DIAGNOSING GASTROINTESTINAL PARASITISM

FECAL EGG COUNTS (FEC)

Adult parasites will lay eggs, so FEC are a measure of the adult parasite population in the sheep or goat, but not a measure of total infection (i.e. L4, L5 and adults). There is much animal-to-animal variation in FEC, so it is important to sample a random proportion of the group.

WHO TO SAMPLE

Sheep or goats grazing pasture that are representative of the group should be sampled. Do not sample animals that have been held off feed for any reason, or that are off-feed due to illness. Ideally submit 10 samples representative of lambs/kids and 10 samples representative of ewes/does. It is also important to sample lambs and kids separately from adults, as counts will be very different - even on the same pasture.

GETTING THE SAMPLES

The simplest way is to group the animals into a corner of the pasture (with clean ground), hold them for 15 minutes and then release them. Pick up 10 individual faecal samples that are fresh and place in individual bags. Immediately place in a cooler with ice packs. Faecal samples can be collected from the rectum. Again, use a plastic bag or disposable glove. Apply a small amount of lubricant (e.g. methylcellulose or KY ® Jelly) to the finger and gently tease out the faecal pellets. This latter method allows identification of the samples. Animals should be randomly selected. See **Appendix 1** for more detailed information.

TRANSPORTATION AND STORAGE OF THE SAMPLES

It is very important that the samples be kept cool (< 5°C) but not frozen until they reach the laboratory. This is to prevent hatching which will lead to underestimation of the level of parasitism. Refrigerated samples should be analysed within 7 days of collection.

ANALYSIS OF THE SAMPLES

A trained person should examine the samples to prevent confusion with air bubbles and pollen or other artefacts commonly found in faeces. It is also important that the samples be evaluated using a quantitative technique. The modified McMaster technique is one such method that will allow the number of eggs per gram (epg) of faeces to be reported. Qualitative counts (e.g. 1+, 2+, 3+) are not useful for differentiating between a moderate infection (e.g. 150 epg) or a severe infection (e.g. 1,500 epg) as both will be interpreted as 3+. See Appendix 2 for a description on how it is performed.

POOLED VERSUS INDIVIDUAL SAMPLES

There is considerable animal-to-animal variation in egg output, with 30% of animals responsible for ~ 70% of the egg output. Pooling of samples, so that only one test is done per group of animals is a valid way of analysing parasite load. However, samples should be pooled at the laboratory (not at the farm) to make sure that equal amounts of pellets are contributed by each animal (minimum 4 grams of faeces each). Results from individual samples will allow the veterinarian to see the distribution of FEC within the group, but it is more expensive to run 10 individual samples rather than one pooled sample.

SIGNIFICANT EGGS PER GRAM LEVELS

The following cut-points are often used for individual or pooled samples:

- Low = <500epg;
- Moderate =500 to 1,000 epg;
- Severe =>1,000 epg.

However, there are several factors that need to be appreciated when deciding what cut-point to use or what action to take:

Species of GIN

Haemonchus is a very prolific egg producer and is associated with rapid changes in pasture infectivity. If this species is predominant, the FEC can change very quickly, as can the level of disease in the lambs. Furthermore, even within the 3 week pre-patent period of the parasite, young-stock can become very anaemic - before egg levels change significantly.

Generally we do not know which type of parasite is contributing to the FEC but can use history of previous infections to help. Larval culture and identification of GIN species can be done in specialized laboratories, although that service is not routinely provided in central Canadian diagnostic laboratories. A technique utilizing peanut agglutinin with a fluorescent dye is used in some laboratories to stain and identify the proportion of eggs which are of the *Haemonchus* type.

Infection from Previous Season

Sheep/goats that grazed the previous summer may have a significant hypobiotic load of *Teladorsagia* and or *Haemonchus* that are sitting in the abomasal wall waiting for more favourable climate conditions before developing to adults, all the triggers are not completely understood. In the spring, the massive re-emergence of these larvae can be associated with significant disease - often called "Type II" disease. The animals have diarrhoea (*Teladorsagia*), bottle jaw and / or anaemia (*Haemonchus*) along with a negative FEC as the larvae have not yet reached the adult egg-producing stage

Grazing Heavily Infested Pastures

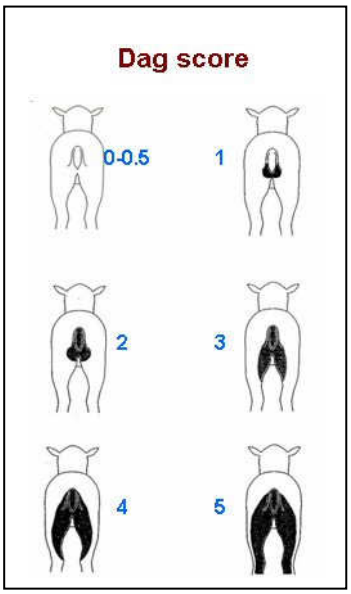
Naive animals that graze very heavily infested pastures may experience disease due to *Teladorsagia* and *Trichostrongylus* before the pre-patent period is complete. Like Type II disease, these animals will have watery diarrhoea and bottle jaw with some deaths - along with a very low FEC.

Individual Variability in FEC

It has been shown that approximately 30% of lambs/kids are responsible for 70% of the total egg production. This means that there is tremendous animal-to-animal variation in egg output - also called "over-dispersion" of the values. If means (averages) are used to determine how infected a group of animals are, there is a great risk of underestimating the level of infection. An example: 3 faecal samples have a count of 1,000 epg and 6 faecal samples have a value of 50 epg, this gives an average value of 367 epg. In this example, if a cut-point of 500 epg is used, it might result in a decision not to treat when treatment should have been performed on the high shedding animals. Factors that should also be taken into account are the clinical condition of the animals, as outlined below.

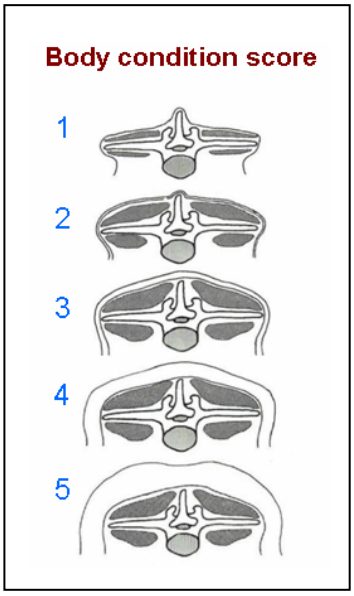
CLINICAL CHANGES IN THE ANIMAL

DIARRHOEA / DAG SCORES



Faecal consistency (formed pellets, soft pellets, liquid diarrhoea) may reflect parasite load, but some animals with parasitic infections (e.g. acute haemonchosis) do not exhibit diarrhoea. Diet type also greatly influences faecal consistency- with lush grass causing diarrhoea, so interpreting this must be done in the light of the type of pasture being grazed. Dag is defined as faecal contamination of the wool or hair coat around the tail and hind quarters. Soft or diarrhoeic stools will cling to the wool / hair. A dag score will give an approximation of faecal consistency or prevalence of diarrhoea in the group of sheep/goats. It should be noted that animals with diarrhoea may actually have decreased FEC because the eggs are diluted, so absence of eggs in an animal with diarrhoea, does not mean that animal is not parasitized.

POOR WEIGHT GAINS / WEIGHT LOSS (BODY CONDITION SCORE)

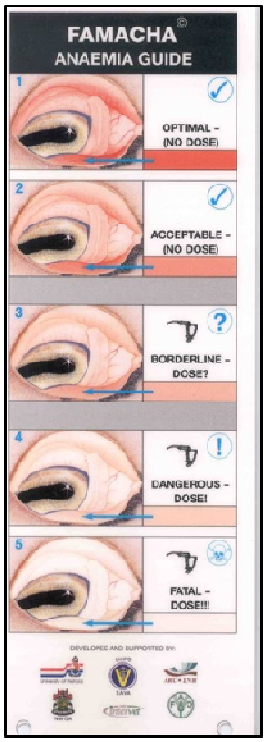


Gastrointestinal parasitism is associated with poor growth rates. The poor growth is primarily due to the decreased appetite from the parasite infection. Additional factors are the energy losses associated with the animal fighting the infection (i.e. immune response) and the losses of protein and blood that the parasites consume. Producers that weigh lambs/kids on pasture, can track growth rates and use this information (along with FEC) to determine if parasitism is clinically important. This may be one of the most sensitive indicators of significant levels of parasitism in individual sheep/goats. A weigh scale set-up so that it is easy to run lambs/kids through every few weeks during the highest risk periods, can allow for selective treatment of those animals not gaining as expected. However, there are other causes of poor weight gains (e.g. poor pasture, coccidiosis, pneumonia) so that FEC should be done to confirm a parasitism problem.

Body condition score (BCS) is difficult to use as so many other factors influence BCS. Additionally, by the time an animal is thin (≤ 2.0), it is experiencing severe clinical illness – too late for a screening test to be of good use. For these reasons BCS is not the best indicator to use to determine level of parasitism. However, an animal in poor BCS may be more susceptible to parasites if debilitated from another disease.

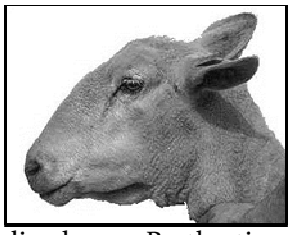
ANAEMIA (HAEMONCHUS)

A major clinical feature of haemonchosis is anaemia. In central Canada, in late July to mid-August, in warm and wet summers - haemonchosis can be the most important type of parasitism on some farms. Lambs and kids can be monitored during this period for evidence of anaemia. This can be done by taking a blood sample and measuring the proportion of red blood cells (packed cell volume or haematocrit). But it is more commonly done by assessing the colour of the conjunctival (around the eye) mucous membrane. The colour is normally pink but it can be pale pink to white in significant *Haemonchus* infections.



The FAMACHA© system makes use of this. It was developed in South Africa in regions where the primary type of GIN is *Haemonchus*, and is used successfully in the south-eastern USA where the epidemiology of parasites is similar. It allows the producer to monitor individual animals and to only treat those that appear anaemic. Its drawback is that if other parasites are important, then it will fail to detect those infections. Other causes of anaemia may also confound the issue. Research performed to date in central Canada, strongly suggests that it is a poor indicator of parasite load. For this reason, the FAMACHA© system should only be used under the guidance of a veterinarian and only as an adjunct to FEC. There are other parasites that can cause anaemia, liver flukes being the most important - which fortunately is not a problem yet in Ontario. If you believe that the FAMACHA © system would be useful on your property, contact your veterinarian for training on how best to use it.

HYPOPROTEINEMIA (BOTTLE JAW)



Almost all the GIN parasites feed on protein, also called albumin, which circulates in the blood and lymphatic system. In severe infections, the protein levels can drop very low and the fluid, which normally stays in the blood and lymphatic vessels leaks out and gathers under the skin and in the gastrointestinal lining. When fluid accumulates under the jaw, this is termed "bottle jaw". Oedema in the gastrointestinal lining causes poor absorption of nutrients and diarrhoea. By the time this is clinically apparent, parasitism is very advanced and the animal is in immediate danger of dying.

POST MORTEM EXAMINATION AND WORM COUNTS

If animals are dying and internal parasites are suspected of being the cause, it is very important to confirm this diagnosis with a total (adult) worm count from the gastrointestinal tract. Do not assume every dead lamb or kid found at pasture is due to worms, as de-worming when it is not required is not only an unnecessary expense, but it may also contribute to anthelmintic resistance.

A veterinarian can perform a field necropsy and attempt to identify abomasal and intestinal nematodes. *Haemonchus* are large and easy to see. *Teladorsagia* and *Trichostrongylus* are small and should be identified and counted in the laboratory using a microscope. The abomasal contents are removed and volume measured, and a sample of a known volume is removed and the worms counted. For example, if there are 10 worms counted in 1/100th of the volume of the fluid in the abomasum, then the abomasum contained 1000 worms. A system recommended for interpreting burdens, in the manual for the Sustainable Control of Parasites in Sheep (SCOPS, 3rd edition) from the UK, is as follows:

2 points = Parasitism is likely affecting productivity
3 points = Parasitism is likely causing clinical signs and even death

Teladorsagia sp:	3000 worms	= 1 point
Trichostrongylus spp:	4000 worms	= 1 point
H. contortus:	500 worms	= 1 point
Nematodirus spp:	4000 worms	= 1 point
Immature worms:	4000 worms	= 1 point