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## **Survey on Equine Parasite Control in the Midwestern and Southwestern United States**

### **Abstract**

We conducted a survey to assess parasite control programs used by three groups of horse owners. The majority of those surveyed indicated that they received information on parasite control from veterinarians, with only 6% indicating reliance on Extension materials for such information. Most participants did not use fecal egg counts as part of their parasite control programs, and most were not aware of parasite resistance to anthelmintics. Our survey results highlight areas in which education for horse owners may be needed.

**Keywords:** [equine](#), [horse owner survey](#), [parasite control](#)

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## **Introduction**

Gastrointestinal parasites can cause health problems for their equine hosts when present in substantial numbers. These health problems include chronic debilitation, reduced growth rates in young horses, poor performance in adult horses, diarrhea, colic, and, in severe cases, death (Reinemeyer, 1987). Horse owners can help control such problems by implementing an appropriate parasite control program. However, parasitologists have expressed concerns indicating that instead indiscriminate use of anthelmintics has led to development of resistant strains of parasites.

The rise in equine parasite resistance to anthelmintics has resulted in an increased research focus on this topic in the United States and globally. Parasite control strategies in the horse were reexamined and resulted in new recommendations published by the American Association of Equine Practitioners (Nielsen et al., 2013). For example, past recommendations included administering anthelmintics every 2 months, but this schedule has been identified as contributing to an increase in resistant strains of internal parasites (Nielsen et al., 2013). The updated recommendations are aimed at reducing development of resistant strains of parasites and address concerns about dosage and frequency of treatment (Nielsen et al., 2013). In addition, most researchers agree that assessment of fecal egg count (FEC) should be incorporated into parasite control practices and that climate and other factors, such as housing and sanitation, should be considered in

determining frequency and timing of anthelmintic strategies (Brady & Nichols, 2009; Matthews, 2014). Importantly, horse owners need to be informed about the decreased effectiveness of some anthelmintics used to treat horses for internal parasites (Luksovsky, Craig, Bingham, Cyr, & Forrest, 2013).

Extension professionals across the United States have developed informational materials on parasite resistance and control programs; however, the degree of adoption of relevant practices by horse owners is not known. Our objective was to identify horse owners' preferred sources of advice on anthelmintics use, parasite control practices, and general knowledge about parasite resistance by surveying horse owners from a variety of performance events and geographical locations in the midwestern and southwestern regions of the United States.

## Materials and Methods

### Survey

Based on studies of parasite control and resistance with which members of our author team had been involved (Blanek et al., 2006; Garcia, Brady, Nichols, & Prien, 2013; Lear, 2014), we developed a 30-question survey instrument to ask questions relating to parasite management practices and knowledge. The survey comprised mostly multiple-choice items, including yes-no questions, along with some fill-in-the-blank and open-ended items. We asked about sources of advice and other factors that led to adoption of a particular anthelmintic program, frequencies and types of anthelmintic treatments used, and weight determination methods. To assess potential parasite load of horses, we included questions about horse access to shared pastures or turnouts. To address the practice of manure removal to reduce parasite egg load, we included questions on cleanup of pastures or turnouts. Additionally, we included questions on incorporation of FEC into parasite management programs and general knowledge of equine parasite resistance.

We administered surveys from April through October 2015 to three groups of competitors at equine events. Surveys were completed by 74 participants at ranch horse, open, and youth horse shows in Missouri, Oklahoma, and Texas. Surveys also were completed by 83 participants in a commercial trail ride in Missouri who were from 19 states throughout the United States. The third group comprised participants from two National Intercollegiate Rodeo Association (NIRA) regions. A total of 46 surveys were completed by participants at rodeos from the NIRA Ozark Region, which included participants from Alabama, Arkansas, Kentucky, Michigan, Missouri, Mississippi, and Tennessee. Another 63 surveys were completed by competitors from the NIRA Southwest Region (colleges west of Interstate I-35 in Texas and all of New Mexico). Additionally, 27 participants in the NIRA Southwest Region, of 200 who received mailed surveys, also completed surveys. In all, information presented in this article is from a total of 267 completed surveys. The survey was approved by the Missouri State University Institutional Review Board (#15-0116).

### Statistical Analysis

Data from the yes-no questions were nominal; therefore, the normality of those data was not checked. Although questions concerning the frequency of deworming had numerical answers, these answers were not evenly distributed and therefore also were not ordinal. As a result, these data were not checked for normality. Data on most recent anthelmintic product used, use of FEC, use of the FEC reduction test (FECRT), and general awareness of parasite resistance were placed in contingency tables. We used chi-square analysis to

identify differences between survey participants from different horse-use groups (Daniel & Cross, 2013). Additionally, because responses to only one item differed significantly among college rodeo participants—that is, fewer participants from the NIRA Southwest Region grazed their horses year-round as compared to those from the NIRA Ozark Region ( $p < .05$ )—we treated college rodeo participants as one group for the remainder of the analysis.

## Results

Across all groups surveyed, advice from veterinarians was listed as the primary source (by 66% of respondents) related to determining frequency of treatment and anthelmintic product used. Less used sources were Extension reports (6%), advice from trainers (5%), and advice from feed store personnel (4%). Across all groups surveyed, a deworming frequency of four times a year was most frequently reported (by 34% of respondents). Frequencies of two (20%), three (24%), and six (18%) times per year were the next most common schedules of treatment.

Several survey questions related to aspects of anthelmintic use. When queried about the primary determining factor for actually purchasing a specific anthelmintic product, price was the determinant for 31% of the survey participants. However, 42% of respondents selected "other" as the determining factor for product purchase and listed factors such as ease of administration, stage of rotational plan, and general advice from veterinarians. Ivermectin was the most popular product most recently used by all groups; however, in relation to the other groups, a significantly higher number of rodeo participants ( $p < .05$ ) indicated that fenbendazole was the product they had last used (Table 1). The majority of survey participants (81%) indicated that they rotated classes of anthelmintics, yet 47% of respondents either could not name the products used or listed products of the same drug class of anthelmintic within their respective rotation plans.

**Table 1.**  
Last Anthelmintic Product Used by Groups of Horse Owners Surveyed

Participant group	<i>n</i>	Ivermectin	Moxidectin	Fenbendazole	Pyrantel	Other
Horse shows	74	55% <sub>a</sub>	15%	15% <sub>a</sub>	10%	6%
Trail rides	83	61% <sub>a</sub>	16%	13% <sub>a</sub>	8%	1%
College rodeo	110	41% <sub>b</sub>	15%	35% <sub>b</sub>	7%	2%
Overall (total, mean) <sup>a</sup>	267	46%	10%	23%	6%	3%
<i>Note.</i> Values in same column with different subscripts differ ( $p < .05$ ). <sup>a</sup> Not included in statistical analysis.						

The most common method used to determine weight of horses was estimation, with 87% of respondents indicating use of this method. Another 7% of respondents indicated using weight tape. Less than 5% of respondents indicated using scales or weight tape measurements combined with horse measurement calculations.

When queried about sanitation and parasite load, 37% of respondents indicated that they used some type of pasture/turnout manure removal.

Data concerning use of FEC and the FECRT and awareness of equine parasite resistance to anthelmintics are shown in Table 2. In comparison to college rodeo participants, more horse show or trail ride participants indicated that they had used FEC as part of equine parasite control. A higher percentage ( $p < .05$ ) of the horse show group than the other groups had used the FECRT to detect parasite resistance. Finally, more ( $p < .05$ ) horse show and trail ride participants indicated that they had knowledge of parasite resistance to anthelmintics as compared to college rodeo participants.

**Table 2.**  
Participants' Use of Fecal Egg Count (FEC) or Fecal Egg Count Reduction Test (FECRT) in  
Their Parasite Management Programs and General Awareness of Equine Parasite  
Resistance

Participant group	Used FEC		Used FECRT		Aware of parasite resistance to anthelmintics	
	No. <sup>a</sup>	%	No. <sup>a</sup>	%	No. <sup>a</sup>	%
Horse shows	74	24% <sub>a</sub>	74	26% <sub>a</sub>	74	66% <sub>a</sub>
Trail rides	83	26% <sub>a</sub>	83	9% <sub>b</sub>	83	56% <sub>a</sub>
College rodeo	110	6% <sub>b</sub>	95	11% <sub>b</sub>	107	29% <sub>b</sub>
Overall (total, mean) <sup>b</sup>	267	18%	252	15%	264	48%

*Note.* Values in same column with different subscripts differ ( $p < .05$ ).  
<sup>a</sup>Number of respondents to question. <sup>b</sup>Not included in statistical analysis.

## Discussion

Most survey participants indicated that advice from veterinarians was a major consideration in determining deworming frequency and what anthelmintic to use. These findings are similar to results of a survey conducted in France in which 74% of veterinarians reported having input on the anthelmintic treatment program used by their clients (Salle & Cabaret, 2015.) A survey of Minnesota horse owners showed that the majority of participants received their health information from equine publications as well as veterinarians, although source of advice on parasite control was not specifically queried (Martinson et al., 2006). It was surprising that only 6% of survey participants in our study identified Extension reports as a source of parasite control information.

Estimation of horse weight for determining anthelmintic dosage was used by 87% of respondents, which is of concern because underdosing may increase risk of development of resistant parasite strains (Brady & Nichols, 2009). It is important that horse body weight is correctly determined. Education on use of formulas based on body measurements as a method of weight estimation is often included in Extension programs on feeding management (Catalano et al., 2019). However, in our survey very few respondents used this approach to estimate equine weight.



The majority of survey participants indicated that they practiced rotation of anthelmintics. However, in our analysis of the surveys, we found that there had been some misunderstanding of rotation between anthelmintic classes and rotation of anthelmintic products within the same class. As a result, although the intent to rotate between chemical classes of anthelmintics was present, lack of knowledge about the difference in brand name versus chemical class prevented implementation of this intent.

In contrast to recommendations from the 1980s that encouraged anthelmintic treatment at 8- to 12-week intervals, current recommendations for deworming frequency and timing are based on season, climate, and FEC (Nielsen et al., 2013). However, the majority of participants in our study responded that they administered anthelmintics quarterly and did not use FEC. Although percentages of respondents from the horse show group using FEC were slightly higher than those reported in a U.S. survey conducted in 1998 (Nielsen et al., 2018), the use of FEC was low across all the groups we surveyed. Results of a 2015 French survey suggested that cost of FEC tests was a main reason horse owners did not employ them (Salle & Cabaret, 2015). Moreover, when representatives of veterinary clinics in Missouri were surveyed in the spring of 2016, the price of an FEC test ranged from \$17.50 to \$25.00 (O'Hara, 2015). Therefore, cost and lack of convenience of using FEC tests may be factors in the low use of this analysis.

Finally, less than half of the participants in our study responded that they were aware of parasite resistance to anthelmintics. The percentage of respondents aware of the problem was higher ( $p < .05$ ) for horse show and trail ride participants than for college rodeo participants. Our findings regarding awareness of parasite resistance to anthelmintics suggest that there may be a need to educate horse owners regarding factors that contribute to resistant populations of parasites.

## Conclusions

As noted, one of the biggest concerns raised by parasitologists is that indiscriminate use of anthelmintics has led to the development of strains of internal parasites that are resistant to products currently available. However, most horse owners we surveyed were not aware of parasite resistance to certain classes of anthelmintics. Clearly, more horse owners need to be informed about this issue. Most parasite control plans used by our survey participants were based on a frequent interval dosing system without FEC testing, practices that may select for resistance. Therefore, although there has been some improvement in adoption of practices currently recommended by the American Association of Equine Practitioners (Nielsen et al., 2013), there may be a need for education efforts to inform the horse-owning public of those recommendations. More specifically, horse owners need to be aware of management factors within their parasite control programs that may select for parasite resistance, such as underdosing a horse because of errors in weight estimation, overcrowding, lack of sanitation in pens and pastures, and failure to use FEC and the FECRT. In a survey conducted in 2009–2010, 36% of respondents ranked parasites *above* West Nile virus, respiratory diseases, and encephalomyelitis as a health concern (Stowe, 2010). Therefore, there is an indication that if horse owners are informed about the issue, they might be receptive to new management tools for control of parasites. One problem is the higher costs associated with FEC testing. However, because the average number of horses per household is only five (Stowe, 2010), there may be an increased willingness to adopt new management recommendations in spite of high costs (O'Hara, 2015; Stowe, 2010). Overall, information we gathered suggests that a higher level of education and communication concerning parasite management is needed for horse owners. Due to the growing concerns over parasite resistance, additional emphasis on equine parasite control may be warranted in Extension materials and programs.

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