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Toxocara vitulorum in beef calves in North Central Florida

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ABSTRACT

In this study, we evaluated the prevalence of *Toxocara vitulorum* in beef calves in North Central Florida. Fecal samples from 433 calves under 9 months of age were analyzed for the presence of eggs in their feces. The prevalence in calves less than 3 months of age was 17.6%, 3–4 months of age was 0.4% and those 5–6 months old had a 0.9% prevalence. As expected, no eggs were detected in any calves older than 6 months. Calves were treated with fenbendazole (10% FBZ) at 5 mg/kg after fecal samples were collected. Twenty calves that had *T. vitulorum* eggs in the feces were resampled 2 weeks after treatment to evaluate effectiveness of FBZ. No *T. vitulorum* eggs were seen in the feces of 17/20 (85%) of the calves that were sampled after FBZ treatment. FBZ was effective in 85% of calves treated for *T. vitulorum* infection in calves. We would like to make beef ranchers and veterinarians in the southern states aware that the prevalence of this parasite has greatly increased recently in northern Florida beef units.

1. Introduction

Toxocara vitulorum is a parasitic ascarid of *Bubalus* and *Bos* spp. (Roberts, 1989a; Warren, 1971) found mostly in tropical and subtropical climates worldwide (Starke et al., 1996). However, *T. vitulorum* is rarely reported in North America (Zajac and Conboy, 2006; Morgan and Hawkins, 1949).

Calves become infected by ingesting third stage larvae from an infected dam's milk (Mia et al., 1975; Roberts et al., 1990; Starke et al., 1992; Warren, 1971), but not from ingesting eggs in the environment (Mia et al., 1975; Refuerzo and Albis-Jimenez, 1954b). Larvae ingested by calves develop into adults in 3–4 weeks, and then begin shedding eggs in the feces (Kassai, 1999). *T. vitulorum* eggs do not hatch in the environment, but larvae in the egg develop to the infective third stage larvae. The infective eggs hatch in the host and the larvae penetrate the intestinal wall, and become hypobiotic in muscles (Roberts et al., 1990). Patent toxocariasis is seen in young calves up to 6 months of age when adult worms are spontaneously eliminated (Roberts et al., 1990; Kassai, 1999). Visceral larva migrans caused by *T. vitulorum* in mature cattle is usually asymptomatic (Kassai, 1999). Omar and Barriga (1991) reported increased eosinophils, elevated creatine phosphokinase and alanine aminotransferase levels, and lower erythrocyte counts and PCV, possibly due to toxemic effects, in experimentally infected rabbits. Intestinal toxocariasis is associated with diarrhea, poor performance, intestinal and biliary obstruction, and death (Refuerzo and Albis-Jimenez, 1954a; Srivastava, 1963).

Adult stage *T. vitulorum* can be effectively treated with piperazine (Alicata, 1959), pyrantel, febantel, and oxfendazole (Roberts, 1989b). Third stage larvae of *T. vitulorum* in the intestine can be treated with pyrantel and levamisole (Roberts, 1989b). Studies carried out to test the efficacy of immunization against *T. vitulorum* in mice have been successful (Amerasinghe et al., 1992; Rajapakse et al., 1994). However, immunization studies in the primary hosts have not been performed.

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The presence of adult *T. vitulorum* in calf feces was noticed at two beef ranches in the spring of 2006 and the managers contacted faculty at the University of Florida for assistance. These huge worms had never been seen by management of these ranches before. This species had never been seen in calves in studies conducted by Drs. Ellis Greiner or Charles Courtney during the preceding 25 years. Our aims were to evaluate the prevalence of intestinal toxocariasis in beef calves on a ranch in North Central Florida. The efficacy of a practical anthelmintic therapy was also investigated.

2. Materials and methods

2.1. Sampled calves

Sample collection was performed at a closed cow-calf operation southwest of Gainesville, FL (29°32′91″N, 82°22′35″W) from May, 2006 to March, 2007. The calves were up to 9 months old. Fecal samples were grouped according to calf age based on the operation's calving records as follows: less than 3 months old, 3–4 months old, 5–6 months old, and 7–9 months old.

2.2. Sample collection and analysis

Fecal samples were collected per rectum, placed in labeled plastic collection cups with lids, and stored under refrigeration. Light microscopical evaluation of fecal samples was performed by fecal flotation with $NaNO_3$ (Fecasol®, EVSCO Pharmaceuticals, Buena, NJ) in 15 ml centrifuge tubes for 10 min in order to determine helminth fauna and presence of coccidian oocysts.

2.3. Evaluation of fenbendazole efficacy

Following fecal sample collection, calves were treated with fenbendazole (Safe-Guard® Suspension 10%, Intervet Inc., Millsboro, DE) at the recommended dosage of 5 mg/kg body weight. Twenty additional fecal samples were collected 2 weeks after fenbendazole treatment and analyzed from individuals that were positive for *T. vitulorum* eggs using the methods described above.

2.4. Statistical analysis

Comparisons of prevalence of *T. vitulorum* infection were performed using the Chi-square test. The level of significance for all calculations was $P < 0.05$. All statistical analyses were performed using the Minitab 15 Software.

3. Results

3.1. T. vitulorum prevalence

From the 433 beef calves sampled, 39 (9%) were determined to be shedding *T. vitulorum* eggs in the feces. Calves less than 3 months of age had a 17.6% prevalence of infection (Table 1). The prevalence for calves aged 3–4 months and 5–6 months was 0.4% and 0.9%, respectively. No *T. vitulorum* eggs were observed in samples from calves 7 to 9 months old. There was a significant difference in the overall prevalence of *T. vitulorum* between age groups ($P < 0.001$). Seasonal variation was not found to be significantly different.

Table 1
Prevalence of *Toxocara vitulorum* in beef cattle in North Central Florida.

Calf age	Prevalence
<3 months	29/105 = 17.6%
3–4 months	5/11 = 0.4%
5–6 months	1/108 = 0.9%
7–9 months	0/47 = 0%

3.2. Efficacy of fenbendazole treatment

No *T. vitulorum* eggs were observed in samples taken from 17 of the 20 (85%) calves that had been infected and were treated with fenbendazole.

4. Discussion

The present study indicates that the prevalence of *T. vitulorum* may be higher than was previously reported (Zajac and Conboy, 2006; Morgan and Hawkins, 1949). Reasons for this observation are difficult to determine, but may be a reflection of global climate change that has been experienced over the last several decades, which has altered distributions of organisms worldwide (Gitay et al., 2002). Since *T. vitulorum* affects water buffalo (Roberts, 1989a; Warren, 1971), another possible explanation is the introduction of buffalo stock from endemic areas into Florida and the subsequent cross-contamination of pastures and equipment with fecal material. The owners of the ranch informed us that there have never been water buffalo on this ranch, but there has been a herd about 5 miles away. To establish this relationship, a study of the movement of buffalo stock, the prevalence of *T. vitulorum* and the fecal waste dynamics in neighboring water buffalo operations is needed. Furthermore, this is essentially a closed herd so the opportunity for new stock to introduce this parasite is not a possibility.

The results of this study demonstrate the disappearance of *T. vitulorum* eggs in the feces of calves after 6 months of age. This is in accordance with previous studies (Roberts et al., 1990; Kassai, 1999).

Treatment of beef calves less than 3 months of age with an anthelmintic such as fenbendazole at 5 mg/kg is a fairly effective and practical method of controlling this parasite in calves. The administration of this anthelmintic may be combined with other management procedures done early in the calves' lives to minimize additional labor costs.

The prevalence of *T. vitulorum* should be evaluated in other areas of Florida and the southeastern states in order to determine the animal health and economic implications of this emerging pathogen.

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