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Research paper

Equine parasite control and the role of national legislation – A multinational questionnaire survey

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ABSTRACT

Experts recommend a change in the control of equine parasites across the world in order to adopt a surveillance-based approach utilizing parasite faecal egg counts (FEC). Several European countries have implemented prescription-only restrictions of anthelmintic usage by law, which is in stark contrast to US, where all anthelmintic products continue to be available over the counter. This study aimed to describe and compare equine parasite control strategies employed in Germany, Austria, the Netherlands, US, and Denmark. An invitation to participate in an online questionnaire survey was published on a large equine news website in each of the participating countries. The main focus of the study was on usage of FEC and anthelmintic treatment intensity in three different equine age groups; foals, 1–3 year-olds and > 3 years old. A total of 3092 respondents participated in the study. Danish respondents used significantly more faecal analyses in their parasite control strategies than participants from the other four countries ($p < 0.0001$). Similarly, Danish participants administered significantly fewer anthelmintic treatments per horse per year ($p < 0.0001$) independent of the age of the horse, and had been using a selective treatment strategy for a significantly longer time period than their counterparts in other countries ($p < 0.0001$). Only minor differences were found between respondents from the other four countries. This is remarkable as both Austria and Germany have had prescription-only restrictions for 3–4 decades. Yet, their parasite control strategies were more similar to those employed by American respondents. The Netherlands had only recently introduced prescription-only restrictions by the time this survey was conducted which can explain why Dutch respondents were also similar to their American counterparts. Taken together, this study illustrates substantially different worm control strategies practiced in Denmark, and this difference cannot be explained by legislation alone.

1. Introduction

Programs employed for parasite control in horses and livestock have undergone substantial change in the past couple decades (Nielsen, 2012; Sargison, 2012; Charlier et al., 2014): Marked development of anthelmintic resistance and a general scarcity of new anthelmintic drug classes have led parasitologists to abandon the classical approach of dosing animals with constant intervals year-round. Instead, it is recommended to generally reduce the usage of anthelmintic drugs and increase diagnostic activities (Lloyd and Soulsby, 1998; Kaplan, 2004, 2013). Despite these newer strategies several surveys conducted over the past two decades illustrated a common trend of using very traditional approaches for parasite control with frequent treatments applied to all horses at fixed intervals, and little or no diagnostic monitoring (Pascoe et al., 1999; USDA, 1998; Biggin et al., 1999; Lloyd et al., 2000; Matthee et al., 2002; O´Meara and Mulcay, 2002; Earle et al., 2002; Lind et al., 2007). Guidelines for equine parasite control have been published in several countries over the past few years in an attempt to decrease and delay further development of anthelmintic resistance (Ploeger et al., 2008; von Samson-Himmelstjerna et al., 2011; Nielsen et al., 2013; Hertzberg et al., 2014). Overall, these recommendations are aiming at reducing anthelmintic treatment intensity, and implementing parasite surveillance through regular fecal egg counts. Selective anthelmintic treatment is one such surveillance-based control strategy, where only horses exceeding a pre-determined strongyle faecal egg count (FEC) threshold are treated, leaving the remainder of

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the population untreated (Gomez and Georgi, 1991).

In 1999, Denmark took initiative to legally require diagnostic steps taken by a veterinarian before an anthelmintic could be prescribed (Anonymous, 1998; Nielsen et al., 2006). The European Union extended this idea in a directive with the goal to reduce drug use in the livestock industry, including horses (EU, E.P.a.o.t.C, 2001). As a consequence of an additional directive (EU, E.P.a.o.t.C, 2006) several countries such as the Netherlands, Sweden and Finland introduced prescription-only restrictions on anthelmintics. Prescription-only restrictions on anthelmintic products were introduced in the Netherlands in July 2008, and this terminated the previous over-the-counter availability of anthelmintic drugs (Koninkrijk der Nederlanden, 2007). Germany, on the other hand, has had stricter regulations of anthelmintic usage for several decades. From 1975, veterinarians were required to use adequate diagnostic procedures before prescribing or delivering of veterinary drugs which are only sold in pharmacies (Bundesministerium für Ernährung, Landwirtschaft und Forsten, 1975; Bundesministerium für Jugend, Familie und Gesundheit, 1976). In 1985, a further requirement for evaluation of treatment effect was implemented independent of the type of anthelmintic (Bundesministerium für Jugend, Familie und Gesundheit, 1985). Current practice stipulates herd level diagnostic measures as appropriate justification for prescribing anthelmintics. In Austria the situation is comparable to Germany as anthelmintics are sold on a prescription-only basis by veterinarians and pharmacies (Nationalrat, 1983). This contrasts to the situation in the US, where anthelmintic drugs are sold over the counter in feed stores, tack shops, and by online vendors.

Accordingly, the legal regulation and availability of anthelmintic products differs widely between these countries. To date, no scientific surveys have compared the consequences of this situation in terms of strategies applied for parasite control across multiple countries. All published surveys investigating parasite control programs are either restricted to one country or even to one breed or equestrian discipline (Reinemeyer and Rohrbach, 1990; Bjorn et al., 1991; Lendal et al., 1998; Biggin et al., 1999; Lloyd et al., 2000; Earle et al., 2002; Matthee et al., 2002; Pascoe et al., 1999; O´Meara and Mulcay, 2002; Comer et al., 2006; Nielsen et al., 2006; Lind et al., 2007; Allison et al., 2011; Relf et al., 2011; Nielsen et al., 2014; Robert et al., 2015; Stratford et al., 2014; Bolwell et al., 2015).

The aim of the present study was to describe and compare the strategies applied for equine parasite control among Denmark, the Netherlands, Germany, Austria, and the US.

2. Materials and methods

2.1. Countries and enrollment of study participants

The study population was horse enthusiasts in the US, Germany, the Netherlands, Austria and Denmark. In each of these countries, study participants were recruited by posting an invitation online on an equine news website inviting people to participate by filling out an online questionnaire. The invitation was posted as a news article and was kept on the respective website for three months during the spring of 2009. The equine online news portals utilized were as follows: www.thehorse.com (US), www.heste-nettet.dk (Denmark), www.bokt.nl (the Netherlands), and www.cavallo.de (Germany and Austria). In addition a couple of equine practitioners in Germany and Austria informed their clients about the survey. In all countries respondents were encouraged to answer all questions by the raffle of either one food basket per country or free faecal analyses. The questionnaire itself was programmed and made available to the public with the online survey software www.2ask.de (Amundis Communications GmbH, Konstanz, Germany).

2.2. Questionnaire and data processing

The entire questionnaire is included as a supplementary file to this publication (see Supplementary Table 1). The questionnaire was developed in English and translated by one of the authors into the native language of each country. The survey was pilot tested by the first author with selected group of German horse owners. The participants were asked to provide personal information as well as information about their horses, and their equestrian activities. In addition, the participants answered questions about their use of faecal analyses and anthelmintic drugs. Respondents were asked to specify the number of treatments and/or faecal samples per horse per year for each of the following age groups: foals, 1–3 year-olds, > 3 years. Furthermore, the respondents were asked about their general interest in worm control, the budget they had spent for worm control in the last year, and their willingness to pay for parasite control services. Questions of financial character were answered in the corresponding national currency (Euros, Danish Kroner, US dollars) and all answers were categorized into low, medium and high willingness or budget with around one third of the answering participants in each category in each country. As education systems are different between the five countries, answers regarding educational levels were categorized according to criteria presented in the supplementary files (Supplementary Table 2).

Respondents disclosing nationalities different from the five target countries were excluded from the data set (142 participants including 61 from Switzerland). Additionally, all “don’t know” answers to the interest in worm control question were eliminated from the analysed dataset. Similarly, participants with “no horse in this age group” answers in worm control questions were not included in the analysis of data for the given age category. This resulted in different numbers of analysed answers depending on the type of question. In order to clarify the analysed number of answers the exact number was specified in brackets and in case of percentage the 95% confidence interval was added.

2.3. Statistical analyses

All statistical analyses were calculated with IBM® SPSS® Statistics 21 (IBM, Armonk, USA).

As the equine industry is widely globalized, but yet very diverse between various breeds and disciplines, multiple regression analyses were applied in order to account for these possible confounding factors.

A univariate Poisson regression was performed for an initial analysis of the association of demographic factors (variables concerning the person, willingness to pay, horses and equestrian activities of respondents) and horse age groups (foals, 1–3 year-olds, > 3 years) with the number of faecal samples analysed per year. Two-way interactions were evaluated where appropriate to assess variable independence. All statistically significant ($p < 0.05$) variables were then included in a multivariate Poisson regression model. Backward elimination was conducted. Variables were left as confounders in the model if removal from the model caused a change of the regression coefficient of a significant category of more than 10% or more than 0.1 if the coefficient was < 0.4 (Hosmer and Lemeshow, 2001). The same approach was used for the multivariate analyses of covariates associated with the number of anthelmintic treatments per year. In these analyses, respondents who based their treatment decision on FEC were excluded.

For the question “How often do you treat your horse with anthelmintic drugs per year?” all answer options from “never” over “one time” to “7 and more times” of the question were categorized into the single category “regular interval treatment” to form a new binary variable with the other category “depending on the faecal egg count” for each of the three age groups. For each available demographic covariate (variables concerning the person, willingness to pay, horses and equestrian activities of respondents) and the interest in worm control, a univariate binary regression was performed with these new variables as