

# Onchocerca cervicalis: a survey into awareness and knowledge of the parasite amongst UK equine veterinarians

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## Short Communication

# *Onchocerca Cervicalis*: A Survey into Awareness and Knowledge of The Parasite Amongst UK Equine Veterinarians

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## ABSTRACT

The nematode *Onchocerca cervicalis* is the most common causative agent of equine onchocerciasis; this condition is characterised by pruritus and dermatitis and is a differential diagnosis for insect bite hypersensitivity. Onchocerciasis is currently presumed of minor importance within the UK, however prevalence may increase if macrocyclic lactone use declines amid concerns about anthelmintic resistance in gastrointestinal nematodes. This survey aimed to establish *O. cervicalis* awareness and knowledge levels amongst UK equine veterinarians and to determine approximate numbers of UK horses affected with unresponsive cases of dermatoses, including insect bite hypersensitivity. An online survey was distributed to UK equine vets between December 2019 and February 2020. Of 88 respondents, 78% were aware of *O. cervicalis*, however 49% of these answered less than half the questions presented about the parasite's lifecycle correctly. Approximately 25% of insect bite hypersensitivity cases respondents saw were deemed unresponsive to standard treatments, 84% of respondents had not previously considered onchocerciasis as a differential diagnosis in such cases. Findings suggest knowledge of *O. cervicalis* amongst UK equine vets is lacking, highlighting a need to raise awareness and consideration of the parasite as a differential when investigating equine dermatoses.

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## 1. Introduction

*Onchocerca cervicalis* is a filarial nematode which affects horses, donkeys and mules worldwide [1]. Commonly known as equine neck threadworm, the parasite has an indirect lifecycle with *Culicoides* midges, specifically *C. nubeculosus*, acting as the intermediate host in the UK [2]. Adult *O. cervicalis* reside in the nuchal ligament where they may persist for up to 15 years, producing larvae which are termed microfilariae [3]. These migrate through connective tissue to the dermis, accumulating in highest concentrations

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*Animal welfare/ethical statement*: The study protocol was approved by the ethics committee of Harper Adams University prior to the questionnaire being launched. To gain informed consent, an information statement was included at the beginning of the survey informing participants of: confidentiality and anonymity of both themselves and the companies they represent, research objectives, expected completion time, right to withdraw, potential uses of data and researcher contact details. Data collected was handled according to the Market Research Society Code of Conduct and hence remained confidential.

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around the ventral abdomen and thorax [3]. The clinical syndrome, equine onchocerciasis, is most commonly characterised by severe pruritus and subsequent skin lesions where dermal microfilariae congregate and thus presents significant welfare implications [4]. It is hypothesized individual host hypersensitivity reactions to dermal microfilariae antigens produce these clinical signs [5].

Identification of onchocerciasis cases may be problematic, as the condition is a differential diagnosis for several common equine dermatoses, including insect bite hypersensitivity (IBH). Furthermore, the only ante-mortem test available is skin microscopy to detect dermal microfilariae [6]; such procedures have variable sensitivity and can be perceived as invasive by clients.

The UK Donkey and mule populations may be largely affected by asymptomatic *O. cervicalis*; a survey of 188 donkeys in Egypt found 83% were infected with *O. cervicalis*, with no gross clinical signs [7] and circulating *Onchocerca* microfilariae were recently detected incidentally in 4 asymptomatic jennies in Italy [8]. Whilst demographic information on the UK donkey population is lacking [9], research indicates a large proportion live alongside horses [10] and therefore these animals represent an important source of *O. cervicalis* infection.

No available treatments will eliminate adult *O. cervicalis*, however the macrocyclic lactones ivermectin and moxidectin are effective in killing dermal microfilariae and hence controlling clinical onchocerciasis when administered regularly [11]. As these products are routinely administered to British horses for the treatment of gastrointestinal nematodes [12], onchocerciasis is being inadvertently controlled and therefore may be presumed rare and of minor importance within the UK. Annual moxidectin treatment in late autumn/early winter is a common practice amongst horse owners, as encysted cyathostomins have developed considerable resistance to other anthelmintics [13]. However, use will likely decline in the near future due to growing concern surrounding anthelmintic resistance (AR), increased uptake of targeted treatment based upon faecal egg counts (FEC) [14] and the recent commercialization of an enzyme-linked immunosorbent assay to detect cyathostomin infections [15]. Therefore, onchocerciasis prevalence may increase. Additionally, since the 1970s, *Culicoides* abundance in the UK has increased and the *Culicoides* activity season lengthened in response to increased temperatures and precipitation [16]. Therefore, continuing climatic changes may also contribute to increased onchocerciasis prevalence.

Scientific literature on *O. cervicalis* in British horses is lacking. The last notable study was published in 1973, before macrocyclic lactones became available in the veterinary market; this research surveyed 3 abattoirs and found infection rates of 22.7%, 13.9% and 12.9% using skin samples from the ventral abdomen [3]. Therefore, it was unknown to what extent UK equine veterinarians were aware of the parasite. This study aimed to assess *O. cervicalis* awareness and knowledge amongst UK equine vets. It also sought to ascertain approximate numbers of UK horses affected with unresponsive cases of dermatoses, including IBH, as such cases could be undiagnosed onchocerciasis. Finally, it aimed to assess the opinion of vets regarding the future use of ivermectin and moxidectin in the UK equine industry.

## 2. Materials and Methods

### 2.1. Questionnaire

The survey was first piloted to assess clarity and usability before being made available on the Jisc Online Survey platform (onlinesurveys.ac.uk) from December 2019 to February 2020. The survey link was blind copy emailed to 277 equine and mixed UK veterinary practices; contact details were obtained from the Royal College of Veterinary Surgeons and British Equine Veterinary Association practice directories [17,18]. The survey was also promoted across social media platforms and through a letter calling for participation [19]. Eighteen questions were split across 4 screens. Respondents were first asked demographic questions so potential associations between these factors and *O. cervicalis* awareness and knowledge could be identified. Respondents were then asked if they were aware of *O. cervicalis*, where they had previously heard about the parasite and if they had ever diagnosed a case of onchocerciasis. The second section sought to assess knowledge levels by asking 'aware respondents' 4 multiple-choice questions regarding the parasite's lifecycle. The third section was used to establish numbers of cases of unresponsive IBH, pyodermas, seasonal contact dermatitis and lice infestations respondents saw and whether they considered onchocerciasis as a differential in such cases. Finally, all respondents were asked questions regarding ivermectin and moxidectin use amongst their clients and their personal opinion on the future use of these products in the UK equine industry.

Statistical analysis was conducted using Microsoft Excel 365 and Genstat 19th edition. 'Aware respondents' were assigned a 'knowledge score' representing the number of correct responses they gave to questions regarding *O. cervicalis* lifecycle which was

used for analysis. Data collected on dermatoses was processed to determine the proportion of cases each respondent saw which were unresponsive to standard treatments. Qualitative data obtained from open questions was coded using a content analysis approach.

## 3. Results

### 3.1. Awareness and Knowledge of Onchocerca Cervicalis

Eighty-eight responses were obtained. The majority (78.4%) of respondents reported that they were aware of *O. cervicalis*. Approximately 80% of 'aware respondents' had heard about *O. cervicalis* at university, whereas 39.1% had heard about the parasite whilst working in practice. Table 1 displays the questions 'aware respondents' were asked regarding *O. cervicalis* lifecycle and the percentage of correct responses. Question 12 had a lower proportion of correct responses than the other 3 questions ( $P < .001$ ), shown through 2-sample binomial comparison tests.

From their responses to these questions, 'aware respondents' were assigned a 'knowledge score' (Fig. 1). The mean score was 1.6, with 49.3% scoring less than 2. Six respondents reported they had previously diagnosed a case of onchocerciasis in the UK, however only one case had been confirmed using skin microscopy, the remainder relying on clinical signs.

### 3.2. Cases of Unresponsive Equine Dermatoses

From analysis of responses, a median of 25.0% of IBH, 16.0% of seasonal contact dermatitis and 10.0% of pyoderma cases respondents saw annually were considered unresponsive to standard treatments. The majority of 'aware respondents' (81.2%; 95% CI:71.9%–90.4%) did not consider onchocerciasis as a differential diagnosis in these cases. When asked why this was, 41.1% of these respondents selected that *O. cervicalis* is rare and 14.3% selected that it is not present in the UK equine population.

### 3.3. Ivermectin and Moxidectin Use

Approximately 60% of respondents reported that over 80% of their clients used either ivermectin or moxidectin on an annual basis (Fig. 2). The majority of respondents (60.2%; 95% CI:50.0%–70.5%) thought that use of these anthelmintics in the UK equine population would decline over the next decade. Reasons provided for this were collated into 6 categories; recent developments in parasitology testing, increased use of FEC and increased awareness of AR amongst horse owners were the most common categories reported.

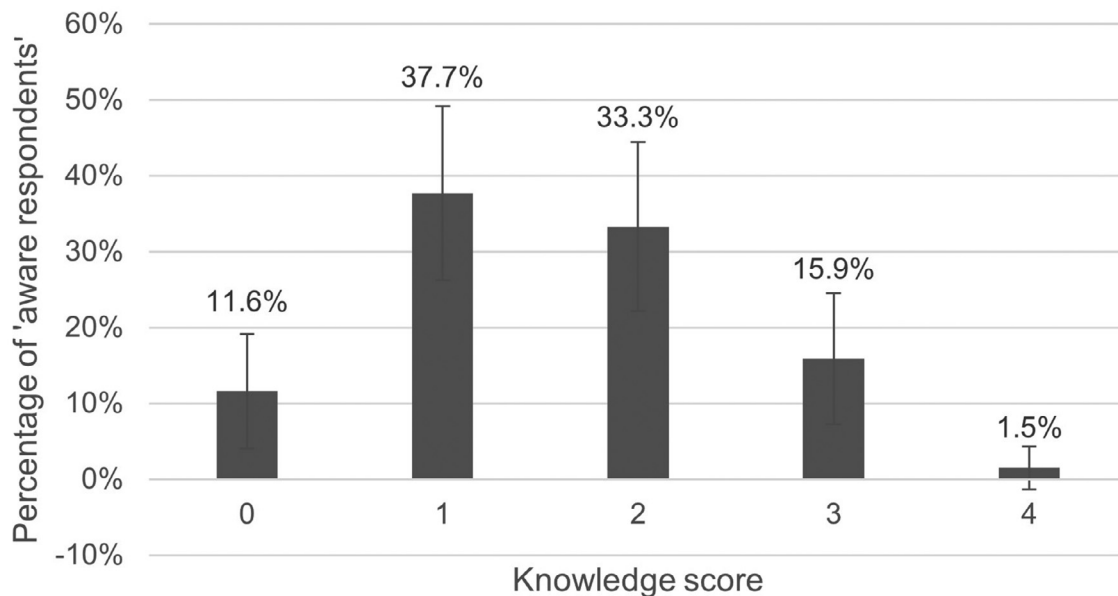
## 4. Discussion

The primary aim of this research was to establish current awareness and knowledge levels of *O. cervicalis* amongst UK equine vets. Whilst the majority of respondents were aware of *O. cervicalis*, results suggested knowledge levels are relatively low, with approximately half of 'aware respondents' answering less than 2 knowledge questions correctly. In particular, only 6.3% of 'aware respondents' correctly identified how long *O. cervicalis* can persist within horses' bodies. As horses suffering from onchocerciasis require regular anthelmintic treatment to control clinical signs, it is important vets are aware adult *O. cervicalis* can remain in the nuchal ligament for a significant proportion of a horse's life. Findings also indicated that a large proportion of equine vets are taught about *O. cervicalis* whilst studying, but never encounter the parasite again; this provides a possible explanation for the low knowledge levels.

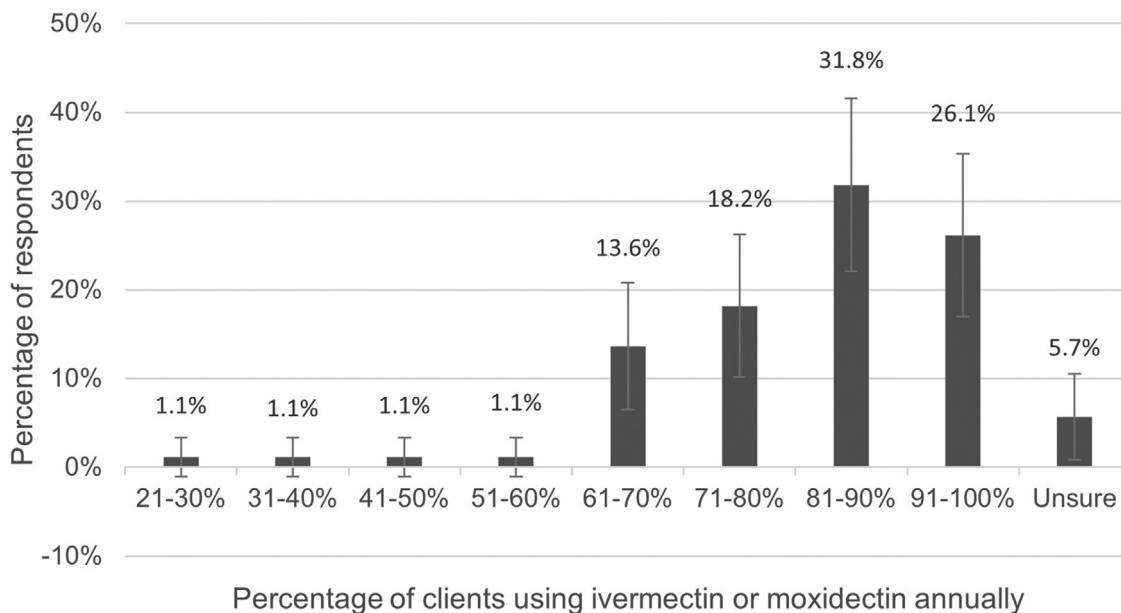
**Table 1**

Questions 'aware respondents' were asked about *Onchocerca cervicalis* lifecycle and the percentage of responses for each question which were correct (95% CI shown).

	Percentage Of 'Aware Respondents' Who Selected the Correct Response (%)
Q9. Which class of parasite does <i>O.cervicalis</i> belong to?	73.5 (95% CI: 63.0–84.0)
Q10. Which of the following acts as the intermediate host for <i>O.cervicalis</i> ?	46.4 (95% CI: 34.6–58.2)
Q11. Which of the following best describes the clinical signs of <i>O.cervicalis</i> infection?	33.3 (95% CI: 22.2–44.4)
Q12. How long do the adult <i>O.cervicalis</i> live within the horses body?	6.3 (95% CI: 0.3–12.3)



**Fig. 1.** Knowledge scores of respondents who reported they were aware of *Onchocerca cervicalis* based upon the responses given to four questions regarding the parasite's lifecycle (95% CI shown).



**Fig. 2.** Levels of ivermectin and moxidectin use respondents reported amongst their clients. Respondents were asked to approximate levels of use into a 10% category (95% CI shown).

Only one reported *O. cervicalis* case had been confirmed using skin microscopy, indicating that uptake of diagnostics is low. Ivermectin and moxidectin are widely available, low-cost and highly effective in removing dermal microfilariae [11]. Therefore, it is probable treatment without diagnosis was considered the most cost-effective approach in suspected cases; particularly as the sensitivity of skin testing is variable depending on a range of factors including microfilariae distribution [20]. In recent years, a rapid

lateral flow assay for use with finger-prick blood has been made available for *Onchocerca volvulus* diagnosis in humans and found to have 89.1% sensitivity [21]. This presents opportunities to develop highly sensitive and cost-effective diagnostic tests for *O. cervicalis* in the future.

Results indicated approximately one-quarter of IBH cases in the UK are unresponsive to standard treatments. This equates to approximately 42,350 horses using an estimated horse population of

847,000 [22] and IBH 5% prevalence [23]. A proportion of these horses could be suffering from onchocerciasis as it is a likely differential diagnosis, [6] however further research would be required to confirm this.

Respondents reported higher levels of ivermectin and moxidectin use amongst their clients than previously recorded through studies which surveyed horse owners [12,24]. As small numbers of horse owners seek veterinary advice when selecting anthelmintic products [14], it is unlikely vets are aware of all their client's worming practices. If ivermectin and moxidectin use in the UK equine population declines as the majority of respondents selected, then onchocerciasis prevalence may increase considerably, therefore it is imperative equine vets can correctly diagnose and treat the condition. Increased awareness of AR amongst horse owners was a common reason provided for the expected decline in use; this correlates with literature showing horse owner concern about AR has increased in recent years [12,14].

The small number of responses places limitations on the conclusions that can be drawn from this study, as it is unlikely results are representative of the entire population of UK equine vets. Previous online surveys targeted towards vets also obtained relatively low response rates [25], therefore a small number of responses was not unexpected. Making the survey available for longer, distributing postal surveys or visiting selected practices to conduct face-to-face surveys may have gathered more responses, however was not possible due to time and resource constraints.

## 5. Conclusion

The findings of this study indicate that UK equine vets may lack knowledge of *O. cervicalis* lifecycle and also may not consider onchocerciasis as a differential when investigating equine dermatoses. It can therefore be hypothesized there are horses in the UK suffering from undiagnosed onchocerciasis, however further research is required. As prevalence amongst UK horses may increase in the near future as macrocyclic lactone use declines, it is important for equine welfare that vets consider *O. cervicalis* as a potential cause of dermatosis. This study therefore highlights the need to increase knowledge and consideration of *O. cervicalis* amongst UK practising equine vets and to conduct studies investigating the parasites prevalence in the UK equine population.

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