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BioWorma® –Frequently Asked Questions

There is a new tool for worm control in goats and one that acts on a completely new part of the worm lifecycle. Previously we only has drenches that only act on the worms inside the goat and it is estimated that in warm, wet weather, these are only 10% of the worms on any farm, with 90% being the eggs and larvae on the pasture. BioWorma® was registered by the Australian Pesticides & Veterinary Medicines Authority in April 2018 and was launched in Australia and New Zealand in mid-July and other countries will have it available as soon as their registrations are finalized.

BioWorma® is a concentrated mix of the spores of the fungus *Duddingtonia flagrans* that go straight through the goat's gut. These spores can't germinate if above 37 degrees C (the goat's body temperature is 39.5 C) nor in the anaerobic conditions of the goat's gut. After being passed through the gut, these fungal spores germinate and grow in the manure at the same time as the worm eggs hatch. The fungus builds lassos or nets that trap these worm larvae and the fungal hyphae then penetrate the worm larvae's cuticle and then consumes them.

How is Bioworma sold?

BioWorma ® is provided in two forms:

- Pure fungal spores for use by feed-mills and veterinarians
- A combination product with Livamol that can be purchased by any animal owner over the counter or on-line. Livamol is a protein, energy, polyunsaturated oils, vitamin and mineral supplement that has been used for decades for show animals.

How much do I need to feed and how often?

Both products require to be feed daily for best results and so suits those goat owners that feed a grain mix to their goats every day. The amounts of BioWorma ® to be fed depends on the animals' weights and a 25 kg goatling or miniature goat gets 1.5 grams, a 50 kg dairy doe gets 3 grams and a 100kg buck would get 6 grams a day. The dose for the Livamol with BioWorma® product is 1 gram per kg bodyweight.

Was there research done on Australian goats?

A research trial done with goats at Dayboro, Queensland in autumn showed that while worm egg counts in the control group given a placebo rose to 27,000 eggs per gram (epg) then dropped to 18,000 epg after 8 weeks, the goats fed BioWorma ® stayed at zero epg for the

full 8 weeks after drenching. This was an outstanding result and better than the good results from trials in other livestock.

See https://www.youtube.com/watch?time_continue=12&v=zo5y0dJjWIk

Is Bioworma a silver bullet?

No. This product must be used as part of an integrated worm plan. However it is a very exciting new development as it acts on a new part of the worm life cycle and will kill worm larvae that are resistant to any drench. My clients get a worm plan that shows how all available tools, if I haven't already provided one.

If one of my goats eats all the feed I put out for my small herd, will they get an overdose?

No – as the BioWorma® just goes straight through the goats gut the goat won't be affected. However the manure of the other goats will then allow larvae to escape and contaminate the pastures. BioWorma® suits small herds where goats are fed on a daily basis and every goat gets its fair share. Cost is also a major factor so it is more economic to ensure it is used correctly.

Will it kill the worms inside the goat's gut?

No. This is why it is important to do a worm egg count on the faeces of goats before you start. The barber's pole worms already in the 4th stomach will not be killed and will continue to suck blood but they will eventually die of old age in around 50-70 days. There may also be some final stage larvae in hibernation in the gut wall if there are already a lot of adult worms already in the gut and this is more likely in winter. If the worm egg count is high then you must drench, even if feeding BioWorma®. BioWorma takes time to work as it won't kill the larvae that is already hatched and on the pasture. Worm egg counts are still needed for the first few months.

What is the With-Holding Period?

As these spores just go straight through the gut and are not absorbed by the goat, there is a **NIL** with-holding period for meat and milk. The fungal spores do not hatch at the high temperature inside the goat and pass out unchanged into the faeces.

Will Bioworma kill the larvae already on the grass?

No unfortunately- only the larvae in the manure as the fungus doesn't get out of the manure. This means your goats will still be getting new worms until all the existing worm larvae die off. In summer this can be as short as 2 months if daily maximums are above 35° C for barber's pole worms but can be 6 months in winter when larvae are less active and hence do not use up their internal food stores. There are graphs available matching maximum daily temperatures with larval life (<http://www.wormboss.com.au/tests-tools/management-tools/grazing-management/larval-survival-of-barbers-pole-worm.php>).

How long do I have to feed it before my pastures are clean?

Based on the answer and link above, you need to feed BioWorma® for 2 months in summer and 6 months in winter. However BioWorma® doesn't kill 100% of worm larvae, as no medicine works 100%, so some may have hatched. Also any new goats added to a pasture will have some worms and these can quickly contaminate the pasture again if they are not being fed BioWorma®.

I have bad frosts? Does this mean I don't have to feed it in the middle of winter?

No. The eggs in the manure won't hatch if the daily maximum temperature is below 5 degrees so BioWorma® is not needed when you have severe frosts and cold weather. Remember that frosts don't kill worm larvae already on the pasture, the cold only stops eggs from hatching. So it is not as if the frost acting the same as BioWorma® killing the larvae, just that the eggs are not hatching so there are no larvae inside the manure for the fungus to kill. Different worm species eggs require different daily maximum temperatures to hatch- barbers pole worms require 18 C, black scour worms 12 C and brown stomach worms only 8 C.

It is very dry right now – do I still need to feed it?

It depends. If you are in a district where the rainfall patterns are very reliable and you are sure to have 4 days' notice then you can stop feeding BioWorma® in the dry. This may be the case in the dry tropic that only get monsoonal rains or Mediterranean climate parts of Australia. There is a risk however that you may get an isolated storm that then will hatch many larvae from faeces without BioWorma®. Even one shower is enough to allow eggs to hatch for the next 4 days and these hatched larvae can last for variable periods inside the manure. It takes approximately 48 hours for any food to pass through the gut into the manure so feeding the day after the rain will mean 2 days of manure will allow the worm eggs to hatch. While barbers pole worms may only last a short while, other species can last weeks protected inside the manure until such time as a second shower breaks up the pile and they then escape.

Won't the Bioworma eventually seed my whole property and so I won't need to feed it anymore?

No unfortunately. Bioworma® contains massive numbers of specific fungal spores per gram and these are needed for it to work. The germinated fungus stays inside the manure so goats don't eat them again and would never eat enough to have the same effect.

I can't afford to Feed Bioworma all the time so when is it best to be fed?

Some suggestions would be:

- A peak worms times i.e. before and during the months when you had had bad worm problems in the past
- The groups of animals that are most susceptible to worm problems i.e. recently weaned kids
- Feeding to does in late pregnancy and early lactation to prevent the peri-parturient egg rise from massively contaminating your pastures.
- When new goats are introduced they need to be quarantined for at least 30 days while blood tests for disease, examinations for lice, footrot, cheesy gland and quarantine worm drenching are done. Drench resistance is a growing problem and often drench resistant worms are introduced with newly purchased goats, sheep or alpacas. Feeding BioWorma® while in quarantine would be an excellent idea as the animals are generally confined in smaller yards and handfed. Ideally BioWorma® would be fed for 70 days, or the maximum life of a barber's pole worm.

Will it kill earthworms?

No – this was examined during the registration process and earthworms and dung beetles were not affected. This fungus occurs naturally all over the world.

What worms won't Bioworma control?

BioWorma® controls all the major strongyle worms e.g. barber's pole, scour worms, Ostertagia etc. However it will not control liver-fluke, lungworm (both of which have complex lifecycles involving snails) nor coccidia (which have oocysts not eggs, nor larvae). See the label for the full list of worms whose larvae are destroyed.

I use Copper Oxide Wire Particle boluses to control barber pole worms – will this kill the fungus?

No. COWP boluses have no effect and both these boluses and Bioworma can be used at the same time with no effects on each other.

Where do I get more information?

A lot of information is available already on these websites.

<https://www.bioworma.com/>

www.duddingtonia.com

The manufacturers of BioWorma® are publishing their results in scientific journals so they are available for peer review. They list them on their website see <https://www.duddingtonia.com/article/articles-list-overview> . There have been many studies on this and similar fungi since the 1990s and a search of journal databases using *Duddingtonia flagrans* will find many more references.