Gastrointestinal (GIT) nematodes cause significantly reduced growth and adverse health impacts in ruminant livestock industries globally, including Australia. Ill health and lost production through gastrointestinal nematode infections are the leading causes of financial loss in Australian livestock enterprises.

In Australia, gastrointestinal nematodes are the number one health problem for sheep, with costs estimated to be $369 million. Internal parasites are also a significant health issue for cattle, costing an estimated $38 million a year in lost production and control costs (Sackett and others, 2006). Water buffalo (Bubalus bubalis) is a relatively new agricultural species in Australia, and the impact of gastrointestinal nematodes is less understood; however, several strategies can be implemented on-farm to reduce any effects these parasites may have.

Nematode species reported in water buffalo in Australia

**Strongyle-type nematodes**

Strongyle-type nematodes are the most common parasites infecting ruminant livestock. These species produce eggs with similar characteristics and are not easily differentiated between during faecal egg counts (Figure 1.). The strongyle-type nematode species reported in water buffalo include species common to sheep and cattle such as Cooperia sp., Haemonchus sp., Oesophagostomum sp.. Nematodes in this category follow a similar lifecycle (Figure 2.); however, the climate tolerance of each species affects the season where infection risk is the greatest.

**Toxocara vitulorum**

Toxocara vitulorum is a non-strongyle type gastrointestinal nematode of cattle and buffalo in tropical and subtropical regions. Some cases have also been reported in more temperate areas, but it is unknown if these infections persist over time. In global literature, significant health impacts have been reported as a result of T. vitulorum infection in calves. (3-24 weeks of age). T. vitulorum have a distinct, round egg with a thick resistant wall (Figure 1.).

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Figure 1
Representations of gastrointestinal nematode eggs recovered from water buffalo. A: Strongyle-type nematode egg, B: Toxocara vitulorum egg

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Adult worms are located in the small intestine of calves (3-24 weeks of age) and produce a large number of eggs which are shed onto pasture. Given the right conditions, these eggs can persist in the environment for over one year. Adult buffalo ingest eggs when grazing contaminated pasture. The eggs then hatch into larvae and migrate around the body where they reside dormant. Larvae can remain in the tissues of adult buffalo for as long as three parturitions. Upon late gestation, larvae migrate to the mammary glands and are excreted in the colostrum and milk for up to eight days. Suckling calves are infected with larvae, which then moult into adults to complete the cycle. It has also been reported that infection of calves may occur during pregnancy (Figure 3).

A recent survey of farms in Eastern Australia has identified that overall the frequency of gastrointestinal nematode infections in water buffalo is relatively low (AgriFutures Australia 2018). It was also identified that some cohorts of water buffalo were more frequently affected than others. Livestock under twelve months of age were the most likely individuals on-farm to be infected with gastrointestinal nematodes. As the age of an animal increased, the observed frequency of infection decreased, indicating the development of immunity to nematode infections, similar to that of cattle.
Other individuals that were more likely to be affected by gastrointestinal nematode infection were animals with low body condition scores.

**Understanding the climate influences of parasite infection**

The common species of GIT nematodes vary by location but can be broadly separated into species that prefer summer dominant rainfall (tropical-subtropical), and species that prefer non-seasonal or winter rainfall (temperate areas).

Common/significant - NSW Summer rainfall / subtropical areas
- Haemonchus spp. (barber’s pole worm)
- Ostertagia ostertagi (small brown stomach worm)
- Cooperia punctata (intestinal worm)
- Oesophagostomum radiatum (nodular worm)

Non-seasonal to winter rainfall / temperate areas
- Ostertagia ostertagi
- Trichostrongylus axei (stomach hair worm)
- Cooperia oncophora (intestinal worm)

**Signs of GIT nematode infection**

Identifying signs of gastrointestinal nematode infections and promptly intervening can lead improved animal health, welfare and production. Signs of parasite infection include:
- Poor performance, such as slow growth rates given the available pasture
- Scouring
- Weight loss
- Depression
- Pale gums and membranes
- Bottle jaw
- Change in coat appearance (becoming coarser)

Sub-clinical infections (where no apparent signs of infection are evident) can also lead to production losses in ruminant livestock. Identifying low levels of infection is best done through diagnostic techniques.

**Diagnostic techniques**

A good understanding of current GIT nemate status in water buffalo can be made using the combination of faecal egg counts, recognising high-risk individuals within a herd, and knowing the seasons of highest risk. Faecal egg counts are relatively low cost and can give an indication of the current adult population of parasites infecting an individual or herd. Compared to sheep and goats, its usefulness in large ruminants is limited due to the development of immunity, and different egg outputs of different nematode species that infect cattle and buffalo lead to less reliable data for on-farm decision making. A high egg count is still significant, but low numbers of eggs per gram may still lead to significant health or production impacts. Faecal egg counts are most useful as a diagnostic tool for young livestock. Submitting faecal samples to a diagnostic facility for faecal egg counts and speciation can be valuable. Knowing what species of gastrointestinal nematodes are present in a farming system is also beneficial to developing a management strategy.

**Gastrointestinal nematode control and management in water buffalo**

In traditional ruminant livestock (sheep and cattle), integrated management strategies utilise drenching and pasture management to reduce the impact of parasites on-farm. In water buffalo farming systems this is restricted due to restrictions in the use of anthelmintics. Because of this, the focus of parasite control in water buffalo is pasture management. Producers should use strategies which optimise livestock nutrition and minimise numbers of worm eggs and larvae on pasture. Times when water buffalo experience high stress, such as movement of stock, weaning, pregnancy and parturition, reduced feed availability, and extreme climatic conditions, can lead to reduced immunity and increase the risk of gastrointestinal nematode infection. Individuals exposed to these stressors should be more closely monitored for signs of parasitism.

**Pasture management**

Spelling pastures can form a break in the transmission of strongyle nematodes. The infective, free-living stage of strongyle-type nematodes have a limited lifespan depending on climatic conditions. Spelling a paddock reduces the population of infective, free-living stage strongyle-type...
nematodes, which reduces the risk of infection when the pasture is next grazed.

During hot and dry periods, a significant proportion of infective stages may die within 2-3 weeks. In warm, humid (coastal) conditions, this may take 6-8 weeks, and during cold periods, infective stages may be viable for up to six months. While in some systems, these lengths of spelling may be possible, closing pastures for up to six months will likely incur reduced national value of pastures.

Grazing pastures with stock that are less susceptible to parasites (adult water buffalo) can also be useful in reducing the risk of infection to young stock. Grazing these paddocks with adult stock leads to reduced infective larvae. Although this may be less effective than long spelling, it can increase pasture utilisation.

Running groups of water buffalo where the proportion of susceptible buffalo is low (more adult buffalo than young water buffalo) can also contribute to reducing infection of young livestock due to the reduced shedding of eggs onto a pasture during grazing periods. This strategy may have management implications, particularly in dairy systems, or while joining livestock.

Calf Rearing

Systems, where calves are weaned early and grown out on a small paddock with supplemental feeding, may be at an increased risk of gastrointestinal nematode infection. High stocking rates of susceptible stock, and no spelling of small paddocks can lead to significant infection rates of calves. Regular removal of faeces, spelling paddocks where possible and monitoring the infection status of calves can help to reduce infections in these systems.

In systems where calves are reared on the cow, then weaned, precautions against transmission should be made at weaning. Where possible, weaned water buffalo should be placed on “clean” pasture to reduce the likelihood of infection during this high-stress period. Yard weaning and supplemental feeding may also aid in minimising stress and reducing infection rates in weaned stock.

The use of anthelmintic products on water buffalo

At the time of publishing this article, no anthelmintics are available as on-label products for water buffalo farmers. This means any anthelmintic treatment must be prescribed as an off-label application by a registered veterinarian.

Quarantine of incoming stock

In the interest of biosecurity and reducing the likelihood that gastrointestinal parasites are brought onto a farm, any new stock should be quarantined. A quarantine drench may be valuable to “clean out” any new stock. This must be done in consultation with a registered veterinarian. It is also recommended that a faecal egg count is carried out prior to making this decision.

Conclusion

Due to the low prevalence of gastrointestinal parasites in water buffalo in Australia and restrictions in place regarding anthelmintics, the management of gastrointestinal nematodes on water buffalo farms can be achieved through three main strategies:

• Monitoring livestock for signs of parasitism, particularly in young and high-risk stock.
• Understanding the seasonality of parasite species for the farm location
• Managing infection risk during grazing by employing spelling, or integrated grazing strategies
• Mitigating parasite infection in calves by reducing the infective population in small holding paddock, and minimising stress at weaning

Although anthelmintics are not recommended as part of a regular management system, livestock health and welfare are a crucial part of farming. If it is recognised that parasitism may be impacting the health and welfare of an animal, it is recommended that a veterinarian be consulted.

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