A Greener World Technical Advice Fact Sheet No. 4

Reducing the Risk of Internal Parasites

Certified Animal Welfare Approved by A Greener World (AGW) has the most rigorous standards for farm animal welfare currently in use by any organization in North America. Its standards have been developed in collaboration with scientists, veterinarians, researchers and farmers across the globe to maximize practicable, high-welfare farm management.

Whether you keep cattle, pigs, poultry, sheep or goats, internal parasites can potentially cause significant welfare problems among livestock, as well as economic loss.

Although there is no single solution for parasite control, prevention is essential and there are a number of techniques that you can adapt to your specific farm situation. You can never completely eliminate internal parasites from your farm; however, by understanding the life cycle of the parasite – and adopting some of the techniques described in this technical paper – you can keep them at a level where they are not adversely affecting your stock.

Understanding the life-cycle of the internal parasite

Infection with internal parasites can lead to weight loss, poor condition, scour, internal tissue damage and anemia. If animals are left untreated they may die. The first step to controlling these parasites is to understand their life-cycle. The life-cycle of the most common gastrointestinal nematodes is as follows:

- Eggs are passed on to the pasture in the dung of the infected animal
- The eggs develop into first stage larvae and then grow into second stage larvae – both stages living within the dung pat – before developing into the infective third stage larvae
- The third stage larvae move to the top of the grasses and other herbage growing on the pasture, from where they are ingested by a grazing animal
- Once inside the animal, the larvae further develop within the gut lining until the fifth stage larvae emerge in the gut
- The worms develop in the gut and the females start to lay eggs, which are passed out in the dung

The whole process takes between 14–21 days, depending on temperature and moisture. An infected host animal can deposit thousands of worm eggs on the pasture in its manure, so when conditions are right levels of worm infestation can increase very rapidly.

Understanding the life cycle can help to minimize the risk of infection. For example, if animals are moved to fresh pasture before the eggs deposited on the original grazing area have had a chance to develop into the infective stage, the infective larvae will have no available host. Bear in mind, however, that both larvae and eggs can survive well in damp conditions so the weather will have an effect on how long a contaminated pasture potentially remains a risk (see 'Rotation of pasture' below).

Stocking density

It stands to reason that the more tightly you stock animals on a particular piece of ground, the greater the risk of them coming into contact with parasitic larvae deposited by their herd or flock mates.

In extensive systems, the low stocking densities can result in an overall 'dilution effect'. In other words, the limited number of animal 'hosts' means that the population of internal parasites may never reach a level where it can affect the animals' health. In addition, older stock that are exposed to low levels of parasite challenge throughout their lives can build up a natural resistance or immunity to parasites. This means that grazing older stock alongside younger, more susceptible animals can help to reduce pasture infection, as the older stock will consume significant quantities of infective larvae without passing eggs or larvae. Indeed, 'leader-follower' systems – where young cattle are grazed ahead of older cattle – are a well-established means for worm control.

Rotation of pasture

It is easy understand that the longer you graze one piece of land by the same species, the greater the risk of a gradual increase in the population of parasite species.

Parasites in extensively grazed pasture of some cattle operations may never reach levels that will cause severe infection. However, even in extensive pig and poultry operations the animals tend to remain close to their huts or shelters. This continual use of the same piece of ground means it will eventually become contaminated. If pigs or poultry are kept on the same area of land then the parasite can always complete its life cycle and infection is more likely to reach levels where growth and production are compromised – and treatment is necessary.

The simple answer is to move animals regularly and to utilize the land with another species, to re-seed or crop it or – if possible – leave it fallow for a period of time. The longer you can leave a piece of ground without grazing the same species on it, the better. While some parasites can survive without a host the longer they are left without

one, the greater the chance that the larvae will die before they can complete their life cycle. A period of 12 months or more is recommended, although this may not be practical in all systems. At least 70 days is usually the minimum to show any benefit.

Management of pasture

Cutting the pasture to preserve grass and forage will remove some larvae but it will not completely clean up contaminated pasture. Land grazed after it has been cut will be lower risk in terms of parasite burden.

Some farmers harrow their pasture to break up dung pats. If the weather is very dry this can expose the larvae to the elements and reduce parasite burden. However, if the weather is damp the eggs and larvae will survive – and the process could actually help to spread larvae over the entire pasture.

Composition of pasture

Some plants contain certain compounds that are believed to act against internal parasites. For example, when tannin rich plants like *Lotus* or are part of the pasture mix, researchers identified reduced parasite numbers in sericea lespedeza grazing lambs. Scientists believe that this could be due to a direct effect of tannin on the parasites or that the tannin could be affecting the passage of the plant protein through the animal's gut and supplying more protein to the hindgut (see 'Nutrition' below).

Min *et al* (2005) showed that grazing sericea lespedeza reduced the numbers of worm eggs produced by goats. Lange *et al* (2006) demonstrated the same effect in lambs fed sericea lespedezai hay. ATTRA (2007) produced a useful summary of information on sericea lespedeza which includes references to other studies with similar results (see 'Further information' below).

Another crop that has shown good results is chicory. Lambs grazing chicory have been shown to have a lower internal parasite burden (Marley *et al* 2006). Chicory is a good crop to finish lambs on: it has a high nutritional value and high trace element levels, probably due to its deep roots, so as well as inhibiting parasites it also promotes lamb growth. Chicory has also been shown to inhibit taint in entire male animals (including boar pigs and ram lambs) so it is a crop with interesting possibilities.

Nutrition

Researchers have shown that poorly nourished animals are more susceptible to infection from parasites. This could be due to a lack of overall protein and energy or a poorly balanced diet, deficient in minerals.

The most common example is seen around lambing time in ewes, where the growth of the fetus and milk production take priority before and after lambing. As a result, the

ewe's body may not be able to manifest a good immune response, as all protein is being diverted to produce and rear a lamb. Good nutrition at this time is therefore essential.

Scientists found that when fecal egg counts (see below) are carried out around lambing time, ewes with multiple births – those animals which are under more pressure to grow the lamb and produce milk than ewes with single lambs – had a higher output of parasite eggs.

The amount of protein in the diet – and particularly the amount of protein that goes through to the hind gut – makes a huge different to levels of internal parasites. A study by Keatinge *et al* (2003) showed that supplementing ewes with soya for two weeks pre-lambing and eight weeks post-lambing significantly reduced worm egg output at peak lactation compared with ewes that were not given any additional supplement.

Mineral levels – particularly cobalt and selenium – have also been shown to have a marked effect on worm levels (Carmichael *et al* 2002 and Ferguson *et al* 1989). Cobalt is, of course, very important for lamb growth. Coupled with the fact that low cobalt seems to result in higher potential worm infestation, it pays to make sure there is enough cobalt in the ration.

Researchers have also shown that infections, diseases or injuries that cause the animal to become debilitated are likely to exacerbate the effect of any internal parasite burden. Likewise, an animal with a heavy parasite infection is more likely to succumb to other background diseases or infections. This shows the importance of managing the risk of parasites – their effects can be far reaching.

Multi-species management

With a very few exceptions, parasites are species-specific. In other words, the key internal parasites that affect cattle will not affect pigs or sheep – and vice versa. If sheep eat cattle worm larvae – or if cattle eat sheep worm larvae – the larvae cannot survive in the animals gut and complete their life cycle.

In 2007, tests were carried out by the Oklahoma State Co-operative Extension Agency (see 'Further information' below) comparing the need for worming when cattle were grazed as the sole species or grazed with goats. The cattle grazed with goats needed less than a quarter of the worming treatments than cattle grazed as a single species. Not only does this multi species grazing promote animal health, it also reduces the production costs of administering wormers and the cost of reduced growth rates when animals are infected.

Since sheep and goats share worms, grazing them together will not reduce the overall worm burden. However, introducing sheep or goats to cattle grazing can significantly improve parasite control. Similarly, bringing pigs and poultry into the grazing rotation

can be beneficial. In smaller scale rotational systems, pigs can follow cattle or sheep, while grazing sheep or goats in poultry pastures can also help reduce parasites, as well as assisting with general pasture management.

Improving the resistance to worms in your herd or flock

Parasites burdens are not equally distributed among all individual animals and some animals are more susceptible to parasite than others.

In the average flock or herd, around 20% of the animals will carry over 75% of the worm burden. These animals are usually responsible for contaminating the majority of the pasture with eggs.

In a closed herd or flock, where breeding replacements are produced on-farm, it is possible to identify and remove those individual animals which are least resistant to parasitic worms. Selective breeding for worm resistance can significantly improve the ability of that herd or flock to resist any background worm levels. Similarly, by monitoring parasite levels in your herd or flock, you can ensure that worming treatments are effective – and save money in the long run.

Monitoring

Two forms of monitoring that are relatively straightforward to perform on farm are fecal egg counts (FEC) and FAMACHA.

Taking a FEC involves collecting a sample of dung from either an individual or a group of animals, mixing and taking a measured amount, looking at in under a microscope, and counting the number of eggs per gram of dung. Some farms get their vets to carry out the analysis of the dung sample; others purchase complete kits –such as the McMasters system available in the US or the FECPAK system developed in New Zealand– and carry out analysis on farm (see 'Further information' below).

Use of FEC allows you to identify when worm egg counts – and therefore the worm burden – is increasing and when treatment against worms would be most effective and beneficial. There are different scales of when action against worms is needed, based on the FEC result for the different species.

FAMACHA is another tool that can be helpful for deciding when to treat – or which animals need treatment. The system was developed in South Africa but has been tested and validated for use in the US. It is only effective for monitoring *Haemonchus contortus* – the Barber Pole worm. The basic premise is that the Barber Pole worm takes blood from the animal, so a heavy infestation causes anemia. Anemia can be assessed by looking at the color of the animal's lower eyelid and comparing it to a standard chart. The lighter the color the more anemic the animal – and the more likely it is in need of treatment (see 'Further information' below to find links to access the chart).

Note: Where the FAMACHA monitoring method is used it is important to pay attention to general flock health and nutrition to ensure that other causes of anemia are not contributing to the results.

Treatment

The type of wormer you use – and the timing of any treatment – can have a huge effect on future levels of parasites on your farm. Over recent years there have been increasing incidences of parasite resistance to different wormer types. Part of the problem is that past recommendations on wormer use are now known to have exacerbated resistance, rather than reducing it.

Farmers were originally told to make sure they treated every animal in the herd or flock. Now if you know you have an internal parasite problem this appears to be a sensible approach. However, if there are any worms present that are resistant to the wormer that is chosen, and every animal in the flock is treated, the only worms that will survive to produce eggs – and potentially re-infect the farm – are those that are resistant.

Farmers were also told to treat the flock and then immediately release the animals onto clean pasture – that is, pasture that was not thought to have a parasite challenge – to try to prevent them being re-infected. But the problem is that this meant that the only worms that would end up on this clean pasture were those that were already resistant to the worm treatment used – and that these worms would then multiply with no competition.

Because of this resistance build up the Barber Pole worm now seems to be highly resistant to benzimadazole wormers, such as Valbazen and fenbendazole, and also avermectins, such as Ivomec. Levamisole treatments appear to work better – for example, Levasol – but some low resistance has been identified. Other gut worms are also now showing resistance to some wormer treatments: in some parts of South Africa sheep can no longer be grazed as the local worm population is now resistant to all the major types of de-wormer.

New advice

Recent advice takes into account 'refugia'. This is the proportion of a population of worms that are sensitive to particular worming treatments. It might seem strange but it is important to maintain a population of worms *in refugia* that are sensitive to de-wormers, rather than try to eliminate all worms from the herd or flock.

Likewise, rather than putting freshly wormed animals onto the cleanest pastures, you should worm the sheep and then put then into pastures with a low to moderate challenge from parasites so that any resistant worm eggs that are shed will be diluted by the existing population of susceptible worms.

Resistance can also develop when the wrong dose of wormer is used. It is well worth weighing a sample of animals – or using a weight tape – before starting treatment to get the dosage right. If you underestimate their weight you will under dose them with wormer, which can allow some worms to survive and develop resistance.

Summary

Try to keep your stocking density low, rotate your pastures, keep different species on-farm, and look at breeding strategies to increase resistance to parasites. Consult with your vet about strategies to make your worming regimes as effective as possible and to avoid building up resistance to worming treatments.

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KEYWORDS

Welfare; internal parasites; worming;