make a major difference in your parasite problem.

- Cull the animals that are producing the majority of the parasite eggs.
- Breed and select animals that don't have as much problems with parasites.
- Nutrition

Reducing the parasite eggs in a pasture by 80%

If all of your animals produced the same amount of parasite eggs in their pellets and you had 100 animals, you would have to get rid of 80 animals in order to reduce the potential parasite eggs in your pastures. That would be dramatic. However, researchers indicated that only 20% of your animals are producing 80% of the parasite eggs in your pasture. If you can identify those animals that are more likely to be producing the majority of the eggs, you can make a major difference in improving the health of your herd.

One of the first things we have started to identify the animals causing the most problems is to have a monthly evaluation of our entire herd. Once a month, each animal has their condition checked and recorded. (see monthly management). Also, any sickness is recorded on the animal's individual chart. Animals that have had bottle jaw and had a difficult time getting over it are

identified. Animals that constantly have pale eyelids indicating being anemic are identified. These are some of the animals that make up the 20% causing 80% of the parasite eggs in your pasture and the sooner they are culled, the sooner the parasite eggs in your pasture will be reduced.

Animal Resistance, Resilience or Immunity to Parasites

During our monthly management check, we also find certain animals that always have better color in their eyelids, better body/coat condition and don't need to be de-wormed as often. Many times we will see that a doe with good eyelid color may also have kids with the same.

Some goats seem to have the genetics to be much more resistant to parasites than other goats and are better able to survive parasite levels without showing any of the symptoms other goats have. Other goats may be dying with the same level of parasites that does not seem to bother the animal with more resistance to the parasites.

We believe it is critical for breeders to identify these goats with the genetic resistance when selecting their breeding herd. A herd with these types of genetics will make a major difference in a breeder's life and their business profitability.

An animal's age and stage of growth play a big part in how likely they will be affected by parasites. The older an animal becomes, the more they have been exposed to parasites and the more they may have become resistant to them.

- **Resistance (immune)** – an animal's ability to resist the effect of parasites
- **Resilience** – an animal's ability to withstand the effect of parasites

Genetics affect an animal's ability to resist infection, as well as withstand infection. Resistance is defined as the animal's ability to resist parasite infection. It is measured by fecal egg counts (FEC) and is 20 to 30 percent heritable. Resilience is defined as the animal's ability to withstand infection. It is measured by blood hematocrit or packed cell volume (PCV). It is less heritable than resistance. This can be generally measured by checking the color of the eyelids.

When the parasite attaches to the lining of the stomach, the goats' major defense mechanism against that is the immune system. When infectious agents enter the body, the immune system reacts through a series of activities that mobilize various components (antibodies, killer cells, etc) that then attack and kill the invaders. These components act on the parasites in the lining of the stomach. How strong the immune response is depends on several factors.

- The immune system has to mature with age; therefore, young animals are relatively susceptible to infection and become more resistant with age.
- Nutrition and/or stress can alter a goats immune competence. Under poor nutrition and/or stressful conditions, the immune system loses some effectiveness and can not respond adequately. Therefore, no matter what the age of the animal, the effect of the parasites will become worse.
- Adult animals have developed stronger immunity and harbor lower infection levels.

The immunity or resistance to parasites is often penalized at times of nutrient scarcity, and the belief is that this is because scarce nutrient allocation is prioritized to growth and/or reproductive . Indeed, an increased supply of protein, from various protein sources reduces the level of round worms in both growing and doe kidding or nursing.

Nutrition in fighting Parasites

The effects of parasites can be influenced by the nutritional status of the goat. It is well known that well-fed animals can better withstand parasite infections than animals on an inadequate diet. It is also true that parasites interfere with the ability of the host to utilize nutrients efficiently. Therefore, it is important to understand this see-saw effect.

The better an animal is fed the better it is able to tolerate increasing infection levels, but eventually a point is reached, depending on the worms and the conditions involved, where parasites overwhelms the goats ability to function properly. The more parasite infection, the more damage is done to the lining of the stomach which will result in reduced absorption of nutrients, thus making the host utilize more stored body reserves.

Proteins are the building blocks of the goat's immune system so as less protein is available, the more the goat's immune function is compromised Protein and minerals, as well as energy, are important in resisting the effects of the round worm because new red blood cells must be generated to replace those lost to the parasites..

Nutrition in early pregnancy increase fat stores and has been shown to increase the immune response to parasites. Does receiving increased protein levels during late gestation are better able to mount an immune response to parasites.

Fecal Testing Equipment

There are only a few items that are required for you to do your own fecal testing at your farm whenever you would like. The basic items are:

- A microscope
- A microscope slide
- A mixing vial
- Fecal flotation fluid
- Pictures of the normal parasites associated with goats
- A syringe, pipette, or eye dropper

Here is a site that has most of these items. **Precision Chambered Counting Slides.** This is the only place I have found for ordering the McMaster Egg Counting slides. They also have a complete kit that includes the slides, mixing vial, syringes and document on useage.

Microscope

Needs to have 100 times magnification. One eyepiece is all that is required. There are Binocular microscopes with two eyepieces but it is not required. We have a binocular microscope but only

use one eyepiece. If I were buying a new microscope, I would not get one with two eyepieces again.

It is nice to have a microscope that has its own light source. Some cheaper microscopes do not plug into electricity to allow a light source for viewing the slides. They have a mirror that you adjust to focus room light into the microscope. The better the lighting, the better the viewing. Get one that has its own light source.

Mechanical stage: A mechanism mounted on top, or as part, of the stage that allows the operator to move the specimen slide in the X or Y direction by turning a knob. Very useful at higher magnifications as it can be difficult to move the slide by hand otherwise since it must be moved such a small amount. Also, moving by hand can be difficult since you must move it in the opposite direction. If you will be using a fecal counting slide and will be counting eggs, it is important that your microscope have a mechanical stage.

Microscope

Slide:

You need a slide to view your fecal samples. It can be just a basic slide but I would recommend that you get a special slide designed just for counting fecal eggs. The picture to the right is a drawing of a McMaster Counting Slide. It is basically two glass slides with one on top of the other. There are two spaces between the slides where the fluid fecal samples can be placed. There is a grid over each of the spaces. McMaster has two types of counting slides related to the grids. The better one is the side that has the grid lines in green. The grid in green color makes it very easy to get an initial focus. The grid is needed if you want to be able to count the number of eggs in a specific area for comparison reasons. I highly recommend having this type of slide. You use the mechanical stage feature of the microscope to view the contents of this grid top to bottom, left to right.



Mixing Vial

You will need some type of a vial for measuring a required amount of fecal flotation fluid and adding a specific amount of fecal material. When the fecal material material is added to the fluid, you will need to break down the pellets in the fluid until it is in a more liquid form allowing the fecal eggs to float in the fluid. The McMaster Egg Counting Kit has two vials in it for this purpose. The vials have markings to show how much flotation fluid to add and then how much fecal samples to add.

Fecal Flotation Fluid

This fluid is required to allow the fecal eggs to float in the liquid. There are some "ready to use" flotation fluids that you can purchase or you can create your own. At this time, we are using a purchased flotation fluid but will be comparing our results with some of the mix-it-yourself fluids. We are currently using a Fecal Float Sodium Nitrate solution we purchased. A saturated sugar fluid is prepared by dissolving a pound of sugar in 12oz (1 1/2 cups) of water. Saturated salt fluid takes a pound of salt in 38.5 oz (4 4/5 cups) of water.. I found the ready-to-use fluid at www.petsupplies4less.com

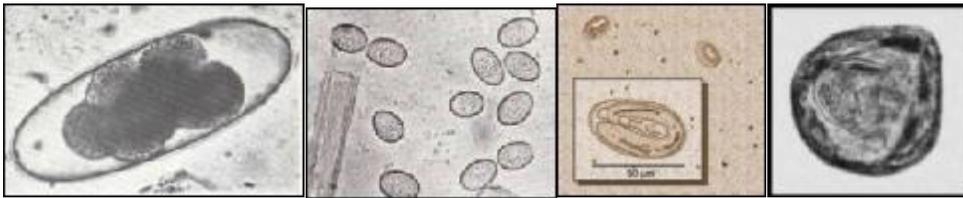
Syringe, pipette, or eye dropper

You need some way of getting a small amount of the fecal sample fluid out after mixing the sample into the float fluid and putting it on the slide. The McMaster Egg Counting Kit has two syringes in it for this purpose.

Pictures of Parasites Associated with Goats

Below are some parasite eggs we have found while analyzing fecal samples. From left to right, they are

- Stomach Worm
- Coccidia
- Common Thread Worm
- Double-pored Tapeworm



Managing your Pastures Better

During the warm months of the year enormous numbers of larvae can build up on your pasture. Your pastures are the primary source of the round worm larvae for your goats. Parasite larvae can live for long periods of time on your pastures. You can't eliminate completely parasites in the pasture.

The magnitude of pasture contamination is affected mainly by

- Stocking rate (number of animals per grazing area). The higher/lower the stocking rate, the more/less feces are deposited on the grazing area, thus more/fewer eggs.
- Genetics of your herd - Some goats have more problems with worms than others and will produce more eggs in the pasture.
- Age of the animals – More eggs are also passed from young vs older animals.
- Season of the year and if parasites in the stomach are in arrested development or not. Most worms have a definite seasonality, so during their season, more eggs are produced and passed.

Pasture management is done by the following:

- Reduce the number of animals in your pastures (see overcrowding)
- Change the browse in your pastures

- Burn the pasture
- Rest your pastures from grazing
- Rotate the animals in the pastures
- Wait to turn your herd into a pasture until after the morning dew is gone which forces the larvae to the ground.
- Dry lot your animals at critical times and feed hay instead of going to a pasture.

Change the Browse

Goats are browsers. Goats love to browse and prefer shrubs and forages to grass. That means goats can be found sampling plants at all levels. Round worm and similar parasites will be found on grass. The larvae normally only travel 2-4 inches up a blade of grass. The higher your animals are grazing above the ground, the less likely they will ingest the larvae. Allowing goats to browse on other vegetation at higher levels will reduce the goat's exposure to these worms. Incorporate browse plant species when possible..

There is growing evidence in work from New Zealand and Europe that grazing or feeding of plants containing condensed tannins (CT) can reduce the fecal egg count, larvae development in feces, and adult worm numbers in the stomach and small intestine.

Researchers are exploring the use of plants to control round worms with medicinal plants having anthelmintic properties. Forages, such as clover, vetches, chicory, and Sericea lespedeza, contain condensed tannins. Condensed tannins can reduce the number of stomach worms and egg production. Some of the forages that may have anti-parasitic effects include Birdsfoot Trefoil, Chicory, Sericea Lezpedeza.

- Sericea Lespedeza - Preliminary test with sericea lespedeza, a CT-containing perennial warm-season legume, have shown positive effects of reduced fecal egg counts in grazing goats and goats in confinement when the forage was fed as hay. Some studies have indicated feeding sericea lespedeza hay to goats can reduce fecal eggs counts by 80 percent and create a higher packed cell volume. We have planted some Sericea Lespedeza this year to see how it will do. It seems to be a very slow starting legume. We are hoping the growth dramatically improves next year so we will feel more comfortable allowing our herd to graze it.. Sericea Lespedeza, when fully developed, is a tall legume and that keeps the goats away from the ground while browsing.
- Chicory – In a study in Scotland, lambs reared on chicory without strategically used dewormers had lower faecal egg counts than their grass/clover grazing counterparts, and grew at similar rates as lambs reared on grass/clover in the presence of strategically used dewormers. The study indicated short and long term grazing on chicory has the potential to reduce worm burdens.
- Hay Grazer - Planting a Hay Grazer forage (sorghum x sudan hybrid forage). This is a forage that grows tall. It can have a tall stem with big wide leaves higher up the stem. The goats only like the leaves therefore they will eat the leaves that are not near the ground and avoid the living site of the larvae. We planted some of this as a trial in one pasture this year. The goats ate the

leaves and left the stem at least 4-5 inches tall. After they had eaten most of the leaves from the forage, we moved them to another pasture. In no time at all, the hay grazer shot up several feet tall again thus allowing our goats to come back and graze the higher forage again. The major focus on planting this is it keeps the goats away from the ground level where the parasite larvae are living.

Rotate the pastures

Rotating your animals to different pastures may help reduce the number of larvae available to them. The longer you can wait before grazing your herd in a pasture again, the better the chance that some of the larvae have died thus reducing the number of larvae that your goats may ingest to start their life cycle again.

As long as your goats are on the pasture, they are continuing to drop their pellets with millions of parasite eggs just waiting to hatch. The longer a pasture is resting from goats on it, the more larvae die and no new eggs are being dropped for future hatching. However, the main reason many breeders use pasture rotation is not for parasite control but to provide the most nutritious forage for growth and development. If grazed correctly, most forages reach the next most nutritious stage in about 30 days, so many rotation schemes have the animals returning to pastures at around 30 day intervals. Unfortunately, this 30 day interval is also about the same time necessary to ensure that the previous worm parasite contamination has now been converted into the highest level of contamination for the next grazing group.

Thus, 30 day rotation schemes may actually lead to increased worm parasite problems. In fact, heavy exposure over a short period of time can lead to disastrous clinical disease and losses. Rotation schemes of 2-3 months have been shown to have some effect on reducing pasture contamination in tropical and subtropical environments but in more temperate environments, contamination can extend out to 8-12 months depending on the conditions. For the most part, it is impractical to leave pastures ungrazed for such extended period of time.

Rotational grazing generally does not help to control internal parasites unless pasture rest periods are long enough (> 70 days). In fact, management intensive grazing (short duration, high intensity grazing) may exacerbate parasite problems in goats because the goats are grazing low to the ground right where the larvae are living..

A Clean or Safe Pasture

- A clean or safe pasture is one in which sheep or goats have not grazed for 6 to 12 months
- A tilled or burned pasture helps reduce the larvae count in it and certainly can make it safer
- If other animals like cattle or horse have grazed a pasture, they have consumed some of the larvae. The larvae are not harmful to them
- If a pasture has had hay removed from it, that will also reduce the height of the grass and allow more heat and sunlight to impact the larvae

- When possible, use the pasture for hay cutting after grazing. This will help to break the worm life cycle and prevent re-infestation. Direct sunlight during the summer months or during freezes in the winter will also help decrease the population of larvae that remain in the soil.
- When possible, alternate the pasture with a short cycle crop, such as culture alfalfa. This management practice will help to break the worm's life cycle, and decrease larvae population in the pasture and prevent re-infestation.
- The effect of mowing, if any, is not large. The proven effect of mowing early in the grazing season on pastures has resulted that farmers and extension workers think that a mown pasture is safe. Unfortunately, the preliminary data presented in studies demonstrate that this is not necessarily true for goat pastures that have been contaminated earlier in the grazing season.. Most goat farmers in the study indicated that they had mown in between grazing periods. Nevertheless, problems occurred on some farms applying mowing in 2002 Thus, the study concluded that they have to convince farmers that they should not only rely on mowing as a measure to get clean pastures.

Be Selective in Deworming

Parasite Drugs (Anthelmintics)

Anthelmintics are drugs used against parasites the either kill the egg laying adults or kill the larvae before they become capable of laying the harmful eggs. While that sounds like it cures all of the problems with the parasites, the reality is the parasites have developed a resistance to almost all of the known drugs that are used against the parasites. Research after research has stated that the resistance is coming from the drugs being overused and/ under dosing of a drug when they were used. This resistance parasites have to these drugs makes the fight against them extremely hard because it takes away one of the key tools breeders use to have for helping control the parasites.

Classes of Drugs

Benzimidazoles – (the white drenches). While these are effective against many types of internal parasites, it is low against the Haemonchus parasite. There are several drugs in this family. They are:

- Albendazole
- Fenbendazole
- Mebendazole
- Oxfendazole
- Oxibendazole

A big problem with the Benzimidazole type of drugs is if parasites become resistant to any one of these drugs, they are also resistant to the others even if you have not been using them.

When giving benzimidazoles by mouth it is better to hold the animals off feed for 12 to 24 hours before treatment (don't remove water, just food). The drugs will not pass so quickly through the GI tract and active levels will be maintained in the body longer.

The Benzimidazoles (Safeguard®, Panacur®, Valbazen®, Synanthic®), also called "white dewormers" are broad spectrum and safe to use. They are effective against tapeworms. Albendazole is effective against adult liver flukes, but should not be used in pregnant or lactating females

Avermectins

The two drugs in this class are ivermectin and moxidectin.

The Macrolytic lactones or "avermectins" (Ivomec®, Dectomax®, Quest®, Cydectin®) are the newest family of drugs. They are broad spectrum and have a wide margin of safety. They are also effective against external (biting) parasites, including nose bots. Moxidectin is a persistent-activity dewormer that continues to kill worms after it is administered.

Imidothiazoles

The main drug in this family is levamisole and has shown to be very effective against the round worm. There has been less parasite resistance shown against levamisole but that could change with breeders starting to over use it as they have all of the other drugs.

Levamisole (Tramisol®), also called a "clear dewormer" is broad spectrum and effective against arrested larvae. However, it has a narrower margin of safety, especially in the injectable form. Pyrantel (Strongid®) is only effective against adult worms. Moratel (Rumatel®) is an oral feed additive and is only effective against adult worms.

Deworming

“The most important aspect of using dewormers is to conserve their effectiveness. This can be achieved by using them as little as possible and only when infection levels dictate that intervention is necessary. The old concepts of treat all animals when a few show signs or all animals at regular intervals (shorter than every 3-4 months) is no longer warranted because it promotes dewormer resistance.” Louisiana State University.

Research and the goat experts use to recommend deworming the entire herd and then moving them to a new, clean pasture. That is no longer the thinking that is coming from the recent research. The problem the “deworm and move to a clean pasture” strategy has is related to the breeding of the parasites inside the stomach. That is the only place breeding occurs that result in the eggs. If a goat only has the most resistant parasites in their system, the breeding can only produce similar strong, resistant parasites. However, if some parasites are the less resistant ones that breed with the stronger, resistant parasites, the product will be parasites that are not as resistant as the most resistant ones.

Recent recommendations are to deworm only the animals that really need it and leave them in the same pasture for a few days before rotating them. This helps keep some of the less resistant parasites in the system to help minimize the number of “super parasites” in your herd.

Goats generally metabolize drugs faster than other animals such as cattle. This means the drugs may go thru the goats system faster than other animals. Since most parasite drugs are actually developed and approved for animals other than goats, the directions and doses may not be best for goats. A larger amount of the drug may have to be given to be effective and instead of giving an injection or pouring it on, it generally need to be given to goats as a drench.

Another recommendation for breeders to consider is to dry lot the herd for a day or two after they have been dewormed to minimize the number of eggs and larvae that survived the deworming are not being dropped in the new pasture.

Per-Parturient Rise (PPR)

A phenomena called the “per-parturient rise” (PPR) in fecal egg output. This occurs at or around kidding time and extends through most of the nursing period. Because the kidding and nursing are stressful conditions, the dam’s immune system is compromised. Furthermore, nutrients are partitioned preferentially to support mammary and fetal development and then lactation, which also decrease the animals’ ability to generate an effective immune response to worm infection. This allows the existing worms to increase the number of eggs laid, thus increasing the number of eggs deposited in the feces.

Do not deworm and move to clean pasture (no animal grazing for at least 3 months) as those worms that survive deworming are probably resistant and then the new pasture will become more highly contaminated with eggs/larvae of resistant worms

Refugia (untreated worms)

Worms that are not treated are called “refugia.” The concept of refugia has been largely overlooked in the past. Having some worms in refugia (not treated) insures that a level of genes remain sensitive to dewormers. (Kaplan, n.d.) A surviving population of untreated worms dilutes the frequency of resistant genes. Consequently, when a dewormer is required, it will be effective because the worms will be susceptible to treatment. (Kaplan, n.d.) When fewer numbers of animals receive treatment, the refugia population remains large. The more refugia, the better. Sustainable techniques, such as FAMACHA©, fight drug resistance by increasing refugia. In contrast, several practices accelerate drug resistance. They include frequent deworming (more than three times a year), under dosing (often caused by miscalculation of body weight), treating and moving to clean pasture, and treating all animals, regardless of need. These practices lead to resistance because they decrease the number of worms susceptible to dewormers (refugia).

Since no dewormer is 100 percent effective 100 percent of the time, worms that survive a dose of dewormer are resistant to that dewormer. Frequent deworming increases the rate resistance develops. Each time animals are dewormed, the susceptible worms are killed. The strong ones survive and lead to a population of very resistant worms. Underdosing causes larger numbers of stronger worms to survive. The weakest, most susceptible worms are killed. But because of the weak dose, more of the stronger worms will be able to survive and reproduce, creating a population of stronger worms. Once an animal has been treated, only resistant worms remain. If the animals are moved to a clean pasture they deposit only resistant worms on the pasture. There are no susceptible worms to dilute the worm population. Treating all animals regardless of need ignores the importance of refugia and will lead, in time, to a population of worms unkillable by dewormers.

Anthelmintics should not be used indiscriminately. Frequent deworming is costly. It accelerates the development of anthelmintic-resistant worms and leads to a false sense of security, which may result in unnecessary production losses and animal deaths. The routine use of anthelmintics is prohibited under the new National Organic Standards.

Another concept that has also been reported to have some success in improving effectiveness is to take animals off feed for 24 hours before administering the dewormer. This will reduce rumen motility and the dewormer will pass through the gut slower and have more contact time with the target worms.

Checking for Resistance

Anthelmintic resistance is when the drug no longer works because the worms have developed a tolerance or resistance to it. Anthelmintic resistance is determined by a fecal egg count reduction test (FECRT). Animals are weighed and treated with the anthelmintics and fecal egg counts are conducted at the time of treatment and 7 to 14 days after treatment. If the anthelmintic kills 90 percent or more of the worm eggs, it is considered to be effective. If it kills 60 to 90 percent of worm eggs, it is considered to have a moderate level of resistance. Anthelmintics killing less than 60 percent of worm eggs are considered to have severe resistance.

The FAMACHA system monitors clinical anemia (reduction of red blood cells, packed cell volume) by examining the color of the goat's lower eyelids and comparing it to a color-coded chart. Variation in eyelid color from pale to red indicates the degree of anemia. Based on this chart, only goats with anemia should be treated. This practice will prevent the overuse of anthelmintics and consequently minimize chances of parasite resistance to anthelmintics. The test has an effectiveness of 90 percent compared to the 20-30 percent effectiveness of overused anthelmintics.

Avoid Buying Highly Resistant Parasites

- Don't buy animals that show signs of having resistant parasites. If you do purchase – aggressively treat for parasites and quarantine them in a dry lot for 21-30 days. Treat them with three different classes of dewormers.
- Be leery of buying animals from a general sale where you don't know anything about the history of the animal.
- Question the breeder concerning what their parasite management is. Many breeders worm on a regular basis whether the animal needed it or not. They may not test to see if their dewormer was effective. This can result in your buying a goat that has just been dewormed having a ton of super worms.
- Some breeders that show animals or have kids showing in 4H/FFA may be worming every 3 weeks regardless of the worm status. This can create super worms that nothing can kill and it is not difficult for those worms to be passed on to the general herd.
 - **Condensed Tannins vs. Better Genetics & Management to Combat Worm Problems**

- We started a project in 2007 (worm resistant breeding) to see if we could dramatically reduce the worm problems that had been occurring in our herd. The worms had built up a resistance to almost all of the dewormers and no new dewormers were projected to be coming. We reviewed all of the recent research studies we could find and developed a program to include almost every tool we could find in reducing the worm problems.
- One of those tools was to include browse in your pastures that contained Condensed Tannins. Those included Sericea Lespedeza and Chicory. After several years, we have decided to quit trying to raise browse with Condensed Tannins and continue our focus on identifying better worm-resistant genetics and other management tools. This article is offered to discuss why we made that decision.
- Browse with Condensed Tannins
- In 2007, we ordered several bags of Sericea Lespedeza seed, which is very expensive. The individual seeds are extremely small. We are big amateurs at preparing a pasture and planting new browse seed. We had purchased some Crimson Clover seeds earlier to try and grow fall browse that had high protein content. It also was a very small seed. We broadcasted the seed across several of our sub pastures that contained Coastal Bermuda grass. The Crimson Clover did great and popped up everywhere. We did the same thing with the Lespedeza and saw nothing. We had read that you need to have limited grazing on the first year of the Lespedeza in order to allow it to get a good start. We left one pasture vacant for almost one year but could not find anything coming up that looked like what we thought it should look like.
- The second year, we finally found a few sprouts that we believed was lespedeza. However by the end of the second year, it was almost impossible to find in the one spot it had been seen before. The third year we found a few more plants in a little bigger area but by the middle of summer it was almost impossible to find those few plants again. This is a plant that is listed as an invasive plant that can take over an area and be next to impossible to get rid of.
- Many people have told us you can take this seed and throw it out on the poorest soil you have and it will grow. I believe that may be true. When I talked to the people selling the seed, I asked about planting it with the Bermuda grass. They said it might have a difficult time competing with the Bermuda when first planted. However other web sites discussing lespedeza and how to plant it, state it can be broadcasted. It seems to me the pastures would have to really be prepared in such a way that nothing else is growing there. That is something I can't afford to do and really don't have the capability of doing. I can't just wipe out all of the browse in a pasture and then allow it to set for a year hoping the lespedeza will come up. I need all of the pastures I have for good rotation and if it did come up, I have to look at if that really is the best long range plan for reducing any worm problems.
- If you look at the research papers on lespedeza, it states goats grazing on lespedeza have shown reduced worm egg counts while they are grazing on it in a pasture or eating in a hay form. However, when the lespedeza is removed, the worm egg counts go back up. That is a big drawback with me. That means if I had lespedeza for our goats to browse, they would potentially have less worms. However, when I sell an animal none of that

protection goes to the new home unless they also have lespedeza. That means the lespedeza is only a temporary patch for the problem at a specific farm and that does not move the industry along toward helping the serious worm problem across the world.

- Better Genetics and Management Programs
- While we were trying to get the Condensed Tannin Plants growing in our pastures, an amazing thing happened. Our worm problems started to decline dramatically each year over the last three years and that is without the Condensed Tannins. The link above to "worm resistant breeding" discusses the approach we took and why. The monthly health checks of each animal, deworming by exception, proper culling and focusing on specific genetics have completely changed the quality and health of our herd. This year had some heavy rain in the spring and especially heavy rain in the fall. Each time my wife said the weather was really going to bring out the worms and the worm problems. It did not. Worm eggs have to have good moisture and warm temperatures to allow them to spread. While we would see a little jump in worms with some animals, by far, all of the other herd did not require deworming and they continue to look healthy and fit.
- Here is a note we received on October, 2009 from a breeder in California that had purchased some of our genetics from another California breeder.
- "My name is xxxxxxxx and I live in xxxx, CA. I visited your website today and noticed the picture of Choctaw Chick and your statement about her bloodline having a clear genetic worm resistant trait. I am a happy owner of a Maul Bold Warrior daughter. She was produced by a doe named AABG/LOID Headlines who is here in California. I wanted to write you and tell you how pleased I am with this doe. I can attest to your claim about worm resistant bloodlines. This particular doe gets wormed about once a year. I have to say she has never shown signs of needing it but since I don't do fecal counts, I do it just because in early spring around kidding time when the grass is wet. I have never had a problem with this doe. She is the easiest keeper I have. Her coat is always slick and shiny and she is almost never dirty. Which to me is another sign of worm resistance - A goat that always looks clean and bright"
- We love to hear things like this. The key point for us is lespedeza may help reduce worm eggs while it is available to the animal but better genetics for worm resistance follows the animal no matter where they go and very likely can show up in the offspring. That is exactly what we are finding.
- Many of the offspring from our "high worm resistance" Does, also show signs of being resistant to worms. We have identified many animals that are high worm resistant and have been able to validate their offsprings are showing the same thing. The email mentioned Choctaw Chick that was shown on our web site. She is now around 18 months old and never been dewormed. When you look at her, she has a very healthy coat. Her dam was Susie Q and she has only been wormed 3-4 times in 3.5 years. Susie Q's sister is Mascott and she is the same way. Mascott's kids are showing the same thing.
- Our focus has become selecting the genetics with "high worm resistance" and not the ones that may do best in the show ring. When Susie Q and Mascott were born, we were just starting our program for improving the genetics. If we had not been in that program, I

don't think we would have kept them. They were both beautiful Does but they were not as big initially as some of our other Does. One research paper mentioned that animals with an immunity to worms may be somewhat smaller because the immunity requires protein. So some protein may go to building up the animals immunity instead of faster growth. We would prefer to have animals that have limited to no worm problems than trying to see how wide and long we can breed them to be.

- Summary
- In May, 2008, we needed to dewormed 20% of our herd. May, 2009 only 2% of the herd needed dewormed. We have sold some great animals, and some show quality, that just did not do as well as other animals in handling worms. We are hearing back from breeders that have some of our genetics that their animals are showing worm resistance. We have no idea if that is an exception or a trend. We know that every farm has different worm issues, different weather, and different management styles. We certainly don't claim that animals coming from our farm will do better against worms on a different farm. Here is what we can state.
- We have monthly records of each of our animals that show the status of their eyelid color, if they were dewormed, status of their coat, body and hooves.
- We can assure breeders that they will not be getting animals with super worms that are resistant to dewormers. If you read some of our articles on "Refugia", you will see that we believe in having some worms in our pastures that have not come from heavily dewormed animals thus causing them to be highly resistant super worms.
- We have clearly documented how we manage our herd to try and minimize worm problems.
- We have decided that it is better to breed for better worm resistant genetics than to try and raise specific plants with Condensed Tannins to possibly reduce worm eggs only while the browse is available. We will continue to be focused on the long term strategy with our breeding program and, as always, we will require that all goat features be financially justified and not judge justified.

Refugia - Secret Weapon Against Drug Resistant Worms

"Refugia" Definition by University of Namibia in South Africa

The word "refugia" is used to denote parasitic populations that have not been exposed to a particular drug and hence still contains a large proportion of susceptible organisms.

"Refugia" is a word that is rarely heard or mentioned in the goat industry. I ran across it in a research paper while I was trying to better understand the worm problem and all of the recommendations for "pasture rotation" that I kept seeing. No one was describing exactly how to do the pasture rotation, especially when a breeder only has a small amount of acreage. I was totally surprised when I started reading about refugia and worm immunity in goats. This article will only discuss the refugia topic.

I believe that there is a vast amount of bad information being given word of mouth and through goat chat groups about worming and I have never read any of the chat group experts discuss or

recommend breeders need to understand refugia. Below are some examples of worming recommendations coming from goat chat groups with a heavy emphasis on "worming the heck out of the goats and moving to a clean pasture". NOTE - there is no such thing as a "worm free" goat after worming.

- "I worm them 3 weeks prior to kidding when I booster vaccinations, I also worm the heck out of them when I am doing vaccinations. For me it is more practical to do all of them ahead of time."
- "Horn peeling can occur in response to stress from worms or nutrition or both. I would worm the heck out of them and get them on good feed and pasture until they straighten out."
- "usually you worm after a 4" rain"

Now, what does refugia mean to you and how does it work.

Before we discuss refugia related to parasites and pastures, it is good to have a basic understanding of how "biological warfare germs" are created. A scientist starts out with some germ being selected. In our example, we will take the flu germ. The scientist will take whatever the strongest antibiotic against the flu, significantly dilute it down and then put the diluted medicine in with the flu germ. This will kill most of the flu germ but a small sample will survive. The scientist allows the germ to grow and then more antibiotic is placed with it but less diluted. Again, most of the germ dies. The surviving germs are allowed to grow and other rounds of antibiotics are added with less and less dilution until the antibiotic is added full strength. It soon results in the antibiotic having no effect on the flu germ and the germ is now a serious problem because there is no known medicine for the drug resistant germ.

Worm larvae in a pasture can follow the same result. Initially, the worms were not resistant to any drugs. As more and more of the first drugs were used, the worms became resistant to that drug and the breeders started using the next drug. Again, the worm becomes resistant to the next drug and breeders continue to move to another drug until there are no more new drugs to use. At that time, breeders were recommended to rotate to "clean" pastures. Breeders were told to "worm the heck" out of the goats, hold them in the barn area for 24-48 hours and then rotate them to a "clean" pasture.

Here is the problem. Worms only breed in the goat's rumen. If you "worm the heck" out of all of your goats and then put them in a "clean" pasture, the only worms the goats will pick up as they graze, are the worse ones. The ones that the best de-wormers in the industry could not kill. What is even worse is, there can be 4-5 generation of worms in a single year.

Let's take an example of assigning a number to indicate how drug resistant the worms are. 0 = no drug resistance and 4 = the strongest worm resistance. We have already discussed the "0" resistant worms and how continual worming has now created the "4" resistant worm. Now if you worm with multiple de-wormers, increased strength or wormed over several days, you have killed much of the "4" resistant worms and now you are rotating the animals to a clean pasture where only "4.5" resistant worms will be and that is generation 1. Generation 2 will create "5" resistant worms. Generation 3 will create "5.5" resistant worms. Generation 4 will create "6" resistant worms. This all occurred in just one year.

With "refugia", you try to maintain as many low resistant worms in your animals and pastures as possible. This is done by ONLY DE-WORMING when it is absolutely necessary and culling the goats that have the biggest problem with worms. 20% of your goats, produce 80% of the worm problem. Now, when the animals go to the "unclean" pasture, there will be more of the low resistant worms and the goats are adding fewer of the most resistant worms. This means the goats are much more likely to pick up low resistant worms than the most resistant worms. When the "0" resistant worm breeds with the "4" resistant worm, the result will be "2" resistant worm eggs. You have reduced the resistance in the worms on your farm. Plus, the research states that the less resistant worms are more likely to attach to the goats rumen while the most resistant worms just coming from the drenching will still be weak from the treatment.

The other concept that goes along with this as stated in one of the research articles is related to worm immunity in goats. It states that goats have to have some worms in their system to maintain their immunity. Without any worms, the goats system will lose its immunity. Think about what you are doing when you vaccinate annually with your CD/T vaccines. If it is not done annually, to keep it in the goats system, the immunity goes away.

Summary

- We totally believe in this concept of "refugia". Our total management program is now based around
- Worming only as the last resort
- Culling the goats with the most worm problems
- Rotating pastures
- Selecting goats with high worm resistance or immunities
 - **Internal Parasite Storm Hits Hard**
 - There has been an internal parasite storm hit many areas of the country this spring following the unusual month after month of rain. It is leaving a path of dead animals and has devastated many herds. Kids that looked like potential Grand Champions this winter, did not look good enough to sell for slaughter by the end of spring if they were still alive. We have been hearing from breeders near and far that they are having the same problem.
 - In the 10 years we have been raising Boers, we have never seen anything like this. It makes it even more difficult to understand because we have just completed our move from Central Texas to North Texas. In Central Texas, we have had heavy rains before but we did not have real pastures for our animals to graze on. We mainly supplemented them with grain and hay. With no grazing potential, we had little problems with worms. Now at our new farm, we have lots of different pastures and tons of grazing but are afraid to let them graze because of so much rain. And that may not be the real problem after all. We may have had the same problem back at our old farm and just don't know it.
 - This is one reason we have started writing the articles about the Boers being "**High Maintenance**". Now some breeders in wet climates may be saying "welcome to what we live with year round". That is the bigger problem. We attended a Parasite seminar by a

Texas A&M professor and he indicated that breeders in wet climates like the coast may have to reconsider raising Boer goats. He said many of them are having to use 2-3 different wormers together every 3 weeks and they are losing ground. He also said there are no new wormers coming.

- The message is breeders are going to have to learn to manage then better because you will not be able to doctor your way out of this problem. Breeders in desert climate areas like South Africa and West Texas may have little problems. Breeders in heavy wet climates may not be able to raise Boers at all. Then there are the breeders in between, like us. Much of the time we are in a drought however occasionally we will get a heavy rainy season.
- What has totally caught our attention during this parasite storm is when we look beyond all of the sick and dead animals, there are others that don't seem to show any sign of problems and are doing great and have beautiful shiny coats. Another surprise is finding breeders with just scrub goats that are not having any problems. How can some animals be doing great while others around them are dying and looking terrible?

Characteristics & Priorities

Choice 1

- A doe with perfect teats but is always the first animal to show signs of being wormy
- A buck that can be made to walk perfectly straight if his hooves are worked upon monthly however if no work is done, the hooves get in terrible shape and significantly impacts his ability to walk properly.
- A doe that has a beautiful long, feminine neck and always does good in the show ring but always has difficulty kidding and requires assistance.

Choice 2

- A doe with functional, but not show quality, teats and rarely shows signs of worms even when the rest of the herd is looking wormy.
- A buck that has a small, natural outward swing to one of his back legs but can go a year without any hoof work and still have little to no impact on his walking.
- A doe that has a shorter neck but never requires any assistance in kidding.

You have to be able to make some tough decisions related to the importance of different characteristics according to some target/goal you have set for your breeding program. Here are some characteristics that are very important but are not listed in the standards.

- **Hardiness** - Ability to withstand diseases and parasites better
- parasite resistant

- lack of pregnancy toxemia
- resistant to respiratory diseases
- **Fertility** - Ability to produce 2 or more kids per breeding season without problems.
- **Self Reliant** - Requires minimum assistance breeding, kidding or their daily lives.
- kidding on their own
- raising kids to weaning age
- minimum hoof maintenance
- **Longevity** - Has a long, productive life, e.g.. 9+ years

We are creating a form to document several of these specific characteristics that we observe in our animals and then also list all illnesses and problems for each animal. This helps us each year decide which animals to keep or add to our breeding herd. The specific characteristics we are observing and their priorities are:

- Parasite resistant
- Raising kids to weaning age
- Fertility
- Kidding on their own
- Hoof quality and maintenance required

General problems

According to the importance of the listed characteristics, you need to consider what you are willing to overlook in order to have that special feature. Some of these characteristics become even more important if you can see it is being passed on to the kids. Here is an example of our list for Parasite Resistant

- We will accept "functional teats" over clean teats if it is a quality doe.
- A small overbite.
- Slightly loose shoulders
- We will accept an animal that does not have a perfectly straight walk.
- etc.

When we are evaluating our animals each year, we can't say an animal will not stay or be added to our breeding herd just because they did not have the first priority. Finding parasite resistant animals will likely be hard to do. We will be looking at which animals have multiple of the lower priority characteristics and then animals that have done better in the lower priority characteristics

than other animals in our herd. Every year, we want our herd improving in one or more of these characteristics.

Health Issues Resulting in "High Maintenance"

Health problems with our Boer goats seem to change year to year. Now that we have moved to a new farm, it seems different environments can cause health issues to be more intense or less intense. This article can only be from our perspective on the two farms we have lived on while breeding Boers.

- **Farm 1** - Around Austin, Texas. We had access to around 10 acres but little opportunity to divide for rotating. Some Bermuda grass for grazing. No opportunity for planting other forage. We had times of drought and times of extended wet weather. Had around 50 breeding animals.
- **Farm 2.** - Northeast Texas. We have around 15 acres fenced for barn and 5 sub-pastures for rotation. We have around 35 breeding does. Some Bermuda grass, burr clover, arrowhead clover and other native forage. We have done winter seeding of turnips, winter rye, hairy vetch and Austrian Winter Peas. We have 18 other acres just for raising our own hay which is "hay grazer".

Now let me discuss the health issues that have caused us the most problems over the years and that we are now placing a heavy focus on the minimizing or eliminating the "high maintenance" results.

- **Worms**- Now that may not be a big surprise to most breeders but until this spring we have had few problems compared to what occurred this spring at our new farm. This spring, our herd was hit especially hard by stomach worms. The medication we had been using seem to have no affect on the worms this time but the worms had a very bad affect on the herd. It was not just our herd that was affected. We were hearing from many breeders that they were having problems and animals were dying. This worm storm came after a spring of above average rainfall. Extensive time was spent reviewing animals for signs, individually doctoring the the ones hit the hardest, gathering wood for burning dead bodies, treating the whole herd over and over again trying to get ahead of the problem.
- **Bloating** - We had rarely had any problems with bloating until 2007 spring and then we lost four adult does quickly that we believe was from bloating. Our neighbor lost animals that we believe had bloat. We heard from many breeders that seem to have animals getting bloat. Animals dying from bloat is a high maintenance hit because of the value of the animal lost and any future production that could have been achieved. It hits hard in high maintenance labor if the animal that died was nursing kids that now have to be bottle fed.
- **Enterotoxaemia** - We are just guessing some of the problems we had were a result of enterotoxaemia. We lost around eight young kids this spring that just all of a sudden were found dead. The year before we moved to the new farm, we had a terrible year of losing kids after birthing that we will assume was from enterotoxaemia. We get many emails and calls from

breeders that have had kids healthy on one day and dead the next. This disease is a cost issue and not a labor issue.

- **Birth Problems-** This is both a labor and cost issue according to how the birthing turns out. We have labeled our 2005 kidding season as the Kidding Season from Hell. We lost about 1/3 of our kids that season. Not all of the dead kids resulted from the time of kidding, but we did have a significant number of does have significant problems kidding and we lost a few. We have made a decision that we can not run to the vet for a c-section every time a doe has a difficult time delivering her kids. The problems that may result from birthing problems are
 - dead doe
 - dead kids
 - kids that need bottle feeding
 - extra weak kids
 - does that need attention to get them back healthy
 - Heavy labor on the breeder's side in trying to assist in delivering the kids.
- **Pregnancy Toxemia** - This year, we only had one doe come down with this but last year we had at least 4-5 does that had to be taken care of for Pregnancy Toxemia. We have had one doe that resulted in 6 weeks of extreme support where the doe literally could not stand on her own. This can result in heavy manual labor to keep these does alive and have a successful kidding. It is also easy to have this result in a cost issue if you lose the doe or the kids.
- **Mastitis** - This can be a heavy cost issue and a labor issue. We have lost several does to Mastitis. This has always occurred soon after kidding and generally results in a requirement for bottle feeding the kids. If the doe is not lost to the Mastitis, it is likely she has at least one side of her udder that is no longer usable in the future. There is also the time required to doctor the doe several times a day treating the disease.
- **Hoof trimming** - Although this is not a problem normally where you lose an animal, it can be extremely time consuming if it is done and more frustrating, if it is not done, every time you walk through your herd seeing the poor shape their feet are in or the difficulty some are having walking.

We understand that breeders can call a vet every time they have a sick animal or send off the dead bodies to be evaluated but there comes a time where a breeder can not justify the cost of having every death or illness analyzed by a vet or university. We have spent thousands upon thousands of dollars carrying animals off to vets. We have learned a lot from those visits to the vets but a time must come where the breeder no longer spends their time trying to learn how to doctor a problem but starts to focus on how to raise animals that have fewer of these problems and how to minimize the cost and labor required to raise them healthy. The next article will take these problems and discuss how we are attacking each of them to minimize or eliminate the problem.

We are approaching these specific areas looking for the following:

Is this problem unique to the Boer Goats?

Could the problem be caused by improper management by us or are there ways we could improve our current management that would help minimize the problem?

Can the Boer breed be improved through selective culling and different breeding criteria other than looking good for showing?

The sources for "High Maintenance" in our situation are listed below and we will look at each of them individually:

- **Worms**
- **Bloating**
- **Enterotoxaemia**
- **Pregnancy Toxemia**
- **Mastitis**
- **Hoof trimming**
 - **Breeding for Worm Resistant Animals**
 - We started a program in 2007 to try and develop our herd into a more worm resistant breed. We are very excited about the progress we have seen as we enter 2013. Our program was basically to understand which animals needed more de-worming throughout the year and which ones needed little or no de-worming. We started out doing a monthly maintenance check at the beginning of each month and document our findings according to our **Monthly Management program**. We started identifying animals that seemed like they never needed worming and others that seem to have a worm problem more than others. We started culling the animals that needed more de-worming. Animals needing less de-worming are the genetics that we want to keep. We often see the offspring from those animals are more worm resistant also.
 - After a few years, we no longer do our monthly program every month. We can now tell if there are some changes in the animals and if we don't see any changes, we may bypass the program if no vaccines are needed at the time. It is clear to tell that we are de-worming far fewer animals now than we did back in 2007. We also follow the refugia program now. The basic focus is to ensure we have animals in the pastures that have not had much de-worming and animals that have had some de-worming. When the worm larvae from each type of animal is ingested, some worms will be less resistant and some more resistant to the larvae. Those larvae will breed and result in worm eggs that are not as resistant to the worms. This keeps the average worms in the herd to be less resistant.

Monthly Maintenance Review

This was refined after we reviewed our problems causing high maintenance and excessive loss of animals. See the article at [High Maintenance](#).

Our Monthly Maintenance Review is something that has been evolving over several years. It has been an informal process with scattered documentation that now must be a more rigid process with consistent documentation and specific follow-up steps clearly defined to move our herd to definite short and long-term objectives. As the objectives are met or missed, the Maintenance Review process will be adjusted to continue to move forward with the objectives. Our objectives and definition of "quality in our herd" will be clearly documented for all to see.

Our current Monthly Maintenance Review will follow these procedure steps. Anita and I do this together. I catch the animals, do the evaluation and give any appropriate medication. Anita documents the evaluation info on the animals' specific health chart and prepares any medicine or treatments that an animal will receive. That is also documented.

On the first of each month we will do the following:

- The evening before the review, all animals will be removed from any food source until we have completed the review that will start mid morning the next day. This is done because, if any animals require worming, the wormer is more effective with little food in the rumen.
- Our animals are moved to catch pens where we can inspect each individual animal.
- The first inspection is evaluating the lower eye membrane color and assigned a value of 1-3. We do not use the FAMACHA charts because we don't think most people can tell the difference of 5 different shades of the membranes. Plus we believe that the breeder has to understand for their self what the different shades mean by doing their own fecal tests after reviewing the membranes of their own animals.
 - 1 - membrane shows dark pink color indicating little to no worm problem
 - 2 - membrane shows medium to light pink color indicating some worm problem but no treatment to be given
 - 3 - membrane shows pale to white color indicating worm problem that requires immediate treatment. Animal will be wormed at that time. A few of the animals wormed at this time will have a fecal test done on their pellets in 10 days to determine how well the wormer is working. This is done to determine when a wormer has become ineffective.
- The coat condition will also be checked and assigned a value of 1-3
 - 1 - shiny coat - little to no worm problem
 - 2 - dull coat
 - 3 - rough coat
- Body condition with value of 1-3
 - 1 - good weight and body shape

2 - some weight loss

3 - significant weight loss

- Did the doe have nursing kids at the time of the review? (a nursing doe may be under more stress and more sensitive to worms than does not nursing kids)
- The shape of their hooves are checked and assigned a value of 1-5
 - 1 - in good shape with no signs of problems
 - 2 - in ok shape but starting to show some signs of growth or turning to one side
 - 3 - starting to look bad but could trim on their own at this stage. As the hoof gets extreme, it may break off on its own and not require attention from us. We prefer that.
 - 4 - hoof is in bad shape and does not look like it will do any self-correcting. Animals with a 4 value on their hooves will be scheduled throughout the next 30 days to have their hooves trimmed.
 - 5 - hoof was trimmed by us at a later date between reviews.
- Any required vaccines will be given at this time.
- Any doe scheduled to kid before the next review, will be given a cd/t shot (to help prevent Enterotoxemia in the kids before they receive their vaccines)
- Any kids born since the last review will be given a cd/t shot (to help prevent Enterotoxemia)
- Any kids receiving their initial cd/t shot last review, will receive their booster.
- Any kids 2 months old will receive their first respiratory vaccine.
- Any kids 3 months old will receive their respiratory vaccine booster.
- Once a year, all other animals will receive their respiratory vaccine shot.
- Any lice treatment will be done at this time.
- When kids are 2 months old, they will be ear tagged.

Even though this seems like a lot of maintenance, and it is, the real purpose of this is to document what the status of the health was for each animal and what was the environment that could have affected them. This information will also include the day to day health activities that required treatment, what the treatment was and how effective it was, birthing and mothering experiences. This process will likely be reduced once we better understand our herd and have been through several culling phases.

It is impossible to cull an animal or decide to keep an animal if you don't have all of the health facts documented where you can compare one animal against another. It is also good information to offer a buyer of one of your animals. However, you can never use this type of information

effectively if you don't have some priorities that go along with them that aid you in achieving your goals, objectives or whatever you want to call them.

This Monthly Maintenance Review may become a very valuable tool for us in achieving a "low maintenance" herd of animals or it may be a waste of time and achieve nothing. Only time will tell.