

The Small Redworm Blood Test

This document provides an overview of the Small Redworm Blood Test, including its application and result interpretation.

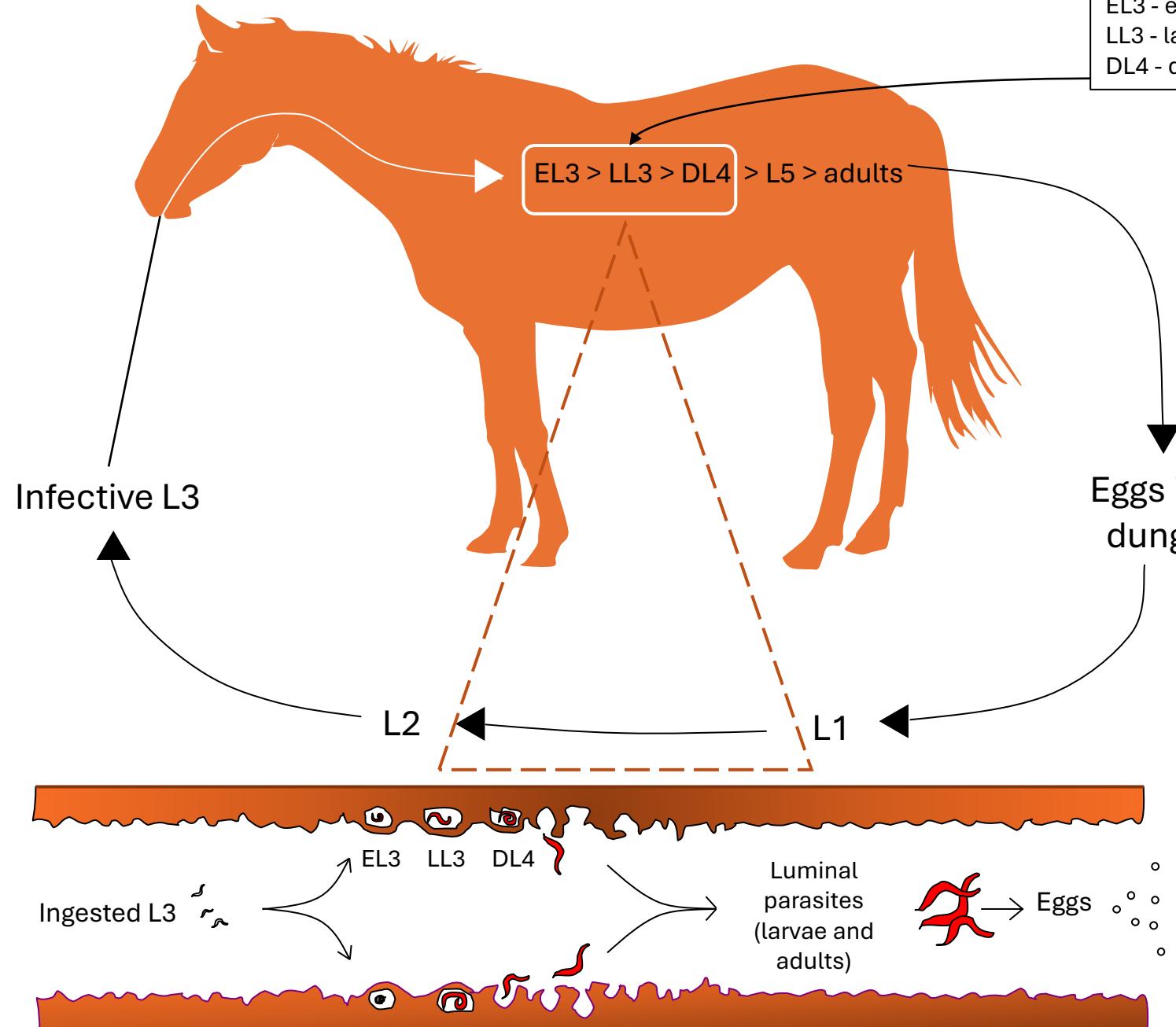
For detailed instructions, refer to the guidelines at [Small Redworm Blood Test](#)



Overview

- Small redworm (cyathostomin) larvae encyst in the mucosa and submucosa of the large intestine
- Higher burdens of encysted larvae are more commonly found in the UK in the autumn and winter months
- Young horses (under 5 years) are more susceptible to heavier encysted larval burdens
 - Older horses, especially those with pituitary pars intermedia dysfunction (PPID), or those grazing on heavily contaminated paddocks, are also at risk
- The emergence of many larvae can lead to a life-threatening condition known as larval cyathostominosis
- Higher-risk horses should receive larvical anthelmintic treatment in late autumn/winter, while low-risk horses may not require treatment

Small redworm lifecycle



Encysted larval stages large intestinal wall:
EL3 - early third-stage larvae
LL3 - late third stage larvae
DL4 - developing fourth-stage larvae

Moxidectin and a 5-day fenbendazole regimen are licensed against all stages. Due to high levels of resistance to fenbendazole, efficacy testing is recommended

Faecal egg counts do not correlate with adult or larval burdens of small redworm in horses

Management measures such as dung removal, maintaining a low stocking density, and resting grazing should be implemented to reduce the transmission of small redworms on paddocks

Horses can accumulate small redworms in the intestinal lumen and wall, with younger animals especially vulnerable to high burdens of encysted larvae. While the exact burden leading to clinical disease is unknown, it is estimated to be in the range of tens of thousands to millions of small redworms.

Considerations

- Anthelmintics are over-used in the UK
- Why are they over-used?
 - Gaps in knowledge regarding the relationship between small redworm encysted larvae and disease have led to a cautious approach, and blanket larvical treatments have been recommended for many years

Factors that influence overuse of anthelmintics in horses

Fear of the consequence of not worming

Decades of advice promoting interval treatments

Years of advice promoting all-group larvical therapy

Perception of increased cost and hassle in diagnostic-led programmes

Knowledge gaps lead to uncertainty which drives a cautious approach

The Small Redworm Blood Test

- The Small Redworm Blood Test is specifically designed to diagnose cyathostomin infections in horses
- The test utilises an ELISA format to detect IgG(T) antibodies specific to three recombinant antigens, which represent the most common cyathostomin species and all horse stages of the life cycle, including encysted larvae (McWilliam et al. 2010; Mitchell et al. 2016; Tzelos et al. 2020)
- In each sample, the antigen-specific IgG(T) is compared to an equine IgG calibration curve to ensure internal quality control on every plate. Results are reported as 'serum scores.'
- The test has been validated using gold standard samples from horses with known cyathostomin burdens of encysted larvae and luminal larvae/adults. In these studies, the test demonstrated high sensitivities and specificities at total small redworm burden thresholds of 1,000, 5,000, and 10,000 worms
- Area under the curve (AUC) values in Receiver Operator Characteristic (ROC) analysis ranged from 0.91 to 0.96 for the three threshold values (Lightbody et al., 2024)
 - AUC values greater than 0.9 are generally considered indicative of excellent diagnostic performance (Swets, 1988)
- All performance parameters of the test, including the serum score cut-offs at different total worm burden thresholds, are detailed in the publication "Validation of a Serum ELISA Test for Cyathostomin Infection in Equines," [Validation of a serum ELISA test for cyathostomin infection in equines - ScienceDirect](#)

Risk assessment

Before deciding to use the Small Redworm Blood Test, it's crucial to conduct a thorough risk assessment. Taking this step ensures that you understand any potential pitfalls and can make informed choices moving forward

1. For horses in moderate to high risk categories, administer a larvical treatment

2. For horses in a low risk category, there are two options:
 - (i) Opt not to administer a larvical anthelmintic treatment
 - (ii) Use the Small Redworm Blood Test to confirm a low worm burden, which would support the decision to forgo larvical treatment



Whatsyourwormrisk.com can be used to help categorise individual horses as low, moderate, or high risk for worm infection

Risk assessment

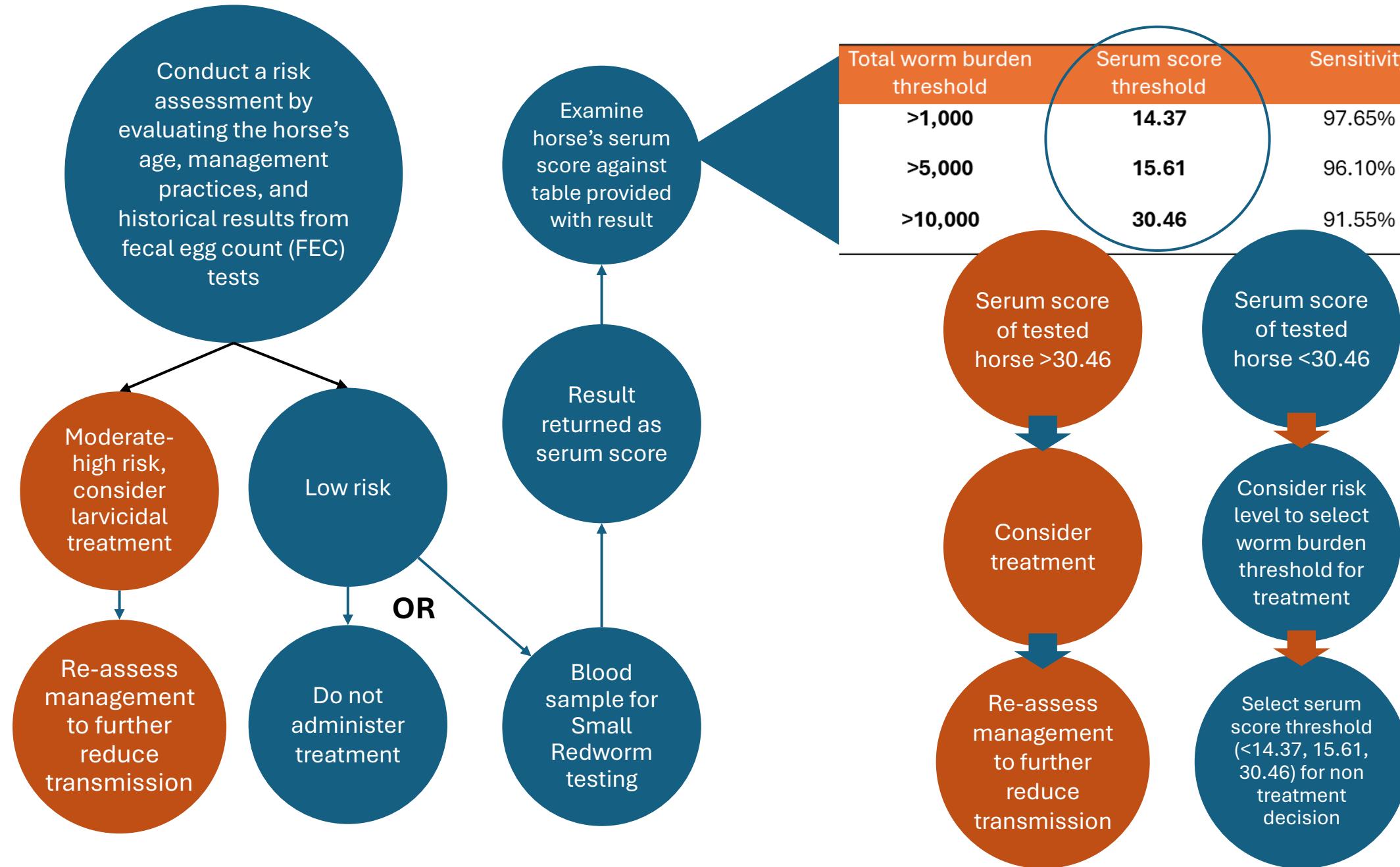
Use this table to help inform the decision of whether to use the Small Redworm Blood Test in larvical treatment decisions



	Low infection risk	High infection risk
Management	All or most of the following: Closed herd, dung removal 2-3 times/week, low stocking density, no young stock (<5 years-old) Horses with limited grazing time (racehorses, sport horses)	All or most of the following: open herd, no/ineffective quarantine, dung not removed/removed less than once a week, high stocking density, young stock (< 5 years-old) present, reduced anthelmintic efficacy reported/suspected
Recent FEC	Individual and group FEC results <200 EPG	Individual or high proportion of group FEC ≥ 200 EPG
Apply Small Redworm Blood Test?	YES	NO

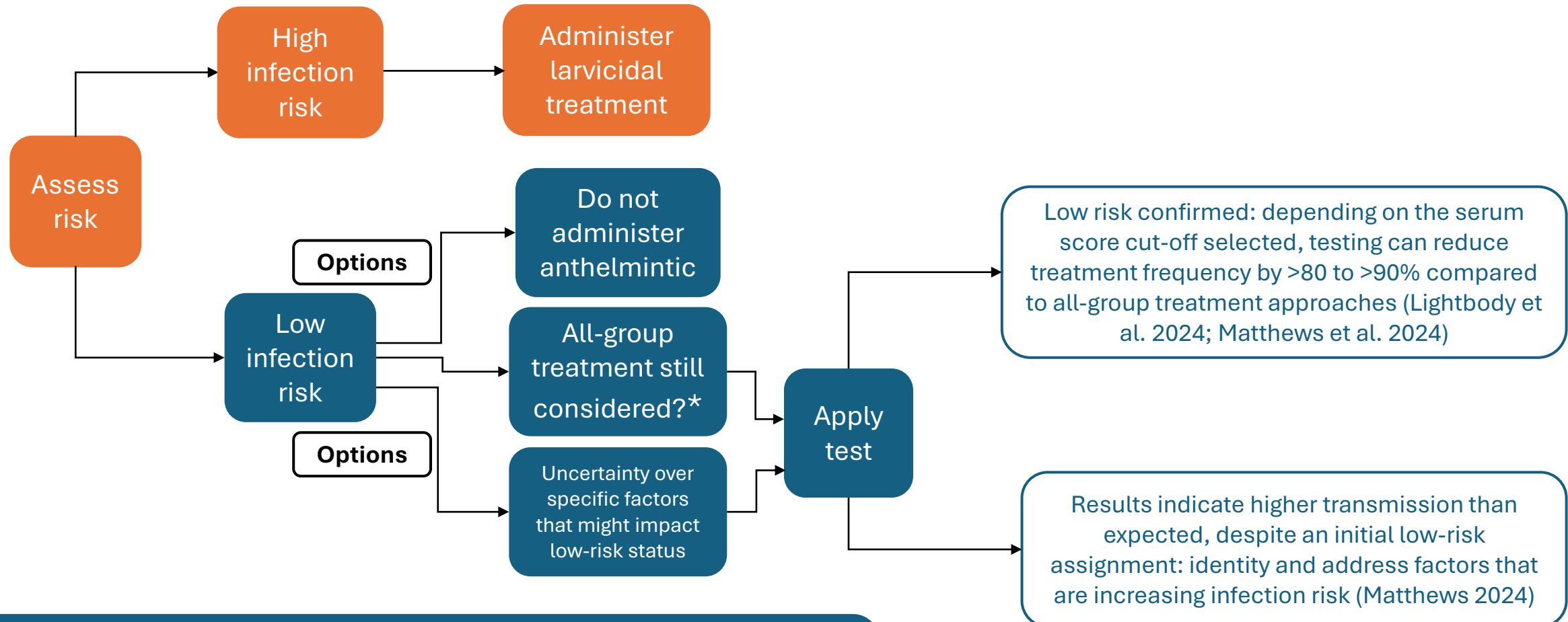
Whatsyourwormrisk.com can be used to help categorise individual horses as low, moderate, or high risk for worm infection

Using the Small Redworm Blood Test for informing treatment decisions in autumn/winter



Total worm burden threshold	Serum score threshold	Sensitivity	Specificity
$>1,000$	14.37	97.65%	85.19%
$>5,000$	15.61	96.10%	71.43%
$>10,000$	30.46	91.55%	75.6%

Small redworm larvical treatments: decision tree for horses in autumn/winter

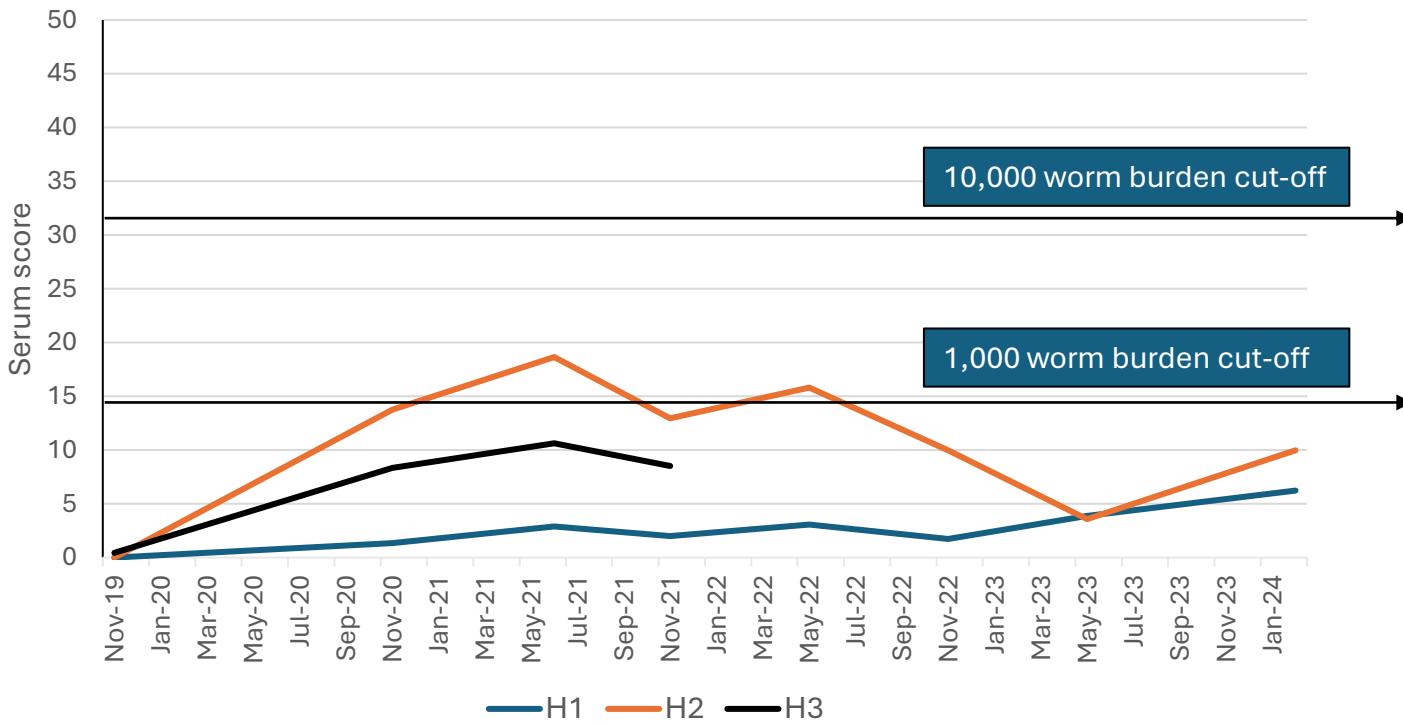


* All recent peer-reviewed studies in the UK and Ireland (Easton et al. 2016; Elghryani et al. 2019; Tzelos et al. 2019; Mair et al, 2023; Walshe et al. 2023) indicate a reluctance in the equine sector to move away from all-group calendar-based worming

Using the Small Redworm Blood Test in a Low-Risk Setting

Case Study 1: Adult Horses with Permanent Grazing, Daily Dung Removal and Low Stocking Density

Horses blood tested 1-2 times a year since November 2019. Their serum scores have consistently been below the 10,000 small redworm serum score cut-off and usually fall under the 1,000 small redworm serum score cut-off. As a result, these horses have not received any anti-small redworm treatment since testing began.



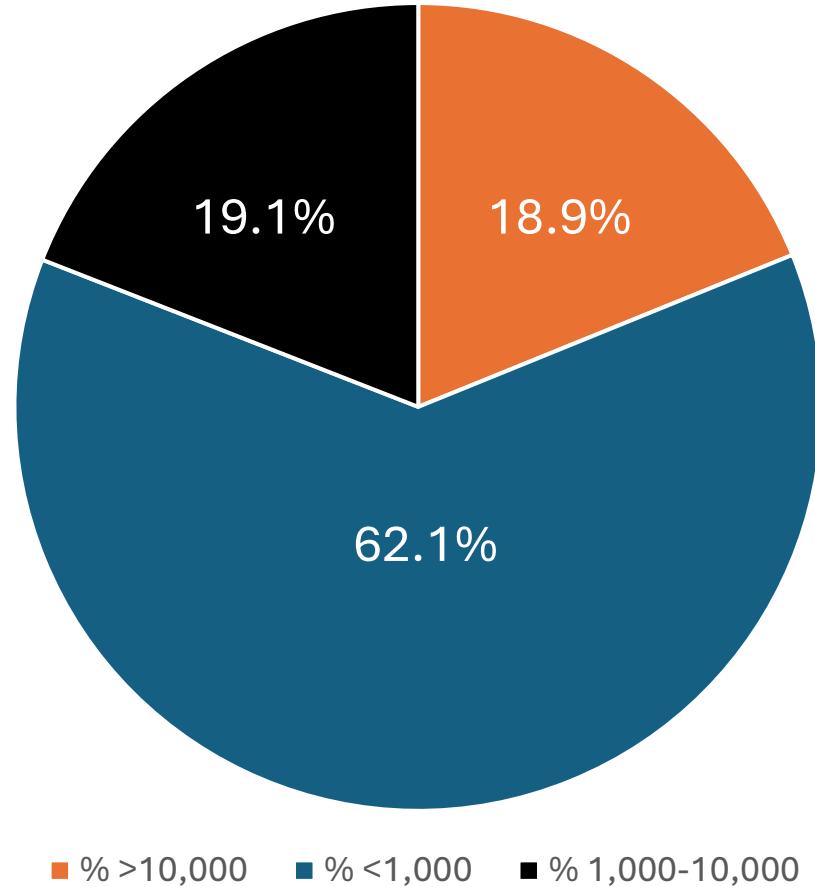
Matthews & Austin 2023



Application of the Small Redworm Blood Test in a Low-Risk Setting

Case Study 2: Cohort of Horses from a Sports Horse Clinic

Blood samples were submitted to the commercial testing service from a veterinary clinic that specialises in sport horses. A total of 981 horses were included in the analysis. More than 60% of the horses had serum score results below the 1,000 small redworm burden cut-off, while over 80% of results were below the 10,000 small redworm burden cut-off.



The Small Redworm Blood Test: Uses and Limitations

It's important to understand what the Small Redworm Blood Test is not intended for
The test should not be used for diagnosing conditions outside its specified purpose

The test is **not** recommended for

1. Predicting risk of larval cyathostomnosis

- The pathogenesis of larval cyathostomnosis is complex and may be influenced by an animal's response to small redworm infection, as well as its overall parasite burden. The upper threshold serum score for the test is 10,000 small redworms, a burden generally not associated with clinical disease. There is limited data on the burden level that leads to this condition; thus, assessing disease risk should be based on a comprehensive history of the individual and its management

2. Diagnosing larval cyathostomnosis in isolation

- Without a detailed clinical history and other diagnostic criteria, such as blood biochemistry parameters, diagnosis of larval cyathostomnosis can be challenging. The test should only be utilised as an adjunct to demonstrate levels of cyathostomin-specific antibodies in an individual horse, which would indicate high exposure to the parasite. Some veterinary surgeons employ the test as a herd-level tool following disease outbreaks to evaluate whether their recommended management changes and deworming strategies have reduced cyathostomin transmission
- As the test detects low cyathostomin burdens with high sensitivity, it can be used as a 'rule out' test for small redworm as a cause of conditions of the GI tract

3. Assessing encysted larval burdens alone

- The test is not designed to assess only encysted larval burdens. It evaluates antibody responses to molecules expressed during all host life cycle stages, including mucosal and luminal larval stages

4. Assessing anthelmintic efficacy

- It takes several months for antibody levels (especially 'off-scale' serum scores) to decrease after a successful treatment that eliminates worms. Therefore, this test is not suitable for assessing the efficacy of anthelmintics

In conclusion

- The Small Redworm Blood Test is designed to assist veterinarians and their clients in making informed treatment decisions, in particular to reduce the indiscriminate use of anthelmintics in **low risk** groups
- Many owners in the UK and Ireland continue to administer blanket treatments, including those targeting larval cyathostomins (Easton et al. 2016; Elghryani et al. 2019; Tzelos et al. 2019; Mair et al. 2023; Walshe et al. 2023). This may stem from concerns about the potential clinical impact of withholding treatment, reinforced by years of advice supporting annual larvicial worming
- Research indicates that fear of potential disease resulting from not worming is driving owners to apply unnecessary treatments, regardless of the threat of resistance (Rose Vineer et al. 2017; McTigue et al. 2022). This suggests that blanket treatments are likely to continue and that simply assessing risk may not considerably reduce larvicial treatments
- Tools are needed to help drive change; the Small Redworm Blood Test can alleviate owner uncertainty by providing a reliable metric that supports confident decisions about withholding anthelmintics
- The test allows veterinarians to engage in treatment decisions, especially where there is an owner preference for blanket larvicial treatments despite low infection risk
- Published research supports use of the test in low infection risk populations, demonstrating substantial reductions in anthelmintic administration compared to all-group treatment approaches (Matthews & Austin 2023; Matthews et al. 2024).
- Efforts to address antibiotic overuse in livestock show that access to data and monitoring, along with veterinary guidance, can help overcome barriers to reducing drug use and improve compliance (Guenin et al. 2023). In this context, the test can be used to support veterinary surgeons in reducing calendar based all-group treatments where they are not needed

References

Easton S, Pinchbeck GL, Tzelos T, Bartley DJ, Hotchkiss E, Hodgkinson JE, Matthews JB. 2016. Investigating interactions between UK horse owners and prescribers of anthelmintics. *Prev Vet Med.* 135:17-27.

Elghryani N, Duggan V, Relf V, de Waal T. 2019. Questionnaire survey on helminth control practices in horse farms in Ireland. *Parasitol.* 146:873-882.

Guenin MJ, Studnitz M, Molia S. 2023. Interventions to change antimicrobial use in livestock: a scoping review and an impact pathway analysis of what works, how, for whom and why. *Prev Vet Med.* 220:106025

Lightbody KL, Austin A, Lambert PA, von Samson-Himmelstjerna G, Jürgenschellert L, Krücken J, Nielsen MK, Sallé G, Reigner F, Donnelly CG, Finno CJ, Walshe N, Mulcahy G, Housby-Skeggs N, Grice S, Geyer KK, Austin CJ, Matthews JB. 2024. Validation of a serum ELISA test for cyathostomin infection in equines. *Int J Parasitol.* 54:23-32.

Matthews JB. 2024. Trainer Magazine. To worm or not to worm? That is the question. 87:54-58.

Matthews JB, Peczak N, Engeham SE. 2024. Latest developments in testing for equine helminths. In *Pract.* Jan/Feb:1-9.

Matthews JB, Austin CJ. 2023. Using diagnostics in supporting sustainable worm control in horses. *UK Vet Equine* 7:2-6.

McTigue FE, Mansbridge SC, Pyatt AZ. 2022. Equine anthelmintic resistance: horse owner and yard manager perception of the barriers affecting strategic control measures in England. *Vet Sci.* 9:560.

Mair TS, Schofield I, Shrubbs JL, Rendle DI. 2023. Understanding UK parasite control practices: a horse owner survey. *Eq Vet J.* 55, S58:13.

Tzelos T, Morgan ER, Easton S, Hodgkinson JE, Matthews JB. 2019. A survey of the level of horse owner uptake of evidence-based anthelmintic treatment protocols for equine helminth control in the UK. *Vet Parasitol.* 274:108926.

Rose Vineer H, Vande Velde F, Bull K, Claerebout E, Morgan ER. 2017. Attitudes towards worm egg counts and targeted selective treatment against equine cyathostomins. *Prev Vet Med.* 144:66-74.

Swets JA. 1988. Measuring the accuracy of diagnostic systems. *Science.* 240, 1285-1293.

Walshe W, Burrell A, Kenny U, Mulcahy G, Duggan V, Regan A. 2023. A qualitative study of perceived barriers and facilitators to sustainable parasite control on thoroughbred studs in Ireland. *Vet Parasitol.* 317:109904.