PREVENTIVE MEDICINE FOR PARASITIC DISEASES

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INTRODUCTION

Wherever possible veterinary input on a stud farm in relation to parasitic diseases should be aimed at prevention rather than treatment. The wide age range of residents together with frequent animal movements both around and on/off a farm can create unique challenges to devising a preventive medicine programme.

ELIMINATION OR CONTROL?

Whereas for ectoparasites an elimination programme may be suitable, for endoparasites a control programme is preferred. Inevitably there is no "standard" programme suitable for all stud farms, despite what may be implied in the lay press. Instead veterinary input should be aimed at recognising the unique variations in management and facilities of individual premises and customising a programme for them. The veterinary surgeon must assess the risks posed by parasites and identify suitable control measures. This will include management practices as well as the use of anthelmintics. Knowledge of the biology of the parasites, efficacy of anthelmintics and management practices of the stud are all required to construct an effective programme. The aim of the programme is to maintain an equilibrium in favour of the horse and against the parasite. Once a programme is in place then regular monitoring is essential to identify any failures in the programme and to assess any potential new risks.

ECTOPARASITES

Lice

The potentially most significant ectoparasites for most stud farms are lice. Both the biting louse, *Damalinia equi*, and the sucking louse, *Haematopinus asini*, may be encountered. Both lice are spread by close contact and infestations are more prevalent in the winter months. High stocking density will increase the amount of close contact as will group housing.

Clinical signs are typically of irritation and pruritus, especially along the dorsum. Self-trauma can lead to hair loss and skin thickening. In a severe infestation reduced growth rate or weight loss may be seen.

Diagnosis is by identification of egg cases and lice in the coat.

Treatment is with topical ectoparasiticides, usually containing pyrethroids.

Chorioptes spp

For the few heavy horse studs *Chorioptes equi* can present a unique challenge. Whilst elimination is ideal, control is the realistic aim. Infestation is almost invariably seen in horses with a marked amount of feather on the distal limbs.

Clinical signs are a result of pruritus and include stamping, rubbing and nibbling of the lower limbs. Specific skin lesions are usually a result of self-trauma.

Diagnosis is based on the identification of the characteristic mites on skin scrapings from the distal limbs.

Treatment is based on the use of topical ectoparasiticides, usually pyrethroid based. Parenteral milbemycins have been shown to decrease mite numbers and are a useful adjunctive therapy. The efficacy of topical ectoparasiticides and treatment of secondary skin lesions can be enhanced by clipping the hair from the distal limbs but this is rarely allowed by the animal's owners.

ENDOPARASITES

Large strongyles

The large strongyles have a direct lifecycle with in most instances a migratory larval stage. There is a long pre-patent period of 6-10 months and adult worms are present in the large intestine. Both larval stages and adults are susceptible to most modern anthelmintics. Recently anthelmintic resistance to pyrantel has been reported.

Small strongyles, cyathostomes

The cyathostomes have a direct non-migratory lifecycle. There is a pre-patent period of 6-20 weeks. The larvae have a development stage within the mucosa of the large intestine. These larvae can enter an arrested state of development, which can last 2-3 years. Adult cyathostomes are

present in the large intestine. The adults, luminal larvae and developing larvae in the mucosa are susceptible to modern anthelmintics. Arrested larvae are poorly susceptible to all anthelmintics. Benzimidazole resistance is widespread and there is an increasing incidence of pyrantel resistance.

Tapeworms, *Anoplocephala spp*.

Anoplocephala perfoliata is the most common equine tapeworm but *A. magna* and *Paranoplocephala mammillana* are also seen. They have an indirect lifecycle with an oribatid mite as an intermediate host. There is a 6-10 week pre-patent period. Adult stages are present in the small intestine and caecum (*P. mammillana* may also occur in the stomach). *A. perfoliata* and *A. magna* are susceptible to an increased dose of pyrantel and all are susceptible to praziquantel.

Strongyloides westeri

Strongyloides westeri has a direct lifecycle with transmission to the foal either in milk from the dam or by transcutaneous passage. It can cause diarrhoea in foals at 1-4 weeks of age. It is susceptible to most modern anthelmintics, although increased dose rates may be required. At parturition treatment of mares is an effective method of control.

Parascaris equorum

Parascaris equorum is the equine ascarid and has a direct migratory lifecycle, which includes the liver and lung. There is a pre-patent period of 3 months during which presence of larvae in the lung may cause signs of respiratory disease. The adults are present in the small intestine and are prolific egg producers. The eggs are very durable and may persist for years on the pasture. Foal to foal transmission between years can occur with the repeated use of foal paddocks. Large numbers of adults can cause colic signs as a result of obstruction in the small intestine. The adult and luminal larval stages are susceptible to most modern anthelmintics, although in potentially heavily infected foals the use of slow onset anthelmintics (benzimidazoles) has been recommended to avoid intestinal obstruction with a plug of adult worms. Age-related immunity develops in older horses. Recently ivermectin resistance has been identified on stud farms.

OTHER

Gasterophilus spp

Both Gasterophilus intestinalis and G. nasalis larvae may be present in the stomach and small intestine. G. intestinalis is more common and usually found in the stomach. Clinical signs are rare and they can be eliminated with ivermectin or moxidectin.

ANTHELMINTICS AVAILABLE

Macrocyclic lactones

Two macrocyclic lactones are available for use in horses; ivermectin (an avermectin) and moxidectin (a milbemycin). They act by selective paralysis of the parasite. Macrocyclic lactones are highly lipophilic although moxidectin has the longer half-life in body fat. This depot effect in adipose tissue gives a long duration of activity for these agents with egg reappearance periods of 7-8 weeks for ivermectin and 12-13 weeks for moxidectin. However in animals with a low body fat content insufficient adipose tissue can result in toxic levels of moxidectin. This drug should therefore be used with caution in foals less than 4 months old and emaciated animals. These agents are only licensed for oral use in the UK and there is no published evidence to indicate an advantage in parenteral administration. To date there is no evidence of the development of clinically significant resistance to these anthelmintics. However, their prolonged duration of activity and near 100% efficacy creates enormous selection pressure for resistance in any surviving parasites. Recent reports have suggested that *Parascaris equorum* resistance may be present.

Benzimidazoles

Fenbendazole, oxibendazole, mebendazole and oxfendazole are all available for use in horses. They act by disrupting the normal function of the nematode intestine, with the result that the nematode effectively starves. This results in a slow onset of effect, which can be advantageous in the treatment of *Parascaris equorum.*

In single standard dosages resistance to these anthelmintics is widespread and therefore their use is limited. At present there is no evidence of a reversion to susceptibility to benzimidazoles following a prolonged period without their use. Benzimidazoles are relatively non-toxic to the horse and as a result prolonged dosing regimes have been developed with specific indications for the treatment of larval cyathostomes.

Pyrimidines

The pyrantel salts cause spastic paralysis of nematode muscle cells, although resistance by both small and large strongyles has been reported. When used at double the standard dose these agents show up to 98% efficacy against tapeworms. Resistance has been identified in the field by both large and small strongyles.

Piperazine

Piperazine also causes spastic paralysis of the parasite but has a narrow spectrum of activity against only adult cyathostomes and ascarids.

SUMMARY OF ACTIVITY OF CURRENTLY LICENSED EQUINE ANTHELMINTICS

Anthelmintic	Dose (mg/kg)	Duration (weeks)	Large strongyles	Migrating large strongyles	Adult small strongyles	Arrested mucosal small strongyles	Cestodes	Ascarids	Strongyloides
Ivermectin	0.2	6 - 8	>90%	>90%	>90%			>90% Resistance now noted	>90%
Moxidectin	0.4	12 - 13	>90%	>90%	>90%	30 - 40%		>90%	>90%
Fenbendazole	7.5 - 10	4 - 6	>90%	>90%	Up to 90% depending on resistance	>90% with 5 day course		>90%	>90% increased dose
Mebendazole	8.8	4 - 6	>90%		Up to 90% depending on resistance				
Oxibendazole	10 - 15	4 - 6	>90%		Up to 90% depending on resistance				>90% increased dose
Pyrantel embonate	19	4	Up to 90% depending on resistance		Up to 90% depending on resistance		>90% 38 mg/kg		
Praziquantel	1.5	NK					>90%		

It has been marketed in combination with benzimidazoles to jointly increase their spectrum of activity. Specific cyathostome resistance to piperazine has been reported.

Praziquantel

Praziquantel causes parasite muscular contraction and paralysis but has only a narrow spectrum of activity with 90-100% efficacy against tapeworms.

MANAGEMENT PRACTICES FOR PARASITE CONTROL

Horse management

Where possible horses of a similar age and parasite status should be kept in closed groups. Changes to the group structure should be minimised. All animals should be treated from 6 weeks of age. Accurate dosing with anthelmintics should be practised with the use of a reliable weight estimator. This is particularly important for rapidly growing youngstock and groups of youngsters with a wide age range.

New individuals should be isolated on arrival until their parasite status is ascertained. In most instances blanket anthelmintic treatment is used rather than a "test and treat" policy.

There are number of anthelmintic dosing schemes which may be incorporated into the parasite control programme for a stud farm. These involve the predominate use of one family of anthelmintic for an entire year and include

1. Interval dosing: synchronised dosing of all animals occurs during their exposure to grazing. Intervals are determined by the egg reappearance period for each anthelmintic (usually benzimidazoles 4 weeks, pyrantel 4 weeks, ivermectin 8 weeks, moxidectin 12 weeks).

2. Strategic dosing: synchronised dosing of all animals occurs during first half of grazing season when rate of pasture egg contamination would be highest.

3. Targeted dosing: monthly worm egg counts are performed on all animals and only those with positive results are dosed.

With all of these schemes a yearly or twice yearly cestodal treatment should be given to provide tapeworm control. In addition a prolonged course of fenbendazole is recommended once yearly in the autumn or early winter to provide the most protection from arrested cyathostome larvae.

The efficacy of any anthelmintic-based parasite control programme should be assessed once or twice yearly. Faecal egg counts should be taken immediately prior to and 7-14 days following anthelmintic administration. Individuals to be tested should be randomly selected but include members from all the grazing groups. Faecal egg counts should be reduced by at least 90% following anthelmintic administration.

If anthelmintic resistance is identified on a stud farm then that class of anthelmintic should be withdrawn from use. This should be on a permanent basis as there is no evidence of a return to anthelmintic susceptibility following temporary withdrawal.

Pasture management

Simple pasture management methods include "dose and move", where all animals in a group are treated at the same time and immediately prior to moving to a new clean pasture. Care should be taken, however, as this practice has the potential to "seed" the new pasture with eggs from parasites that survived (or were resistant) to the previous anthelmintic. Harrowing can be used to disperse parasite eggs and larvae within faecal pats but must be performed immediately prior to a period of dry weather otherwise the effect is only an increased area of contamination on the pasture.

The single most effective method of parasite control is the removal of faeces (and therefore parasite eggs and larvae) from the pasture. This not only removes the infective agents but will also significantly increase the available grazing area. Mechanised pasture sweepers/faecal collectors are available and pastures should be cleaned on a weekly or twice weekly basis. Care should be taken, however, that excessive grass contamination with soil does not occur with recent evidence of an association between excessive soil contamination of grass and equine grass sickness.

Whatever parasite control programme is implemented, monitoring is essential in order to be sure of its success. Ultimately signs of clinical disease will indicate an inadequate programme but routine faecal egg counts will give an earlier warning of potential parasite build up. Ideally pasture egg and larval counts could be used but at present these techniques are insufficiently accurate to be useful.