



Use of a multiple choice questionnaire to assess UK prescribing channels' knowledge of helminthology and best practice surrounding anthelmintic use in livestock and horses

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ABSTRACT

Grazing livestock and equines are at risk of infection from a variety of helminths, for which the primary method of control has long been the use of anthelmintics. Anthelmintic resistance is now widespread in a number of helminth species across the globe so it is imperative that best practice control principles be adopted to delay the further spread of resistance. It is the responsibility of all who prescribe anthelmintics (in the UK, this being veterinarians, suitably qualified persons (SQPs) and pharmacists) to provide adequate information on best practice approaches to parasite control at the point of purchase. Poor uptake of best practice guidelines at farm level has been documented; this could be due to a lack of, or inappropriate, advice at the point of anthelmintics purchase. Therefore, the aim here was to evaluate levels of basic knowledge of helminthology, best practice guidelines and dispensing legislation among veterinarians and SQPs in the UK, through a Multiple Choice Question (MCQ) test, that was distributed online via targeted emails and social media sites. For each respondent, the percentage correct was determined (for the MCQ test overall and for subsections) and the results analysed initially using parametric and non-parametric statistics to compare differences between prescribing channels. The results showed that channels generally performed well; veterinarians achieved a mean total percentage correct of 79.7% (range 34.0–100%) and SQPs, a mean total percentage correct of 75.8% (range 38.5–100%) ($p=0.051$). The analysis indicated that veterinarians performed better in terms of knowledge of basic helminthology ($p=0.001$), whilst the SQP group performed better on legislation type questions ($p=0.032$). There was no significant difference in knowledge levels of best practice between the two channels. Multivariable linear regression analysis showed that veterinarians and those answering equine questions only performed significantly better than those answering all questions. Based on information gaps identified by analysis of individual questions, a number of areas for improvement in knowledge transfer to both channels are suggested to improve the quality of advice at the point of anthelmintics purchase.

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1. Introduction

All grazing livestock and equines are at risk of infection from a variety of helminths, and these parasites can have a substantial negative impact on animal productivity, health and welfare (Love et al., 1999; Charlier et al., 2014). For the last half century, the main method of controlling helminth infec-

tions has been the application of anthelmintics. Until recently, for nematodes, three broad spectrum anthelmintic classes were primarily used for this purpose: benzimidazoles, imidazothiazoles/tetrahydropyrimidines and macrocyclic lactones (Prichard, 1990). There are also a variety of flukicide products licenced for the treatment and control of trematode infections (Fairweather and Boray, 1999). Recently, two new anthelmintic compounds were licenced and marketed for use in the control of nematode species in sheep in several countries. These compounds are monepantel (Zolvix[®], Elanco Animal Health), which is an amino-acetonitrile derivative compound (Kaminsky et al., 2008), and derquantel (a spiroindole), which is combined with the aver-

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mectin, abamectin (Startect[®], Zoetis) (Little et al., 2011). Resistance (including multi-class resistance) to the traditional classes of anthelmintic is widespread in nematodes of cattle, small ruminants and equids (Bartley, 2011; Sutherland and Leathwick, 2011; Kaplan and Vidyashankar, 2012; Papadopoulos et al., 2012; Matthews, 2014) and there have been reports of resistance to the commonly used, most broad spectrum flukicide, triclabendazole (Fairweather, 2011; Flanagan et al., 2011). Moreover, the first reports of resistance to monepantel are already published (Scott et al., 2013; Mederos et al., 2014). With regard to pigs, resistance has been reported to benzimidazoles and imidazothiazoles/tetrahydropyrimidines in the EU (Gerwert et al., 2002); however, there is a lack of published data on anthelmintic resistance status in worms this host species.

In the UK, the two new classes of anthelmintic can be dispensed only by veterinarians or by pharmacists on veterinary prescription (Prescription Only Medicine – Veterinarian, POM-V). All the other classes are categorised under a Prescription Only Medicine – Veterinary, Pharmacist, Suitably Qualified Person (POM-VPS) label and can be dispensed by Registered Qualified Persons, the types of which are Veterinarians, Pharmacists and Suitably Qualified Persons (SQPs). A SQP must possess a qualification awarded by the Animal Medicines Training Regulatory Authority (AMTRA, 2013; <http://www.amtra.org.uk/>), a body appointed under the Veterinary Medicines Regulations by the UK Secretary of State. There are a number of SQP categories in relation to the animals for which they can prescribe; there are various combinations, each of which is assigned a lettered code to describe an individual's permit in the prescribing and supply of medicines (Table 1). Prescribers can be located at a variety of premises such as veterinary surgeries, feed merchants, pharmacies and online. It is the responsibility of prescribers to provide information on current best practice approaches to parasite management at the point of purchase. In the UK, these are described in industry guidelines such as the Sustainable Control Of Parasites in Sheep (SCOPS, [http://www.scops.org.uk/\(Abbott et al., 2012\)](http://www.scops.org.uk/(Abbott et al., 2012))) and Control Of Worms Sustainably (COWS, [http://www.cattleparasites.org.uk/\(EBLEX, 2010\)](http://www.cattleparasites.org.uk/(EBLEX, 2010))). No such guidelines exist for horses in the UK, but similar principles apply as laid out in guidelines of the American Association of Equine Practitioners (<http://www.aaep.org/info/parasite-control-guidelines>). For pigs, guidelines are described by the Responsible Use of Medicines in Animals Alliance (<http://www.ruma.org.uk/pigs/anthelmintics-pigs/>). A number of farmer and horse owner surveys indicate that there has been a relatively poor uptake of the guidelines (Morgan and Coles, 2010; McMahon et al., 2013). Risk factors highlighted as important in preserving anthelmintic efficacy are not widely implemented, particular examples being the use of effective quarantine or in the calculation of accurate dose rates (Barton et al., 2006; Relf et al., 2012). It is imperative that best practice control principles be adopted by farmers and horse owners to delay further dissemination of anthelmintic resistance and to preserve efficacy of the currently effective products.

In 2013, the British Veterinary Association (BVA) lobbied the UK Veterinary Medicines Directorate (VMD) to make changes to the Veterinary Medicines Regulations with regard to reclassifying all anthelmintics as POM-V. The BVA's argument was underpinned by the assumption that SQP knowledge of parasitology is inferior to that obtained in the course of a full (5–6-year) undergraduate veterinary degree (Anon, 2013b). In EU countries such as Denmark and the Netherlands, legislation requires the involvement of a veterinarian and the establishment of a parasitological diagnosis prior to dispensing anthelmintics and prohibits treatment on a prophylactic basis (Nielsen et al., 2006). In a rebuttal from their Secretary General (Anon, 2013a), AMTRA argued that the BVA claims were unsubstantiated and cited facts such as the persistence of anthelmintic resistance in countries employing 'vet-only'

prescribing systems, as well as on-going concerns surrounding prescribing practices and resistance with regard to veterinarian-only prescription antimicrobials. With these views in mind, there is little quantitative or qualitative published evidence on which to base the assumptions that either veterinarians or SQPs are better placed to prescribe anthelmintics. For this reason, the aim here was to evaluate levels of knowledge in these channels through execution of a multiple choice question (MCQ) test covering basic helminthology knowledge, prescribing legislation and best practice principles surrounding helminth control.

2. Materials and methods

2.1. Ethical statement

Approval for the survey was granted by the UK Department for Environment Food & Rural Affairs (DEFRA) Survey Control Unit. With regards to respondent confidentiality, all information was stored on a secure server at the Moredun Research Institute (MRI). Data on this server is backed up daily at an external site.

2.2. Study population

For selection of veterinarians, details of large animal (i.e. livestock and equine) practices in the UK were obtained from the Royal College of Veterinary Surgeons (RCVS) database. The database was cross-checked to group branch practices together, and to omit practices that were not first-opinion practices, such as referral services, or services related to fertility or embryo transfer. The details were also cross-checked with practice websites to establish that the veterinarians contacted currently covered ruminant, pig and/or equine species. This resulted in a list of 755 UK-based veterinarian/practice emails. A further 384 veterinarian/practice emails were obtained from a British Equine Veterinary Association (BEVA) list to give a total of 1139 veterinary surgeons or practices on the mailing list. Note that was not possible to determine the exact number of veterinarians working on each species at each practice. An email inviting the veterinarians to take part in the survey was distributed directly, detailing an introduction to the study and a link to the MCQ test in SurveyMonkey (www.surveymonkey.com, see below). The same link was shared on the pages of the following groups on Twitter (<https://twitter.com/>): the BVA, BEVA, British Cattle Veterinary Association (BCVA), Pig Veterinary Society (PVS), and Sheep Veterinary Society (SVS), as well as the large animal veterinary practice group, XLVets (<http://www.xlvets.co.uk/>). The MCQ test link was also shared via websites or forum pages of the SVS, PVS, BEVA and the BVA. The SQP sample was achieved directly via Mr Stephen Dawson, Secretary General of AMTRA. A total of 2847 SQPs covering advice provision for the equine, ruminant and pig industries (i.e. E, EA, G, J, K, L and R-SQP license holders (Table 1)) were emailed directly from AMTRA Head Office with the same text and link sent to the veterinarians. The same link was shared on Twitter at <https://twitter.com/SQPWebinars>. Email invitations to take part in the survey were also distributed to SQP members of the Animal Health Distributors' Association (AHDA, <http://www.ahda.co.uk>). This is an organisation comprising UK animal health product distributors and represents 90% of the POM-VPS and Non-Food Animal – Vet, Pharmacist, SQP animal medicines' market.

2.3. Study design

The survey comprised several demographic questions to ascertain the profession, age, gender and location of each respondent. These were followed by knowledge-based questions (in MCQ format), all of which were intended to ascertain a respondent's ability to advise on helminth control in line with current UK legislation

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