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Strategic Control of Nematodes in Beef Cattle

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The beef industry often underestimates the effect of gastrointestinal (GIT) nematodes on productivity of cattle herds. As veterinarians we immediately connect the word "roundworm" with sheep – and, as you are reading this the words *Haemonchus contortus* float ominously through your brain, right?

Although it is widely accepted among veterinarians and the agricultural community that cattle are less affected by nematodes than sheep, they still play a major role in beef cattle industry and therefore account for large economic losses. In fact, it is documented that gastrointestinal nematodes cost the North American cattle industry more than $2 billion per year in sub-optimal productivity and increased operating expenses.[1]

It is important to note that, although clinical disease cause by GIT nematodes is not commonly observed, *subclinical* disease can have a significant impact on the production performance of a beef herd.[2] Strategic control of these parasites can yield significant returns for the producer.

In order to provide sound scientific advice about nematode control in a cattle herd, a detailed understanding of the relationship between parasites and their hosts is important.

Below is a graph that illustrates the *typical* lifecycle for nematodes which is accompanied by a table defining the list of bovine nematodes.

The graph depicts a *direct lifecycle*, which means no intermediate host is necessary to complete the cycle, which is the most common in nematodes, with a few exceptions.[3] An average cow-calf pair produces approximately 3 tonnes of manure containing 51 million nematode eggs during a grazing period of 5 months.[1]

If the environmental temperature is optimum (typically 15°C), the eggs will hatch and develop into larvae in the environment of the faeces.[3] Larvae will then typically moult to the third stage, retaining its sheath that protects it from desiccation and enables it to survive prolonged periods in the environment.[1] In the right conditions this process generally take 5-6 days.

Larvae migrate away from the faeces into the surrounding grass. During periods of optimal temperature, the larvae then migrate up the stems of the grass, where they are ingested by grazing cattle. It is important to note that without sufficient moisture, this process cannot take place, because the larvae need a water film to migrate.[1, 3] These stages (egg to L_3) is termed the "free living stages" of the parasitic lifecycle and it is these stages that infest pastures and should be managed accordingly.

As these larvae age they lose their infectivity and fewer parasites are found during winter, but some still survive and provide a source for reinfection.[1]

Upon entry in the rumen the third stage larvae go into another moulting phase to form L_4, then L_5 and finally the adult reproductive stage.[1, 3]

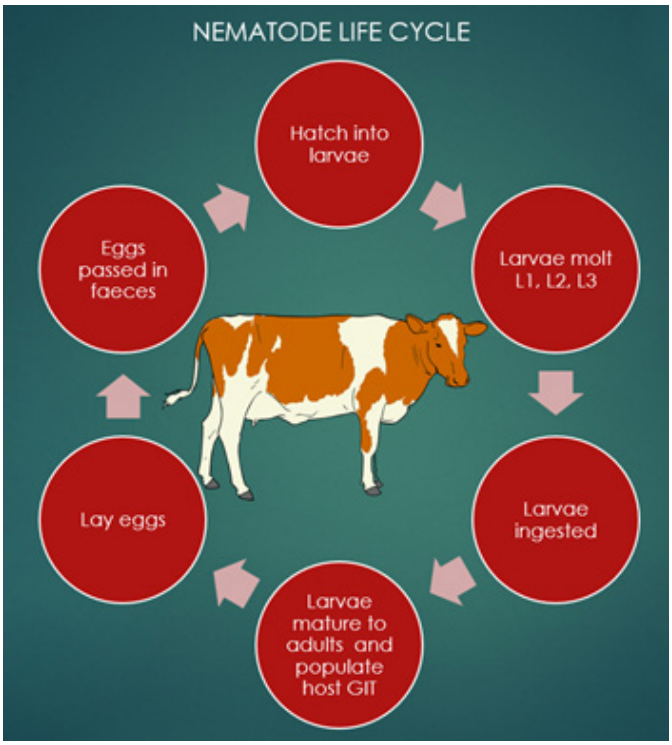

Illustration 1: Nematode Life Cycle

BOVINE NEMATODES[3]		
NEMATODE	**SCIENTIFIC NAME**	**INFECTION SITE**
Wireworm	*Haemonchus placei*	Abomasum
Brown Stomach Worm	*Ostertagia ostertagi*	Abomasum
Cattle Bankrupt Worm	*Cooperia spp.*	Small Intestine
Hookworm	*Bunostomum phlebotomum*	Small Intestine
White Bankrupt Worm	*Strongyloides papillosus*	Small Intestine
Ascarid	*Toxocara vitulorum*	Small Intestine
Nodular Worm	*Oesophagostomum radiatum*	Large Intestine
Whipworm	*Trichuris spp.*	Large Intestine
Lung worm	*Dictyocaulus viviparus*	Lungs
Parafilaria	*Parafilaria bovicola*	Subcutaneous
Eye worm	*Thelazia rhodesii*	Eye

Table 1: Bovine Nematodes[3]

Nematode infections can cause profound changes in the bovine gastrointestinal tract such as[1]:

- Reduce height and number of luminal microvilli
- Increase numbers of goblet cells in mucosa
- Cellular hyperplasia and increased thickness of *muscularis* layer
- Inflammation and influx of inflammatory cells and mediators
- GIT becomes hyperactive – increased frequency and intensity of contractions
- Neural hypersensitisation
- Fluid transported into lumen
- Protein loss
- Resultant decreased appetite, diarrhoea, dehydration, and anorexia

Given the findings above, it is evident that the histologic and physiological changes brought about by nematodes can lead to significant production losses. In addition to all the direct effects mentioned, nematode infections may also have an immunosuppressive effect on the host, which can often present as animals that are more susceptible to developing other diseases or that fail to mount an effective immune response to vaccination.

Effective management of nematode populations and consequent infestations has significant financial merit for the beef producer.

Cattle can develop effective resistance to nematode infestations and are much more adept at this than their small stock counterparts. Anecdotal evidence suggests that calves are more susceptible than adult bovines to nematode infections and the current scientific research supports this hypothesis. Worm egg counts (EPG's) decrease as cattle age.[1]

A group of calves would thus shed many more nematode eggs than a group of cows, and adequate levels of resistance against these parasites may take up to two years to develop.[1] It is very common for calves to have a sufficient nematode infestation to be classified as sub-clinically diseased.

This subclinical state is commonly overlooked, ignored, or not even identified with resultant production losses. Studies that test for subclinical parasite burdens are usually designed to measure one or several production parameters.[4] Production parameters that may be negatively impacted include: weight gain, feed conversion, forage utilisation, conception rate, calving interval, milk production.[4]

Mixed infections are not uncommon and can even have negative interactions in calves. Mixed *Ostertagia* + *Cooperia* infections can reduce weight gain by over 200g/day.[5]

A study was performed on pastures to compare the efficacy of the following topical anthelmintic formulations; ivermectin, doramectin, eprinomectin and moxidectin.

This study specifically looked at the performance of weaned calves that were backgrounded for a period of 112 days during late winter and early spring grazing. All cattle were weighed on day 0, 1, 28, 56, 84, 111, 112 and the respective treatments administered at day 0. Calves treated with doramectin, eprinomectin and moxidectin all showed significant greater gains (12 – 26 kg) than the control group.[6]

Not only does strategic deworming with a suitable product at the right time result in additional weight gain in backgrounding calves, but nursing calves treated at 90 days prior to weaning also realise significant gains in weaning weight. *Hersom et al* published results from a study done through the University of Florida where they dewormed 568 spring born calves at three different locations at 90 days prior to weaning with doramectin (1ml/50kg BW).

Breeds included in the study were Angus, Brangus, Brahman and Romosinuano, cow-calf pairs from treated and control groups were managed identically within the respective locations. Across

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all locations the dewormed calves gained significantly more total weight (P<0.001) and the average daily gain (ADG) was 6.5% greater, compared with the control group (non-dewormed calves).[7]

The additional weight gain of the dewormed group was 2.7kg more per calf.[7] At current market prices of R33/kg for weaner calves, this would translate to an additional R89.10 for the producer. If we assume a price of R6 for the doramectin per dose, this will mean R83.10 net profit for every calf treated with doramectin 90 prior to weaning. This equates to a 1485% return on investment when treating your calves with doramectin - which I would say is a pretty nifty investment!

As a veterinarian you should always give your farmers the best, up-to-date scientific advice. Being a partner in your cattle producers' business, you should approach the challenges and opportunities holistically and provide results that would yield sustainable growth.

Equipping your beef cattle producing clients with a holistic management program by taking into account the lifecycle of the involved helminths, the interactions they have with the host and the important role the environment plays in this interaction, you can add value to his enterprise and distinguish yourself as an integral service provider in the agricultural sphere.

References

1. Stromberg BE, Gasbarre LC. 2006. Gastrointestinal nematode control programs with an emphasis on cattle. *Veterinary Clinics: Food Animal Practice* 22(3):543-65.
2. Jelinski M, Lanigan E, Gilleard J, Waldner C, Royan G. 2016. Survey of gastrointestinal nematode parasites in Saskatchewan beef herds. *The Canadian Veterinary Journal* 57(2):160.
3. Malan F. 2911. Ask the vet what cattle farmers should know (1). 40 Heerengracht, Cape Town 8000: Media24 Specialist Magazines 65-75.
4. Corwin RM. 1997. Economics of gastrointestinal parasitism of cattle. *Veterinary Parasitology*. 72(3-4):451-60.
5. Kloosterman A, Albers GA, Van Den Brink R. 1984. Negative interactions between *Ostertagia ostertagi* and *Cooperia oncophora* in calves. *Veterinary parasitology* 15(2):135-50.
6. Williams JC, Loyacano AF, DeRosa A, Gurie J, Clymer BC, Guerino F. 1999. A comparison of persistent anthelmintic efficacy of topical formulations of doramectin, ivermectin, eprinomectin and moxidectin against naturally acquired nematode infections of beef calves. *Veterinary parasitology* 85(4):277-88.
7. Hersom MJ, Myer RO, Carter JN. 2011. Influence on weaning weights of nursing beef cattle calves dewormed 90 days prior to weaning. *Livestock Science* 136(2-3):270-2.