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Global equine parasite control guidelines: Consensus or confusion?

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ABSTRACT

Equine parasite control has historically been characterized by confusing and conflicting information, posing significant challenges for veterinarians and horse owners to make evidence-based decisions. Since 2012, equine parasite control guidelines have been developed and published for different parts of the world to address this situation and provide trusted sources of current guidance. At the 2024 International Equine Infectious Disease Conference in Deauville, Normandy, France, lead authors of equine parasite control guideline documents published in the USA, UK, Sweden, Denmark, the Netherlands, Australia, and Europe convened and presented their guidelines. This led to a discussion of differences and similarities between the guidelines and an effort to identify current research needs in this area. In general, all guidelines recommend a surveillance-based approach for equine parasite control, emphasizing the importance of anthelmintic resistance testing. Some guidelines have a focus on controlling *Strongylus vulgaris*, while others primarily focus on cyathostomins, ascarids and tapeworms. Although the same four anthelmintic drug classes are marketed in most countries, there are some differences between product portfolios available, most notably between Australia and other countries. European countries have various degrees of prescription-only restrictions on anthelmintic products, whereas products are available over the counter in Australia and the USA. Commercially available diagnostic portfolios differed somewhat between countries and affected recommendations made as well. In conclusion, the guidelines are in general agreement and are based on the same general principles. One major challenge is communicating the recommendations effectively to end-users, which should be made a priority going forward.

1. Introduction

Equine parasite control is a complex process with countless factors to consider. Veterinary practitioners and parasitologists are frequently approached with questions on this topic. However, despite great intention and effort, end-users often experience confusion and a lack of consensus. A standard message has been that there are no one-size-fits-all programs and that control strategies must be tailored to conditions specific to each equine operation. While this is true, such statements do not offer much actual guidance and evidence-based recommendations for parasite control were lacking until the introduction of several guideline papers in recent years.

Over the past decade, several equine parasite control guideline papers have been published and made available to veterinary practitioners. The first such resource was initiated by the American Association of Equine Practitioners (AAEP) and was published in 2012,

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with subsequent revisions in 2016, 2019, and 2024 (Nielsen et al., 2024). This was followed by a guideline document issued by the European Scientific Counsel Companion Animal Parasites (ESCCAP), which was first published in 2018 and subsequently revised in 2019 and made available in eight different languages (https://www.esccap.org/guidelines/gl8/). A Swedish equine parasite control guideline document was then published in 2022 (Hedberg-Alm et al., 2022a), followed by Danish (https://www.ddd.dk/faggrupper/faggruppe-heste/vejledninger-og-guidelines/parasitkontrol-hos-heste-i-danmark/), Dutch (Kootwijk et al., 2024) and British (https://canterforhorses.org.uk/) guidelines in 2024. The most recent guidelines were published in Australia in 2025 (Beasley et al., 2025).

At the 12th International Equine Infectious Disease Conference (IEIDC), held in Deauville, Normandy, France, in October 2024, a special guideline session on equine parasite control was organized, wherein representatives from each of the above-referenced guidelines presented, compared, and discussed their respective documents. This led to a stimulating discussion, which is now followed up with the present paper. The aim of this document is to 1) briefly describe each of the guideline documents, 2) outline major differences and discuss underlying reasons for these, and 3) identify research priorities for supporting and further developing guidance for modern equine parasite control globally.

2. Guideline documents

Table 1 describes equine parasite control guideline documents published since 2012. The following sections briefly outline each of these guideline documents.

2.1. US guidelines

The AAEP initiated this guideline document by appointing a task force in 2011. The group included veterinary practitioners, veterinarians working for pharmaceutical companies, clinical faculty from veterinary schools, and veterinary parasitologists. The task force is overseen by the AAEP Infectious Disease Committee, which reports to the AAEP Board of Directors (BOD). Once developed, the guideline document was first reviewed by infectious disease committee members and subsequently reviewed and approved by the BOD. The document includes an appendix containing a standard operating procedure (SOP) for a fecal egg counting technique, a summary of anthelmintic classes available, and an overview of the development and survival of strongylid eggs and larvae in the environment.

Table 1
Equine parasite control guideline documents published since 2012.

Launch year	Country/ region	Organization	Published	Access	Language
2012	USA	AAEP[a]	AAEP website	Open	English
2018	Europe	ESCCAP[b]	ESCCAP website	Open	Several[h]
2022	Sweden	Joint[c]	HästSverige website	Open	Swedish
2024	Denmark	DDD[d]	DDD website	Open	Danish
2024	United Kingdom	CANTER[e]	CANTER website	Open	English
2024	The Netherlands	Joint[f]	Dier en Arts	Open	Dutch
2025	Australia	AEPAP[g]	Australian Veterinary Journal	Open	English

[a] American Association of Equine Practitioners.
[b] European Scientific Counsel Companion Animal Parasites.
[c] Collaboration between Swedish Agricultural University, Swedish Veterinary Institute, Equine Clinics, and parasite diagnostic laboratories.
[d] Den Danske Dyrlægeforening (Danish Veterinary Association).
[e] Controlling ANTiparasitic resistance in Equines Responsibly.
[f] Collaboration between Utrecht University, Royal GD, Equine Clinic Emmeloord, Eikenlust Equine Consultancy Bilthoven and Equine practitioners.
[g] Australian Equine Parasite Advisory Panel.
[h] English, Italian, Spanish, French, German, Polish, Hungarian, and Ukrainian.

2.2. ESCCAP guidelines

The ESCCAP has developed an extensive portfolio of guidelines for parasite control in different animal species and appointed a committee to develop an equine document in 2016. The committee consisted of three parasitologists representing three different countries. Draft guidelines were then reviewed by two external expert reviewers and were revised and subsequently reviewed by European country representatives within ESCCAP before publication. The ESCCAP provides practical and free recommendations for practitioners available in eight different languages and provides information about the most important gastrointestinal parasites in Europe. The recommendations include measures for diagnosing and preventing infections, considering the specific requirements of different age groups and husbandry systems and providing specific treatment plans for these. As such, both the so-called selective and the strategic treatment approaches are outlined.

2.3. Swedish guidelines

The Swedish guideline was initiated in 2022 by a group consisting of veterinary practitioners, researchers, veterinary parasitologists and veterinarians working at parasite diagnostic laboratories. Before publication on Swedish websites and in equine clinics, the guideline was reviewed by an external reference group of equine clinicians, practitioners, parasitologists, and horse owners. These guidelines are aimed at both veterinarians and horse owners and include a summary of equine parasites, preventive strategies for parasite control, including pasture management, the anthelmintic classes available and the status of anthelmintic resistance.

2.4. Danish guidelines

A group of two parasitologists, one university clinician, and one PhD student contacted the Danish Veterinary Association in 2023 to suggest developing a Danish guideline for equine parasite control. After meeting with representatives from the equine section of the association, the initiative went forward. An online membership meeting was held inviting suggestions and questions to be addressed by the guideline, and two documents were subsequently developed, including 1) a guideline document for veterinarians with an appendix containing standard operating procedures for fecal egg counting and coproculture techniques and 2) a folder with general information about parasite control aimed at horse owners. All documents were reviewed and approved by the equine section of the Danish Veterinary Association. Furthermore, the guidelines were discussed with representatives from the Danish Veterinary and Food Administration, and all recommendations were deemed compliant with Danish legislation and regulations.

2.5. British guidelines

The UK Veterinary Medicines Directorate (VMD) initiated the creation of a pan-industry, multi-stakeholder group termed CANTER (Controlling ANTiparastic resistance in Equines Responsibly) in 2023. The expert voluntary group includes representation from the three prescribing professions, veterinarians, pharmacists, and suitably qualified persons (SQPs), parasitology diagnostics providers, veterinary parasitologists, academics and researchers, representatives from the veterinary pharmaceutical sector and trade organizations, charities, and policy makers.

The CANTER guidelines were developed and written by an appointed Working Group representative of all stakeholders and endorsed by the

CANTER Core Steering Group in 2024. The guidelines for sustainable equine parasite control are prescriber-facing and signpost to the recently published British Equine Veterinary Association (BEVA) protectMEtoo Toolkit (https://www.beva.org.uk/Resources/Medicines/Anthelmintic-Toolkit) devised to support more responsible use of dewormers by veterinarians and in veterinary practices.

2.6. Australian guidelines

The Australian Equine Parasitology Advisory Panel initiated the Australian guidelines for equine internal parasite management in 2022. This panel consists of equine clinicians based at veterinary schools across Australian universities, veterinary and equine practices, and Thoroughbred stud farms, veterinary parasitologists, and representatives of pharmaceutical companies. Findings of a recent Australia-wide research project have provided new insights into intestinal parasites (*i.e.,* strongyles and ascarids) and parasite control from the perspectives of Australian horse breeders and equine veterinarians. These studies have formed the basis of newly developed guidelines for managing and treating gastrointestinal nematodes in horses. Tailored for equine veterinarians, these guidelines contain information on target parasites and risk factors for their transmission, as well as practical advice for surveillance, anthelmintic choice, timing of treatment, testing for anthelmintic resistance and managing refugia. Following a review by the education committee of the Equine Veterinarians Australia, the guidelines were published in January 2025 in the Australian Veterinary Journal following a peer-review (Beasley et al., 2025).

2.7. Dutch guidelines

In 2009, the Dutch Ministry of Agriculture supported the writing of an article with the title 'Antiparasitics and prescription medication in horses' (Sloet van Oldruitenborgh-Oosterbaan et al., 2009). This article then served as a guideline in disciplinary boards and court cases. In 2018, Pfister and van Doorn presented their insights on monitoring helminths in a peer-reviewed publication (Pfister and van Doorn, 2018), forming a base for the Dutch guideline document.

In 2022, four veterinary experts (equine internal medicine/veterinary parasitology also referred to as the 'inner circle') put together a draft document. This was then discussed with a larger group of experts ('outer circle'). Thereafter, in March 2023, the draft document was discussed with approximately 50 equine veterinarians at a post-academic and case-oriented session. With all received comments, the inner and outer circles reviewed and edited the draft document during several rounds. The final guideline was published in October 2024 in the journal Dier en Arts (Kootwijk et al., 2024) and is now published on several additional platforms, including the website of The Royal Dutch Organization for Veterinarians (KNMvD).

3. General concept

All the guideline documents share the same overall goal of reducing/minimizing the risk of equine parasitic disease. Eradicating or eliminating parasites from equine operations is neither considered an attainable nor a desirable goal. Furthermore, all guidelines recommend a surveillance-based approach to parasite control and seek to abandon the more traditional preventative strategies based on frequent administration of anthelmintics. Finally, all guidelines recommend regular monitoring of parasites and routine anthelmintic efficacy testing through the Fecal Egg Count Reduction Test (FECRT).

4. Legislative differences

European Union countries have implemented prescription-only restrictions on anthelmintic usage, although vast differences exist with regard to implementation and administration between countries. Denmark and Sweden implemented the tightest restrictions, allowing only veterinarians to prescribe anthelmintics and requiring diagnostic work to justify the prescription. In the Netherlands and Germany, rights to prescription of equine anthelmintic products are restricted to veterinarians, but diagnostics are not mandatory. The United Kingdom has implemented a unique prescription-only system, wherein veterinarians, pharmacists, and suitably qualified persons (SQPs) can prescribe and supply equine anthelmintic products. In Australia and the US, on the other hand, anthelmintics are available over the counter.

5. Climatic considerations

Parasite transmission is known to be highly affected by climate and weather patterns. Due to their vast sizes, the US and Australia both span multiple climatic zones, requiring recommendations to be tailored to each. The Australian guidelines acknowledge that climatic conditions differ widely within the country and must be considered when designing a parasite control strategy. The US guidelines include a chart with computer-predicted strongyle parasite pasture infectivity profiles for different parts of the country, emphasizing the importance of connecting strongyle control efforts to the active parasite transmission seasons. Similarly, the Danish guidelines include computer model outputs describing pasture strongyle infectivity over the course of the year, and the Dutch guidelines include information about the influence of seasonality and moisture on the transmission of *Fasciola hepatica*. The remaining guidelines do not provide climatic considerations for parasite control.

6. Parasite species

While the different guideline documents generally consider cyathostomins, *Parascaris* spp., and *Anoplocephala perfoliata* as main targets of parasite control programs, some regional differences were noted which will be outlined in the following sections.

6.1. *Strongylus vulgaris*

The Swedish and Danish guidelines have a primary focus on *Strongylus vulgaris*, which has been documented to have reemerged under the tightly administered prescription-only restrictions in place on anthelmintic products in both countries (Nielsen et al., 2012; Tydén et al., 2019). This parasite was historically considered the most pathogenic helminth parasite infecting horses (Kester, 1975), and recent studies from Denmark and Sweden have demonstrated that *S. vulgaris* is still a cause of life-threatening intestinal infarctions in horses today (Pihl et al., 2018; Hedberg-Alm et al., 2022b). Given the prescription-only policies in both countries, both Scandinavian guidelines focus on diagnostic monitoring for this parasite and outline treatment plans for when it is encountered. The Dutch guidelines also consider *S. vulgaris* with a specific focus on avoiding pasture contamination with this parasite and developing appropriate quarantining protocols.

While other guidelines do not include specific instructions for controlling *S. vulgaris*, the AAEP guidelines identify preventing the reemergence of *S. vulgaris* as a primary justification for strategically treating all horses once or twice a year. The ESCCAP guideline recommends annual screening for large strongyles via PCR or larval culture for farms employing the selective treatment approach.

6.2. Cyathostomins

Larval cyathostominosis is a well-described disease complex known to have a 50 % case-fatality rate in its acute phase (Reid et al., 1995; Lawson et al., 2023). However, the overwhelming majority of horses harbor these parasites without experiencing health issues (Nielsen et al., 2021a). All guideline documents consider cyathostomins a main target, but some differences in perceived relative importance were noticed between regions. However, larval cyathostominosis appears to remain relatively rare, though epidemiological data are lacking. In the US, this condition is very rarely encountered, and cyathostomins are not considered a major cause of intestinal health issues. In Australia, the condition is not common either. However, in 2023–2024, a few cases have been suspected following heavy rainfalls during the summer months (December–February) in New South Wales and Queensland (A. Jabbar, personal communication). This contrasts the situation in Northern Europe and the Netherlands, where larval cyathostominosis cases are encountered with some regularity (Lawson et al., 2023).

The species composition of cyathostomin burdens may differ between regions, but there is limited information available at this stage. In a study in The Netherlands, pooled L3 samples were differentiated by reverse line blot (RLB). At day 42, after moxidectin treatment, almost exclusively *Cylicocyclus* spp. (mainly *Cyc. nassatus*) were found, while 42 days after pyrantel treatment of the same horses, the population consisted mainly of *Cylicostephanus longibursatus* (Kooyman et al., 2016). A recent meta-analysis of data from worm count data generated primarily in Europe and the US over four decades identified a top tier of three species (*Cyathostomum* (*Cya.*) *catinatum*, *Cylicostephanus* (*Cys.*) *longibursatus,* and *Cylicocyclus* (*Cyc.*) *nassatus*) making up 56 % of the adult worm burdens, and an additional five species (*Cys. goldi, Coronocyclus* (*Cor.*) *coronatus*, *Cys. calicatus, Cys. minutus,* and *Cyc. leptostomum*) contributing an additional 22 % of the burdens (Bellaw and Nielsen, 2020). Recent metabarcoding investigations of strongylid species prevalence and abundance have revealed new insights into strongylid species composition in various populations. One British study suggested that *Cya. catinatum* was the primary species associated with ML resistance, whereas *Cyc. nassatus* was the primary species encountered in populations of pyrantel resistant cyathostomins (Bull et al., 2025), while a Swedish study found no apparent differences in species composition between pyrantel resistant and susceptible populations (Hedberg-Alm et al., 2023a). A US study investigated a population with shortened ERP following ivermectin and moxidectin treatment, and the major species encountered post-treatment were *Cya. catinatum*, *Cyc. insigne*, *Cyc. nassatus*, *Cyc. radiatus*, and *Cyc. elongatus* (Nielsen et al., 2022). An Australian study suggested that the primary species associated with moxidectin resistance were *Cyc. nassatus*, *Cys. longibursatus*, and *Cor. coronatus* (Abbas et al., 2024a). Taken together, while these studies suggest that a few species may drive anthelmintic resistance in cyathostomin parasites, they also suggest a very complex relationship with different species dominating in different studies. Indeed, the cyathostomin species composition does appear to vary by region and age group (Nielsen et al., 2022; Hedberg-Alm et al., 2023a; Abbas et al., 2023, 2024b; Diekmann et al., 2025a), and more work is needed to characterize this further. Interestingly, recent work has documented the existence of several cryptic cyathostomin species (Bredtmann et al., 2019a, 2019b; Gao et al., 2020; Louro et al., 2021), demonstrating the need for more work defining and describing and understanding equine strongylid communities. At this stage, however, information about possible health implications of cyathostomin species compositions is needed before metabarcoding will have practical value and can be meaningfully incorporated into equine parasite control programs.

6.3. *Anoplocephala perfoliata*

Equine tapeworm infection has been well documented to be associated with ileo-cecal colics (Nielsen, 2016a), but the perceived importance of this parasite varies between countries. Given the low pathogenicity of cyathostomins in the US, *A. perfoliata* is considered the most significant helminth pathogen in adult horses in that country. This contrasts with the situation in Australia, where this parasite is rarely encountered and not perceived as of major importance. In European countries, *A. perfoliata* infection is routinely diagnosed (Engell-Sørensen et al., 2018; Osterman-Lind et al., 2023), and the parasite is generally considered important, although it can be debated whether it should be ranked above or below the cyathostomins. However, it should be noted that the routine fecal egg counting techniques rarely recover cestode eggs. Therefore, this lack of information is also due to limited studies focused on estimating tapeworm prevalence (*e.g.,* most studies primarily focused on ascarids and cyathostomins). Noteworthy, when using antibody-based diagnostics, the prevalence of the parasite has been indicated to be considerably higher than found by coproscopic analysis (Jürgenschellert et al., 2022), although it is well-known that presence of antibodies can reflect exposure rather than actual infection, which can complicate interpretation. Taken together, information about occurrence and importance of *A. perfoliata* is still lacking, and limited guidance is offered by the current guidelines for how to best control this parasite.

7. Anthelmintic resistance

Global findings of anthelmintic resistance in equine nematode parasites have recently been reviewed (Nielsen, 2022). The same resistance findings tend to be reported worldwide, although some regional differences can be noted.

7.1. Cyathostomins

Benzimidazole resistance is widely reported in equine cyathostomins with no signs of regional differences. Resistance to the pyrimidine class is almost as widely reported in cyathostomins, but differences in availability and historical use of this class could result in lower resistance levels in some countries (Lester et al., 2013; Relf et al., 2014; Hedberg-Alm et al., 2023a). Macrocyclic lactone resistance in cyathostomins has been reported with increasing frequency in recent years, and is found in Australia, France, the UK, and the USA (Nielsen, 2022) but has yet to be reported in Denmark and Sweden, where recent investigations demonstrated full efficacy (Hedberg-Alm et al., 2023b; Nielsen et al., 2025).

7.2. Ascarids

Macrocyclic lactone resistance appears widespread in equine ascarids, but the other two drug classes have only been sporadically investigated (Nielsen, 2022). It is remarkable that ascarid resistance has been reported to both the benzimidazole and pyrimidine drug classes in Sweden despite the restrictions on anthelmintic use in that country (Martin et al., 2018; 2024), and similar unpublished observations have been made in other countries. These findings suggest that the efficacy of these two anthelmintic classes should be closely evaluated in other countries as well.

7.3. Other parasites

Equine pinworms (*Oxyuris equi)* have been documented as resistant to the macrocyclic lactone (ML) class in a relatively limited number of studies, but it is remarkable that the reports represent four different continents (Nielsen, 2022). This suggests that ML resistance may be widespread in *O. equi* worldwide.

Two US studies have recently documented evidence of treatment failure of praziquantel and pyrantel pamoate against *A. perfoliata* (Nielsen, 2023; Finnerty et al., 2024), but this has not been investigated elsewhere, thus far.

8. Diagnostics

All the guideline documents recommend a surveillance-based approach to parasite control with routine implementation of routine diagnostic testing. However, differences in diagnostic portfolios available in different countries appear to affect these recommendations. The main differences are outlined in the following.

8.1. Fecal egg counts

Fecal egg count monitoring remains a core component of parasite control programs all over the world, and all guidelines recommend these for monitoring of anthelmintic efficacy, presence of ascarids, and strongylid shedding levels. In general, all guidelines recommend the McMaster technique as a pragmatic option considering cost, ease of use, and familiarity within the veterinary industry. However, many different techniques and modifications exist, and some of these, such as the Mini-FLOTAC, have been shown to perform with better accuracy and precision (Noel et al., 2017; Bosco et al., 2018). Nonetheless, since these better performing techniques may not be available in all locales, they are not widely recommended. In recent years, several platforms utilizing artificial intelligence-based image analysis for fecal egg counting have been introduced commercially (Slusarewicz et al., 2016; Nagamori et al., 2020; McEvoy et al., 2024; Steuer et al., 2024), and such automated technologies may become more widely adopted in the future.

Given the plethora of available fecal egg counting techniques, the CANTER guidelines include a section explaining appropriate performance metrics of fecal egg counting techniques and how to appropriately choose a technique suitable for the intended purpose. The appendix of the Dutch guideline includes a SOP for pooled strongyle fecal egg counting with the McMaster method. The other guideline papers do not provide any further guidance for choosing the appropriate fecal egg counting technique. However, some guidelines pay specific attention to coprological techniques for detecting *A. perfoliata* eggs, especially in countries where serological testing is not readily available.

8.2. Serology

The United Kingdom is the only country to offer commercially available assays for anti-helminth antibody detection. Enzyme-linked immunosorbent assays (ELISAs) are available for the detection of anti-*A. perfoliata* antibodies in serum and saliva (Proudman and Trees, 1996; Lightbody et al., 2016), and a serum ELISA is available for measuring anti-cyathostomin antibodies (Lightbody et al., 2024). The CANTER guidelines include suggestions for how to interpret results of these tests as part of a parasite risk assessment approach. Similarly, the Dutch guideline also incorporates guidelines for using these anti-cestode antibody tests and mentions the anti-cyathostomin antibody assay as well. However, none of the other guideline documents includes guidance for the use and interpretation of these tests.

8.3. Strongylus vulgaris testing

As mentioned above, routine testing for *S. vulgaris* is recommended in Sweden and Denmark, whereas the ESCCAP guidelines recommend *S. vulgaris* testing for farms using a selective treatment approach. A coproculture technique with subsequent morphological identification of third-stage larvae is recommended in both countries but a fecal polymerase chain reaction (PCR) assay is commercially available for this purpose in Sweden. At this stage, routine testing for *S. vulgaris* is not recommended within the guidelines in other countries. However, to date, there are no evidence-based recommendations available concerning how to best employ larval culture or PCR based *S. vulgaris* testing, including details such as the number/proportion of horses to be tested, the minimum number of strongyle larvae/eggs to be examined or the best seasonal time point for testing.

9. Anthelmintic products

9.1. Availability

Four different anthelmintic classes are available for equine use: benzimidazoles, pyrimidines, MLs, and pyrazino-isoquinolines (praziquantel). Although these four classes tend to be available everywhere, some regional differences should be noted.

Most notably, several anthelmintic combination products are available in Australia. These typically contain two or more active ingredients targeting the same nematode species and are not marketed in the northern hemisphere. Except for the MLs, very few single active products are available in Australia, which makes choosing the appropriate anthelmintic a very different exercise than in other countries.

Interestingly, pyrantel products have been discontinued in Denmark, reducing the number of available anthelmintic classes to just three, with only two nematocidal classes and one class targeting tapeworms.

9.2. Environmental impact and ecotoxicity

A consideration, which every prescriber should keep in mind, is the effects of anthelmintics on soil fauna and water quality. In the future, these environmental effects may lead to lead to stricter rules in Europe, particularly for the MLs. The CANTER guidelines have a chapter devoted to this topic, and the Dutch guidelines touch upon these aspects as well.

10. Challenges and future needs

10.1. Diagnostics

The general emphasis on parasite surveillance/diagnosis raises the need for better and more refined diagnostic tools. Among these, there is an imminent need for diagnostics suitable for the evaluation of anticestode treatment efficacy. Measuring serum or salivary antibodies is not useful for this purpose given, the relatively long half-life of these antibodies and the continued exposure to these parasites. Standard fecal egg counting techniques often lack diagnostic sensitivity and recover very few tapeworm eggs (Anderson et al., 2024), making evaluating anthelmintic treatment efficacy problematic. Currently, the FECRT guidelines sanctioned by the World Association for the Advancement of Veterinary Parasitology (WAAVP) do not include guidance for evaluating anticestode treatment efficacy (Kaplan et al., 2023), and neither do any of the equine guideline documents discussed herein.

In the Scandinavian countries, the prominent focus on *S. vulgaris* warrants a need for better techniques for high throughput screening for this parasite. Coprocultures can be performed in-house by veterinary practices, but the procedure is time-consuming, and large-scale testing requires considerable shelf-space and expertise. Coprocultures have been shown to perform with low to moderate negative predictive values (Nielsen et al., 2010) and pooling samples from multiple horses to save time and effort has been shown to further negatively affect diagnostic sensitivity for the detection of *S. vulgaris* (Nielsen et al., 2021b). A *S. vulgaris*-specific PCR has been validated (Nielsen et al., 2008) and is currently commercially available in Sweden, but submitting samples to a reference laboratory for such analysis is both time-consuming and costly and may, thus, not be widely adopted. Thus, it would be desirable to have a reliable and affordable *S. vulgaris* test capable of generating timely results.

All the guidelines recommend routine FECRT anthelmintic efficacy testing but the general perception is that veterinarians have been reluctant to adopt this on a large scale. It may be that veterinarians and their clients find this procedure time-consuming, costly, and cumbersome, but this has not been investigated on widely. The WAAVP guidelines have attempted to address this by providing two protocols: a research protocol and a less stringent clinical protocol (Kaplan et al., 2023). However, in the authors' experience, the clinical protocol may still be considered too cumbersome by many veterinarians, the recommended group sizes cannot always be met, and very few see value in calculating efficacy estimates using the available online tools. Some guideline documents have now included simplified versions of the WAAVP FECRT guidelines and provide suggestions for approaching scenarios with fewer than five horses available. Hopefully, these simplified guidelines will facilitate further adoption of routine anthelmintic efficacy testing in equine operations.

10.2. Health impact

While it has been well established that equine helminth parasites are capable of causing clinical or subclinical disease, this apparently happens relatively rarely nowadays, even with a perceived pathogenic parasite such as *S. vulgaris*. No real data exist quantifying the risk of adverse health consequences associated with infection. Infection with *S. vulgaris* far from equates to disease, and practising zero tolerance to helminth infection is not sustainable.

Cyathostomins are ubiquitous in grazing horses worldwide, but disease is a rare event for which the risk factors are poorly understood. A major issue is that diagnosis of larval cyathostominosis is mainly based on a range of clinical findings and, thus, prone to be either overlooked or misdiagnosed. For reasons currently not understood, larval cyathostominosis appears to be very rare in North America, whereas this condition occurs with some regularity in the British Isles (Lawson et al., 2023), the Netherlands, and Northern Europe. The recent advent of metabarcoding techniques has enabled investigations on a cyathostomin species-specific level, and it would be valuable to investigate the possible clinical significance of cyathostomin species composition.

Equine ascarids can also cause serious disease, and in some cases, even death in foals (Nielsen, 2016b), although large-scale incidence data do not exist. More research is needed to understand parasite infection dynamics, identify effective management procedures, and quantify the risks of ascarid disease.

Despite the well-documented pathogenic potential, *S. vulgaris* only causes non-strangulating intestinal infarction in a small subset of infected horses (Nielsen et al., 2016), and disease mechanisms are poorly understood. In addition to tools for diagnosing parasite infection, it would be very valuable to develop biomarkers for monitoring disease processes caused by the parasite. In several recent studies, *Strongylus edentatus* and, in one case also *S. equinus,* were more frequently encountered than *S. vulgaris* (Jürgenschellert et al., 2022; Abbas et al., 2023; Halvarsson et al., 2024; Diekmann et al., 2025b) and this may warrant more attention in the future.

10.3. Treatment options

It is abundantly clear that the global equine anthelmintic product portfolio is becoming very narrow due to the increasing levels of anthelmintic resistance reported in multiple equine parasites (Nielsen, 2022). New nematocidal classes with new modes of action have not been introduced for equines since ivermectin in the early 1980s, and praziquantel was launched for tapeworm control over 30 years ago. Examples of total treatment failure are now observed on farms where none of the available classes have full efficacy against all target parasites (Nielsen et al., 2020; Nielsen, 2023). With only four anthelmintic classes available, resistance documented to each of these in multiple parasite species, and not all classes available in all countries, there is a pronounced need for new anthelmintics with new modes of action. Furthermore, the introduction of a new anthelmintic class would need to be accompanied with clear guidance for how best to implement it and maintain efficacy for as long as possible.

10.4. Pasture management

Given the departure from heavy reliance on frequently administered anthelmintic treatments, there is an increasing need for more knowledge about the impacts of pasture management and grazing schemes on parasite transmission in different climates. There is some information available on the effects of such measures on strongyle parasite transmission (Osterman-Lind et al., 2022), but most of it is several decades old, it only represents some climates, and equine studies are relatively limited (Eysker et al., 1986; Herd, 1986a, 1986b). It is remarkable that no information is available on the impact of pasture management on ascarid and cestode transmission in horses, and there is a huge need for studies on these aspects. Taken together, the impact of pasture management on parasite transmission and implications for reduction of anthelmintic usage should receive high research priority in years to come.

10.5. Quarantine procedures

Recommendations for new arrivals remain a discussion point, and most guidelines do not include recommendations for appropriate parasite testing, treatment, and quarantining periods. However, the Swedish, Danish, Dutch, and ESCCAP guidelines include a specific section for newly arrived horses, recommending deworming upon arrival, a quarantine period in a separate paddock, and a follow-up efficacy test before integration into the communal pasture. This area could be further defined with future revisions of the guideline documents.

10.6. Biological control

Keeping in view the widespread anthelmintic resistance in ascarids and cyathostomins, biological control is an underutilized tool for controlling parasitic nematodes of horses (reviewed by Szewc et al., 2021). Nematophagous fungi have been shown to reduce the numbers of free-living stages of parasitic nematodes of grazing animals (*e.g.,* sheep, cattle, goat and horses) on pasture. For instance, in-feed treatment with nematophagous fungi can reduce larval numbers post-excretion. *Duddingtonia flagrans* is a nematode-trapping fungus that has shown considerable efficacy against infective stage larvae of gastrointestinal nematodes of horses. *This* is currently the only nematophagous fungus commercially available for the biological control of horse nematodes. An Australian *D. flagrans* product was recently shown to reduce equine strongylid larvae on pasture by 84 % (Healey et al., 2018a; 2018b). However, additional data are required to demonstrate the optimal use of such products in different climatic conditions, geographical regions, and seasons (Carmo et al., 2025).

10.7. Messaging/communication

All the countries identified a strong need for better and more effective communication about the guidelines and education about parasites, diagnostics, drug resistance, and clinical aspects. Some organizations hosting the guidelines, such as the AAEP, Danish Veterinary Association, and Swedish Agricultural University, have hosted continuing education webinars and seminars on these topics, and the CANTER website provides a comprehensive resource with multiple chapters with up-to-date information. However, the general experience is that most equine veterinarians, advisors, and horse owners are either uninformed, misinformed, or confused about equine parasite control, and there is a substantial need for continuing education and public dissemination in this area.

Historically, a common complaint from various sides has been frequent encounters with conflicting information and recommendations. This was probably due to a combination of outdated information still being propagated, commercially or otherwise biased information developed to support the use of various anthelmintic or diagnostic products, and unsupported ideas/hypotheses posted by various individuals or groups on social media platforms. The hope is that the publication of parasite control guidelines will help address this problem by providing evidence-based and up-to-date information, which can be consulted and referenced by all stakeholders. This, in turn, should reduce confusion and conflicting information. However, there is a prominent need for creating awareness of these guidelines, ensuring they reach their intended audiences. Some of the hosting organizations have advertised their guidelines in newsletters and social media posts, and CANTER has had a communications committee in charge of disseminating information about the resource. Despite these activities, it appears that communication efforts could be strengthened even more, and this remains a major area of emphasis going forward. More research needs to be conducted to understand how to best reach the intended audiences (veterinarians, other prescribers of anthelmintic products, horse owners, and equine professionals) in different countries and provide useful guidance.

11. Concluding remarks

In conclusion, there is substantially more consensus than disagreement between the guidelines. They share the same overall goals and advocate a surveillance-based approach to equine parasite control. Differences in legislation, anthelmintic and diagnostic product portfolios, and climatic conditions have led to some variation in terms of parasite species being emphasized, diagnostic test utilization, and the timing of anthelmintic treatment. However, overall, these differences are relatively minor. All guidelines emphasize the importance of routine anthelmintic treatment efficacy evaluation, which equine veterinarians around the world have not widely adopted. It will be interesting to monitor the impact of these guidelines in years to come. We expect that the relatively uniform message between guideline documents will reduce the conflicting and outdated information currently in circulation, and it could be hoped that routine efficacy testing will become more widely adopted around the world. Having reached a generally uniform message between the guidelines, the next obvious step is to work to effectively reach the intended audience and communicate guidance for practising modern equine parasite control.

CRediT authorship contribution statement

Martin K. Nielsen: Writing – original draft, Conceptualization. **Alison Pyatt:** Writing – review & editing. **Jodie Perrett:** Writing – review & editing. **Eva Tydén:** Writing – review & editing. **Deborah van Doorn:** Writing – review & editing. **Tina H. Pihl:** Writing – review & editing. **Jennifer S. Schmidt:** Writing – review & editing. **Georg von Samson-Himmelstjerna:** Writing – review & editing. **Anne Beasley:** Writing – review & editing. **Ghazanfar Abbas:** Writing – review & editing. **Abdul Jabbar:** Writing – review & editing, Conceptualization.

Declaration of competing interests

The authors declare no conflicts of interest.

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