

Breeding Better....Worms?

Worms, Drenches, Refugia, and Anti-Parasite Camelid Management

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You may not know it, but you are a breeder. It doesn't matter if the only animals you can see out in the paddock are wethers, for those animals are full of tiny animals. These are the "worms", the microscopic parasites that inhabit your happy stock. Your animals pass the worms' eggs out with their faeces, and juvenile worms get back into their hosts when the grazing animals inadvertently eat them along with the grass. You are breeding worms. You can breed them to be stronger worms, able to resist any drench we can throw at them, or you can breed weaker worms that your camelids can control on their own.

Similar to the way grasses have evolved along with grazing animals to survive being eaten, so the grazing animals have evolved alongside the parasites that inhabit them. Your alpacas are designed to carry a certain "worm burden" with no problems at all. The camelid immune system is designed to do battle with these intruders, in fact the immune system would run haywire if it did not have its usual enemy to fight against!

Problems arise when, for whatever reason, the number of worms grows greater than the animal's immune system can handle. This is where illness and even death can occur. For the last half century we have had a quick and easy solution to the problems of worms - drench! Drench (wormer) is a family of chemicals known as anthelmintics, poison for the worms living within.

The introduction of chemical drenches helped to revolutionize farming after the Second World War. Animals could be stocked at much higher rates, and per-animal productivity increased. But it was not long before parasites started to appear that were resistant or immune to these chemical drenches. This was not a problem at first as new "families" of drench kept being invented which allowed farmers switch drench product and sidestep the issue- for a short time. Now the problem of resistance is spreading, new drench families are no longer being rapidly developed, and we all need act to preserve the health of our animals.

What is a "worm"?

These are parasites that affect grazing stock animals. They come in a wide variety of shapes, sizes and life-cycles with 14 different genera of worms, and a myriad of different species. Most worms live in the abomasums or intestine, but some species also inhabit the lungs or liver. All the worms survive by stealing nutrients from the host. They breed, and their eggs are passed out with the faeces. These eggs hatch on the pasture and become larvae. Larvae can survive on the pasture for months, and burrowing underground can even survive droughts. The larvae will migrate about 30cm from any given pile of faeces, an advantage for camelids because they use toilet areas (middens) which tends to concentrate the parasite burden in one place. In New Zealand 85-95% of

the parasites on your farm are larvae on the pasture. After passing through a number of larval stages the parasite is ready to be eaten by a passing grazing animal. Then they mature into adult worms, and begin producing more eggs.

How do we test for worms?

One way to detect the presence of worms is to do a Faecal Egg Count (FEC). This is a simple procedure where a sample of poo is mixed with a saturated salt or sugar solution, and observed under a microscope. The eggs are counted, and this gives a measure of the "worm burden" your animal is carrying. You can do your own FEC, or send samples off to a lab (ask your vet how). There have been reports that the basic floatation test is not sufficient for detecting the presence of *haemonchus contortus* (the blood-sucking Barbers Pole worm) eggs, and many owners in areas that suffer persistent *haemonchus* problems have switched to the centrifuge method.

A FEC is not a perfect measure. Some parasites produce eggs only intermittently, or at specific stages in their life cycles. Some types of parasites produce lots of eggs, while others don't. You need to talk to your vet and find out what the local parasites are, and what a FEC will and will not tell you about your animals worm-burden.

Faecal Egg Counts give you a picture of the worm population in your animal 3 or 4 weeks ago. This is because it takes that long for the worms to mature to the point where they start producing eggs. An animal with a low FEC may have a high worm burden, as juvenile worms feed like adults and cause significant health issues. In the case of *haemonchus*, the juvenile worms alone can prove fatal, so always treat an animal that is showing signs of ill-health or distress, even if the FEC is low. If FEC remains low, and the animal's health does not improve, then the problem may not be worms and you need to talk to your vet.

Using faecal consistency (solid pellets vs. soft or runny feces) is not a reliable measure for worm burden. An animal can have perfect pellets and a massive worm load, or be scouring and be nearly worm-free.

What is natural resistance?

The camelid immune system is well suited for fighting off parasite attacks. Camelids actually need some worms to keep their immune system in balance, trying to make animals worm-free by excessive chemical application is both impossible and counter-productive from a health perspective. A mature, healthy animal should be able to handle a moderate worm burden without any difficulty. Animals that are very young, very old, stressed, or sick have less effective immune systems, and are more susceptible to parasite attack. (Note, there are some types of parasites for which this advice does not apply. The meningococcal worm present in North America is one example of a parasite that needs frequent chemical treatment to prevent it from getting a potentially-lethal foothold in your animals.)

You should manage your animals to maximize natural resistance. This means that animals need to be exposed to some worms so that they can develop immunity. Healthy adults in good conditions may never need to be drenched, if they are managed properly. Monitor young animals (up to about 2 years of age) closely, as they will be more vulnerable and are more likely to need occasional "help" in the form of drenching if the worms begin to overwhelm them.

Natural resistance has two major advantages. First, it allows you to keep your animals healthy and happy with a minimal application of chemicals. Second, natural resistance will keep your animals safe from drench resistant worms, and is your only recourse when the chemicals stop working.

Relying entirely on natural immunity is wonderful, but of course this is in an "ideal world." The reality of the situation on your farm may be different. While striving to nurture and develop natural immunity is good, always treat an animal where necessary to maintain its health.

What is a drench?

Drenches (a.k.a "wormers") are a group of chemicals known as anthelmintics, they kill the internal (and sometimes external) parasites without harming the host. There are three families of drench in common use in New Zealand. While the names on the bottles can seem long and perplexing, there is actually a very easy system for determining what family of drench you are applying. You will have to check the back of the bottle for the list of active ingredients, as the brand-name on the front is rarely informative.

- Benzimidazoles (white drench) all have names that end in "-azole", e.g. Albendazole, Mebendazole.
- Levamisoles (clear drench) go by the names Levamisole or Morantel.
- Macrocyclic Lactones all have names that end in "-ectin", e.g. Abamectin, Ivermectin, Moxidectin.

In camelids there are two methods of applying drench, either orally (squirt it in their mouth), or subcutaneous injection. It is very important that a proper dose be administered. Llamas have been observed regurgitating oral drench up to 2 hours after application, making the drench ineffective. For this reason I recommend subcutaneous injection. If you are not sure how to do this properly, talk to your vet or an experienced breeder who can show you how.

It's easiest to learn on freshly-shorn animals, and once you get the "feel" for it injecting through a thick fleece is no problem.

How much drench should I give?

Because of the rarity of camelids, none of the drenches (or any other veterinary pharmaceutical) have been officially tested or approved for use in camelids. Their use is "off label", and dosages come from the experience of breeders and vets in the US, Australia, and New Zealand.

- For the Benimidazoles and Macrocytic Lactones the recommended dose is 1.5 times the sheep dose.
- For Levamisole the recommended dose is the sheep dose. Warning! The safety margin on Levamisoles is very small. Be careful to give only the correct amount, as an overdose can be very dangerous-even fatal.

Dosage is based on animal weight. If you are not sure of their weights of your animals, talk to a vet or breeder with access to stock scales, as they may be able to help. Otherwise for alpacas assume weights of 60-90 kg for adults, and for llamas assume weights of 130-180 kg for adults.

What is Drench Resistance?

Drench resistance has nothing to do with the chemical drench, rather it is a change in the worm population that renders them resistant or even immune to some or all anthelmintics. Giving drench to your animals no longer clears them of their worms. If your worm burden is high, and the worms are drench resistant, you can be in a lot of trouble.

Drench resistance is by family. So if you have worms resistant to one type of macrocytic lactone (say Ivermectin), then they will also have some resistance to abamectin, moxidectin, etc.

How do we measure and define Drench Resistance?

To be considered effective drench should kill more than 95% of the worms. This can be measured by doing a FECRT- faecal egg count reduction test. This is done by taking a FEC directly before drenching, then performing a second FEC 10 days later. If the egg count drops by less than 95%, then you have some resistance. In a worst-case scenario there would be no reduction in the FEC post-drenching, at which point you know that the worms are completely resistant to that family of drench.

How does Drench Resistance start and spread?

There is natural genetic variation in the worm population. These genetic differences make some worms more or less susceptible to drench. Every time you drench your animals you are putting selective pressure on the population, and those worms that have some resistance are more likely to survive and pass on that resistance to their children. Over time with successive waves of selection you create worms with ever-increasing levels of resistance.

Under-dosing is one of the surest methods of selecting for drench resistance. This allows worms with only a mild-resistance to survive, but these interbreed and the natural genetic recombination in the offspring increases the chance that more-resistant worms will emerge. Likewise the

application of long-acting drenches can speed the appearance of resistance, as the concentration of drench in the animal declines slowly over time, resulting in a long period when a sub-lethal concentration is present, and like an under-drench allows for the rapid selection of resistance.

For a time it was thought that switching drench-family often was a good way to prevent resistance from appearing- this turned out to be very wrong. Switching often just lets the worms develop resistance to more families of drench more quickly, and makes the situation worse.

Drench resistance is very much like the antibiotic resistance that has become endemic in hospitals around the world. Because of the abuse and misuse of drench chemicals over the last 50 years, their effectiveness is now seriously reduced.

How can I prevent Drench Resistance in my herd?

The situation for alpaca and llama breeders is somewhat different from other livestock industries, we have some distinct advantages and disadvantages when it comes to slowing the arrival of drench resistance.

Advantages:

- The herd sizes are small, and animals can be dealt with on an individual basis more easily.
- The use of middens tends to concentrate the parasite burden in small parts of the pasture which opens up more avenues of control.

Disadvantages:

- Camelids share parasites with sheep and goats, so the bad drench policies of those industries over the last half century are now our problem, too.
- There is a lot of animal movement, particularly among alpacas moving to and from stud services, which increases the movement of parasites from farm to farm.

Recommendations:

- Drench only when needed. Don't just drench by calendar, use either FEC or monitor animal health to determine when drench is required. Remember, the consistency of the poo is not a good measure of the worm numbers.
- Give enough drench. Don't under-drench. Make sure the dose is delivered properly.
- Only drench animals that need it. Move away from whole-herd drenching.
- Ensure your drench is actually working. Conduct a faecal egg count reduction test. You should repeat the FECRT occasionally to make sure that drench resistance is not creeping in.
- Quarantine drench incoming animals. This involves giving a triple-active drench (containing all 3 drench families), and keeping the

animal in the yards for 4 or 5 days.

- Know where your animals are coming from. If the farm of origin has poor management practices, you must understand the chances are that animal is carrying more resistant worms.
- Practice refugia

Refugia - what is it, and how can it help?

Refugia is a term you may have come across in one of the farming newspapers. While it may seem confusing, the underlying principle is quite simple- you want to maintain a population of worms on your pasture that is vulnerable to the drench chemicals. The technical definition is "the proportion of a worm population that cycles (breeds) and is not exposed to a particular drench chemical, so escapes genetic selection for resistance."

You need to keep a population of drench-susceptible worms in your pasture, so that they can breed with the resistant worms and hopefully keep down the total resistant population. Refugia alone will not stop the arrival of drench resistance, but it will delay it.

After drenching (based on the recommendations above) put your herd back onto a highly contaminated pasture for a week or so. This may seem counter-intuitive, but the reason is simple. After drenching only the resistant worms will survive. If you put the animals onto a clean pasture then those resistant worms will fill up the clean pasture with resistant offspring, resulting in a huge increase in the resistant worm population there. By putting them back onto a contaminated pasture the resistant larvae will grow up surrounded by drench-susceptible mates. Hopefully when they interbreed most of the offspring will not be resistant.

How can I manage without drench?

If all the drenches stopped working today, could you keep running your farm? Trying to minimize your drench usage increases the chances that it will be effective when it is really needed. There are a couple of simple management practices that can help you farm without chemical assistance.

- Use rotational cross-grazing. This involves having a second (non-camelid) species on your farm. These animals come in and clean up the paddocks. This works because when worms pass through the "wrong" species they are killed. Horses and cattle are best for this, sheep and goats are not recommended, as they do share worms with camelids and will just spread more worms around the paddock. Rotational grazing has a second advantage of reducing nutrient concentration on the middens. The horses or cattle eat all the lush grass on the middens (ingesting and killing thousands of larvae), and then excrete the nutrients all over the rest of the paddock.
- Don't over-stock. High stock numbers increase worm numbers, and can eventually overwhelm even fit and healthy animals. Over-

stocking also forces the animals to graze near or on the middens, increasing their uptake of larvae.

- Keep your stock happy and well-fed. Stress suppresses the immune system. A well-fed adult can develop natural immunity and live without drench.
- Breed for worm-resistant stock. Camelids vary in their natural immunity. Do regular FEC on your rising potential stud males. Those that maintain much lower egg counts may be good breeding choices.

Conclusion

The first step in the battle against drench resistance is knowing that the battle is taking place. I hope that after reading this article you will take a close look at your own management practices, and work to maximize the health and well-being of your animals. The most recent alpaca health survey revealed that more than half the breeders using Dectomax (a macrocyclic lactone) are systematically under-dosing their animals (the recommended dose for an adult alpaca is 3ml). So it is not a surprise that in the same survey there was also a confirmed Dectomax resistance issue on a farm in Canterbury. Don't blindly assume your drench is working.

For further information on drench resistance and its control, I would suggest "***Internal parasites of sheep and their control- now and in the future***" by Dr Clive Dalton. This excellent book is aimed at farmers, and has a large amount of information about dealing with parasites under New Zealand conditions.