

**ALTERNATIVE PARASITE CONTROL  
& MAINTAINING GUT HEALTH AND  
NUTRITION TO MAXIMIZE IMMUNITY**

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**ALTERNATIVE**  
WHAT CAN BE CHOSEN INSTEAD?



**INSTEAD OF WHAT?**  
LOTS OF DEWORMING

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**WHAT ARE THE ALTERNATIVES?**

- Immunity
- Animal Management
- Pasture management
- Grazing management
- Bioactive forages
- Biological control
- Nutrition
- Zero grazing
- Alternative dewormers
- Genetics
- Vaccination



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### IMMUNITY

THE BODY'S NATURAL DEFENSE

- Young animals aren't born with parasites. They lack immunity and develop resistance to parasites with age and (continuous) exposure.
- Females suffer a temporary loss of immunity around the time of parturition.
- Goats don't develop immunity as fully as sheep.
- Immunity is compromised by poor nutrition and other diseases and can be overcome by high challenge.



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### ANIMAL MANAGEMENT



- Hygiene  
Feed, water, hot spots
- Lambing/kidding  
when, where?
- Weaning management  
age, nutrition
- Other diseases  
pneumonia, soremouth, footrot, other parasites (e.g. coccidia)

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### PASTURE MANAGEMENT

Starts with good fertility

- Annual forage crops
- Mixed swards
- Forbs
- Legumes
- Taller growing forages
- Browsing
- Removing a hay crop
- Tillage
- Liquid nitrogen fertilizer (?)



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### GRAZING MANAGEMENT



- Rotational grazing
  - Short duration grazing
  - Long rest periods
- Minimum grazing heights
- Low stocking rates
- Safe pastures
- Avoid "hot spots"
- Creep grazing
- Mixed species grazing
- Sacrifice areas

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### BIOACTIVE FORAGES

- Forages containing secondary plant metabolites that have anti-parasitic properties.
- Forages containing condensed tannins have been shown to have inhibitory effects on internal parasites.
  1. Sericea lespedeza
  2. Chicory
  3. Birdsfoot trefoil
  4. Sainfoin



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### SERICEA LESPEDEZA "POOR MAN'S ALFALFA"

- Non-bloating, warm season legume that grows in sub-optimal conditions.
- Sericea-fed animals have been shown to have reduced fecal egg and coccidia oocyst counts.
- The anti-parasitic effects of sericea lespedeza (AU Grazer®) have been demonstrated in fresh forage, hay, silage, and leaf meal pellets.



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### USING SL TO HELP CONTROL PARASITES

#### WORMS

- A minimum of 25% of the diet is required to have an impact on parasites; has been grazed satisfactory as sole forage.
- Long term use of SL may depress growth rates in lambs/kids, due possibly to mineral imbalance.
- Best to graze in rotation to minimize nutritional impact and to maintain stand.
- Provide free choice minerals
- Combine with other parasite management strategies.

#### COCCIDIA

- Feed pellets two weeks prior and 4-6 weeks after period of stress, usually weaning.
- Combine with other parasite management strategies.
- Simms Brothers only supplier of SL pellets.

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### NUTRITION

- There is a nutritional cost of parasitism
- Animals under nutritional stress (especially <2 BCS) are more susceptible to the effects of parasitism
- Supplemental protein, especially by-pass protein, has been shown to both reduce the negative effects of parasitism, as well as boost the immune system to prevent infection.
- Vitamin and mineral supplementation.
- Cost of supplementation should be considered.



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### NUTRITIONAL EFFECTS ON P

- Can improve immunity to parasites by manipulating protein content of ration.
  - Periparturient females
  - Young growing animals
- Animals in poor condition have a poor tolerance to parasites.
- Trace minerals also important. Under-rated and little-understood

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- Worm infection results in animals diverting protein from muscle growth to immune response
- Ruminants have two sources of protein: microbial and by-pass
- Provide extra protein in two ways: improve protein content of pasture or by feeding protein-rich supplements.
- Improve protein content of pasture by inclusion of legumes, improving soil fertility, and grazing management.
- Need to ensure animals have sufficient pasture to graze
- Energy is less important to immunity.
- Improve digestibility of pasture
- Minerals are less important, but should be supplemented where deficiencies may exist.
- Extra protein improves resistance. Extra energy improves resilience.

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**ZERO GRAZING**  
 PENS, CONFINEMENT, DRY LOT

- One way to manage internal parasitism is to raise livestock in pens, with no grazing.
- There is no source of infection or re-infection.
- Animals can still be fed forage diets.
- Is most common with commercial dairy goats.
- Can be combined with grazing.
- Sacrifice lots = zero grazing
- Coccidia can still be a problem.



**2014 Pen vs. Pasture Study with meat goats**

Time (days)	Pen (Weight)	Pasture (Weight)
0	0	0
14	~1000	~1500
28	~1000	~2200
42	~1200	~2300
56	~800	~2400
70	~1200	~4500
84	~1500	~2500

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**ALTERNATIVE "DEWORMERS"**

- **Copper oxide wire particles**
- Copper sulfate
- Diatomaceous earth (DE)
- Essential oils
- Herbs
- Pumpkin seeds
- Tobacco
- Other

Ineffective  
Unproven  
Potentially toxic



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### COPPER OXIDE WIRE PARTICLES (COWP)

- Small needles of copper oxide
- Slow release form of copper
- Poorly absorbed form of copper
- Have been shown to reduce barber pole worm infections in sheep and goats.
- When used in combination with a dewormer, may improve efficacy of treatment.
- Copper toxicity has not been observed in any research trials with goats or sheep.



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### HOW TO USE COWP

- COWP is sold as copper supplements (boluses) for cattle (12.5, 25 g) and goats (2, 4 g).
- Can be repackaged into smaller doses for deworming sheep and goats.
- Should give smallest effective dose. Selectively treat.
  - 0.5-1 g for lambs/kids
  - 1-2 g for adults
- Should determine copper status of animals on your farm before significant use, especially sheep; do mineral profiles (livers/kidney) on deceased animals.



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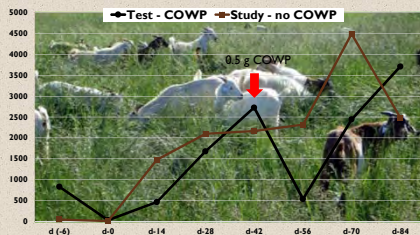
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### FIELD TRIAL WITH COWP

WESTERN MARYLAND PASTURE-BASED MEAT GOAT PERFORMANCE TEST



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## BIOLOGICAL CONTROL

- Dung beetles
- Nematode trapping fungus



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**DO the right thing by YOUR dung beetle population!**  
Larvae will perform best in the egg if you allow them a little freedom. Maximum development of both sexes of animals in pastures and dung beetle populations will be.

**Parasite control**  
Dung beetles feeding on dung from Australian ewes reduces both the reproductive rate of highland nematode (reduced mortality of head and internal organs, reduced egg production and animals developed up to a healthy pasture system, 2018).

**Nematode control**  
Nematode control reduces parasites keep the pasture system healthy and allows a better condition, productivity of livestock enterprises, with saving strategies (Merritt 18th, 2018).

**Worm management**  
200 ewes of internal grazing can remove dung beetle populations and parasites by decreasing the amount of pasture area, making the most healthy much and a source of food.

**Dung beetle**  
Dung beetles feed on dung and decompose it into soil, thereby, and facilitate, since the beetles are able to return to a pasture at the same time that the animal are grazing from the soil.

**Dung beetles DO have economic benefits!**  
Animals suggest that dung beetles would double all the eggs of the same species (nematode) in a pasture of 1.2 g of internal parasites in the same area (Merritt 18th, 2018).

At a stocking rate of 1.2 ewes per ha, ewes that had dung beetle grazed 1.2 kg of faeces per day. However, 12,000 dung beetles per ha in a pasture would double the amount of faeces that would be available to the soil (Merritt 18th, 2018).

Experimental treatments suggest that approximately 10% of the total dung beetle weight (up to 10% of the total weight) of the dung beetle population would be responsible for the majority of the faeces that would be available to the soil (Merritt 18th, 2018).

If the stock of ewes that 1 ha of land is 1000, 1000000 (1000000) would be available to the soil (Merritt 18th, 2018).

The study estimates that about 1000000 dung beetles per ha can reduce the amount of faeces that would be available to the soil (Merritt 18th, 2018).

**References/References**  
Merritt 18th, 2018. The Northern Tablelands dung beetle express. Queensland Department of Agriculture and Fisheries. <https://www.daf.qld.gov.au/industry/stocking/dung-beetles>

**Supporting information**  
Merritt 18th, 2018. The Northern Tablelands dung beetle express. Queensland Department of Agriculture and Fisheries. <https://www.daf.qld.gov.au/industry/stocking/dung-beetles>

**Contact**  
Merritt 18th, 2018. The Northern Tablelands dung beetle express. Queensland Department of Agriculture and Fisheries. <https://www.daf.qld.gov.au/industry/stocking/dung-beetles>

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## NEMATODE TRAPPING FUNGUS

- *Duddingtonia flagrans* is a natural strain of fungus which targets, traps, and kills roundworm larvae.
- Reduces numbers of worm larvae that emerge from manure onto pasture, which reduces pasture infectivity and worm burdens in animals.
- No detrimental effect environment.
- Feed-thru product → no effect in animal



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## BIOWORMA®

**BIOWORMA®**

- Contains 34.6% fungus 500,000 units per gram
- Due to EPA restrictions, distribution is limited to veterinarians and EPA-approved feed mills and premixers.

**LIVAMOL® WITH BIOWORMA®**

- Nutritional supplement that contains 2.2% fungus 34,000 units per gram
- Available over-the-counter

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## USING BIOWORMA®

- Manufacturer suggests that BioWorm® "be fed daily to animals during periods when conditions are conducive to larvae development and transmission onto pastures at temperatures > 40°F"
- Should target most susceptible animals on farm, usually periparturient females and weaned lambs/kids.
- Can be top-dressed or incorporated into a feed mixture.



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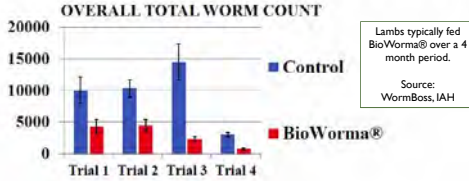
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## USING BIOWORMA®

WHAT TO EXPECT

TOTAL WORM COUNTS OF TRACER SHEEP AT END OF EACH TRIAL

**OVERALL TOTAL WORM COUNT**



Trial	Control	BioWorm
Trial 1	~10,000	~4,000
Trial 2	~10,000	~4,000
Trial 3	~14,000	~2,000
Trial 4	~3,000	~1,000

Lambs typically fed BioWorm® over a 4 month period.  
Source: WormBoss, IAH

Reduces number of worm larvae on pasture  
68% - Sheep | 86% - Goats | 81% - Cattle | 84% - Horses

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### BIOWORMA® LIMITATIONS

- Needs to be fed daily.
- Palatability may be an issue.
- Cannot get wet
- Cannot be put in a pellet.
- Only works on roundworms; it has no effect on other parasites, including coccidia.
- Producers can only buy supplement containing BioWorma® (only 2.2% fungus).
- Expensive!



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### (LIVAMOL® +) BIOWORMA® COST

BASED ON BUYING ONE 15-LB PAIL\*

Weight	1 animal			30 animals		
	1 day	30 days	90 days	1 day	30 days	90 days
50	\$ 0.298	\$ 8.95	\$ 26.85	\$ 8.95	\$ 268.50	\$ 805.50
75	\$ 0.448	\$ 13.43	\$ 40.28	\$ 13.43	\$ 402.75	\$ 1,208.25
100	\$ 0.597	\$ 17.90	\$ 53.70	\$ 17.90	\$ 537.00	\$ 1,611.00
125	\$ 0.746	\$ 22.38	\$ 67.13	\$ 22.38	\$ 671.25	\$ 2,013.75
150	\$ 0.895	\$ 26.85	\$ 80.55	\$ 26.85	\$ 805.50	\$ 2,416.50
175	\$ 1.044	\$ 31.33	\$ 93.98	\$ 31.33	\$ 939.75	\$ 2,819.25
200	\$ 1.193	\$ 35.80	\$ 107.40	\$ 35.80	\$ 1,074.00	\$ 3,222.00

Source: Premier 1 Supplies, Iowa  
\*excludes labor

A 100-lb. animal will consume 3 lbs. per month. 1.6 ounces per day

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### (LIVAMOL® +) BIOWORMA® COST

BASED ON BUYING FOUR OR MORE 30-LB PALES\*

Weight	1 animal			30 animals		
	1 day	30 days	90 days	1 day	30 days	90 days
50	\$ 0.210	\$ 6.30	\$ 18.90	\$ 6.30	\$ 189.00	\$ 567.00
75	\$ 0.315	\$ 9.45	\$ 28.35	\$ 9.45	\$ 283.50	\$ 850.50
100	\$ 0.420	\$ 12.60	\$ 37.80	\$ 12.60	\$ 378.00	\$ 1,134.00
125	\$ 0.525	\$ 15.75	\$ 47.25	\$ 15.75	\$ 472.50	\$ 1,417.50
150	\$ 0.630	\$ 18.90	\$ 56.70	\$ 18.90	\$ 567.00	\$ 1,701.00
175	\$ 0.735	\$ 22.05	\$ 66.15	\$ 22.05	\$ 661.50	\$ 1,984.50
200	\$ 0.840	\$ 25.20	\$ 75.60	\$ 25.20	\$ 756.00	\$ 2,268.00

Source: Premier 1 Supplies, Iowa  
\*excludes freight and labor

A 100-lb. animal will consume 3 lbs. per month. 1.6 ounces per day

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**ECONOMICS OF BIOWORMA®**

- Will depend on how many animals you are losing to parasites.
- Even if you aren't losing animals, what is the productivity loss?
- Is cheaper if you buy it in bulk.
- Would be cheaper if you can get your vet to carry BioWorma®
- Could you get by feeding it every other day (reduce cost by half)? Previous research with fungus showed this to be true (Miller).
- If you feed periparturient females (2 weeks prior to 8 weeks after parturition), will this prevent most of the infection in lambs and kids?
- What will be the long-term benefit of feeding BioWorma®; might you need to bite the bullet (\$\$\$) and feed it for several years.



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**ECONOMICS OF BIOWORMA®**

- Rest your pastures instead; use the money you'd spend on BioWorma® to feed your animals in dry lot (zero grazing).
- For some producers, the cost of BioWorma® is higher than the cost of buying feed.
- Save your money and time; use other management techniques to keep internal parasites at a manageable level.



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