The emergence of resistance in many parasite populations, and the lack of any new worming compounds on the horizon is driving researchers to find better ways to control worms in domestic horse populations.

We need to move away from an interval treatment regime towards an evidence-based, strategic, and targeted program that will help extend the life of our current arsenal of worming products.

Last month’s article, “A new era of worm control in horses” introduced the notion of moving away from a calendar-based interval treatment regime, where every horse on a property is treated at 6 to 8 weekly intervals, and towards a more strategic, evidence-based approach where individual horses are treated based on faecal worm egg counts.

The driving force behind this shift is the emergence of resistance in many parasite populations, and also the lack of any new worming compounds on the horizon. It’s important that we extend the life of our current arsenal of worming products as long as we can!

What is resistance and how does it happen?

Parasites are a genetically diverse group of organisms. Within any population (in this instance, worms), there are some that are naturally more resistant to anthelmintic drugs than others. When the worms are exposed to a drug treatment, the susceptible ones are killed, but the resistant ones survive and go on to reproduce and multiply (Fig 1). Put simply, it’s survival of the fittest! Since resistance has a genetic base, it is inherited from one generation to the next. The rate at which resistance develops is determined by the selection pressure placed on the population (i.e. the frequency of exposure to drugs).

Survival of the most resistant

Under an interval-based worm control program, where the entire worm population is exposed to a drug every 4-6 weeks, selection pressure is very high. It is important to note, that resistance to one compound usually confers resistance to other compounds within the same family of drugs. This is because all the compounds within a family kill the parasite by the same mechanism. So for example, parasites that have developed resistance as a result of frequent exposure to ivermectin, a member of the Macro cyclic Lactone (ML) family, are likely to also be resistant to other MLs (such as albendazole or moxidectin). Refer to table 1 for a refresher on the different families of worms available and their egg reappearance periods (ERP – the time between treatment and the reappearance of eggs in the faeces).

An irreversible process

Another important fact about resistance is that once it has developed, it is not reversible! Studies have shown that resistant parasites, even after 10 years of no exposure to the drug, are still resistant.

Which parasites are resistant?

The two most important nematodes of the large roundworm infecting foals predominantly in their first year of life and small strongyles or cyathostomes (infecting horses of all ages), and unfortunately, anthelmintic resistance is a significant problem in the control of both these parasites.

Resistance was first detected to the BZ family of drugs (e.g. fenbendazole, oxibendazole) decades ago, and now it is considered to be present worldwide. Researchers have confirmed that BZ resistance is very prevalent among small strongyles in Australia. This means that using a worming product containing only a BZ (such as Panacur, containing fenbendazole) to control small strongyles is unlikely to be successful. The BZs, however, still seem to be very effective against Parascaris and pinworm (Oxyuris equi).

Overseas, in Germany, Italy, the UK and USA, small strongyle resistance to the tetrazydroprimidines (THP), Pyrantel, has also been reported from a large number of properties. One Australian study also found resistance to Morantel on a couple of properties.

Fortunately, overseas studies show that there is still very good efficacy of the MLs (ivermectin, moxidectin) against small strongyles, despite a few published reports of isolated cases of reduced efficacy, and also some reports of a reduced egg reappearance period following treatment.

These are, however, the early signs of the emergence of resistance, and should provide incentive to horse owners to adopt practices that slow the development of resistance!

There are anecdotal reports of failure of ML products to remove pinworm infections, both here and overseas, but no official studies have been carried out to confirm this. Perhaps the most alarming information to come overseas is the high prevalence of ML-resistant Parascaris. Reports have emerged from the USA, Canada, Pakistan, the Netherlands, Denmark, Sweden, Finland, Italy and Germany of almost total failure of ML products to control Parascaris infections. And yet, no studies have been undertaken to see if resistance is present here in Australia! Common sense says it’s time we investigate the situation...

Table 1: Classes of drugs available for treatment of horse worms and the Egg Reappearance Period (ERP)

<table>
<thead>
<tr>
<th>Drug Class</th>
<th>Active Ingredient</th>
<th>ERP</th>
</tr>
</thead>
<tbody>
<tr>
<td>BENZIMIDAZOLES (BZs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oxibendazole</td>
<td></td>
<td>4 weeks</td>
</tr>
<tr>
<td>Oxendazole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fenbendazole</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Morantel</td>
<td></td>
<td>4 weeks</td>
</tr>
<tr>
<td>Pyrantel</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TETRAHYDROPYRIDIMIDINES (THPs)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albendazole</td>
<td></td>
<td>6-8 weeks</td>
</tr>
<tr>
<td>Ivermectin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MOXIDECTIN</td>
<td></td>
<td>12 weeks</td>
</tr>
</tbody>
</table>

Is your property home to drug resistant worms?

by Dr Anne Beasley, BAgSc(Hons), PhD

How resistance advances following exposure of worms to drugs

Prior to worming a small number of worms are naturally resistant (represented by the red worms). The drug kills the susceptible worms, leaving the resistant worms behind to reproduce. Only resistant clipping are passed into the environment, and are available to infect other horses. Horses new harbour a much larger proportion of resistant worms – the drug becomes less effective.

Resistance is unlikely to be successful.

Studies have shown that resistant parasites, even after 10 years of no exposure to the drug, are still resistant. The threat of resistance should motivate us all to change the way we manage worms on our properties.

These are, however, the early signs of the emergence of resistance, and should provide incentive to horse owners to adopt practices that slow the development of resistance!

There are anecdotal reports of failure of ML products to remove pinworm infections, both here and overseas, but no official studies have been carried out to confirm this. Perhaps the most alarming information to come overseas is the high prevalence of ML-resistant Parascaris. Reports have emerged from the USA, Canada, Pakistan, the Netherlands, Denmark, Sweden, Finland, Italy and Germany of almost total failure of ML products to control Parascaris infections. And yet, no studies have been undertaken to see if resistance is present here in Australia! Common sense says it’s time we investigate the situation...

continue next page...

Warm Egg Count testing is available at various laboratories in Australia. Regular testing will be cheaper than worming a whole mob of horses unnecessarily or with a product that doesn’t even work.
THE ‘E.T.S.’ APPROACH TO WORM CONTROL

The following approach helps to reduce the number of treatments required every year for mature, grazing horses.

Evidence-based
Periodically monitor faecal egg counts of horses and only worm when necessary. Use only drug classes you know are still effective on your property. There are various diagnostic laboratories nationwide that offer faecal egg counting services, and you can carry out a faecal egg count reduction test by collecting and submitting samples from a group of horses on the day of treatment and again 10-14 days after treatment. Monitoring is often cheaper than worming a whole mob of horses unnecessarily or with a product that doesn't even work!

Targeted
Identify and target those horses on the property that require more frequent treatments, and give fewer treatments to those that are low egg-shedders.

Strategic
Time the treatments to pre-empt high risk seasons and use pasture hygiene (if practical) to break the parasites’ life-cycle. Another very effective weapon (where available) is to graze horses in rotation with cattle/sheep (who harbour different worm species not infective to horses). The ranchers will “vacuum” up much of the equine worms.

Broodmares and young horses
The above includes broodmares which, on such a monitored and controlled program, should not need any additional treatment at foaling to protect against Strongylus vestiﬁciation. There is less room for improvement in treating foals and young horses as they are more susceptible and their egg counts quickly rise to high levels following the Egg Reappearance Period. These horses (weanlings, yearlings) should be grazed separately to older stock and it is still imperative to test the efficacy of your worming product (especially the ML class) against Parascaris, the main target for treatment in young horses. Despite the common recommendation that foals be treated as early as 4-6 weeks of age, there is no real value in treating earlier than 8 weeks.

A long overdue study of drug resistant worms in Australia
A research team based at the University of Queensland, Gatton campus, plans to investigate the presence of ML resistance in both small strongyles and Parascaris populations. Properties will be recruited from up and down the coast of Australia, including northern QLD, southeast QLD and the Hunter Valley regions. Already there has been an overwhelmingly positive response from many southeast QLD properties that feel that this is a valuable and necessary project.

The aim of the project is to carry out faecal egg count reduction tests (FECRTs) on groups of horses – mature horses for tests of efficacy against small strongyles, and foals/weanlings for tests of efficacy against Parascaris.

Become involved
In order to be involved in the project, a few simple criteria need to be met:
• There needs to be a minimum of 10 horses on the property from either category (or both if you have breeding stock)
• Mature horses aged 2 years and over and foals aged up to 12 months
• In order to measure a reduction in faecal egg count, there needs to be an existing egg count prior to treatment – so at least 6 weeks needs to have passed since the horses were last treated before undertaking the test (otherwise, egg counts are likely to be zero!).

• A product containing an ML (typically ivermectin) needs to be used for the test (this is what is typically used anyway).

• The horse owner/manager needs to be willing to collect and submit faecal samples from the horses on the day of treatment, and again 10-14 days after treatment – there’s no sugar coating it, this may require some effort if horses are not yarded or stabled. Usually it’s simple enough to bring the horses into a smaller yard and observe them until a sample is passed by each – or even to tie each to a separate tree for a couple of hours. Whatever works!

What benefits will come from this study?
Despite some effort required on a couple of occasions for sample collection, the incentive to participate in the study comes in the form of information. A participating property will learn what critical parasites are infecting their horses, and the resistance status of parasites on their property, which is critical in designing an effective control program.

Egg counts also help to identify horses within the herd that are high, moderate or low egg shedders – again allowing a strategic approach to worm control to be adopted (see June article). The laboratory work will be undertaken as part of the study and will not be charged to the property – so this represents a signiﬁcant saving. And, of course, all properties will receive reports on the ﬁndings of the study. Surveillance of drug resistance in horse worms in this country has been severely lacking, and without this important knowledge it’s possible that we are treating our horses with ineffective products wasting money and, more importantly, advancing resistance.

The study will begin this year and continue through 2013. If you are interested in participating or finding out more about the project, you can contact the principal investigator, Dr Anne Beasley, on a.beasley@uq.edu.au.

THE ‘E.T.S.’ APPROACH TO WORM CONTROL

The most alarming information to come from overseas studies is the high prevalence of ML-resistant Parascaris. This UQ project will be the first study undertaken to see if resistance is present in Australia.