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Individual intake and antiparasitic efficacy of free choice mineral containing fenbendazole for grazing steers

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Abstract

A 95-day study (June 25–September 27, 2001) was conducted using 120 steers (311.9 ± 2.4 kg) randomly allocated to two treatments: (1) mineral containing 0.55% fenbendazole (FBZ) and (2) control, no FBZ in the mineral. Animals in the FBZ group were individually identified by an electronic tag that was read each time an animal attended the mineral feeder. The feeder was equipped with load cells that enabled individual mineral intakes to be estimated. The FBZ group was provided with non-medicated mineral during a 14-day adaptation period (July 23–August 5) and an 8-day post-medication period (September 17–24). The intake of FBZ was monitored for 14 days during each of the two treatment periods; August 6–19 and September 3–16, separated by a 14-day non-medicated period, August 20–September 2. Control animals had access to non-medicated mineral for the entire 95-day study period. All steers were grazed on alfalfa-grass pasture for the duration of the study and had free access to flocculated, filtered and chlorinated water via an automatic waterer. Fecal samples were collected from steers three times during the experiment July 23, August 27 and September 27, and analyzed for nematode eggs and *Giardia* sp. cysts. Seventy-five and 83% of the steers in the FBZ group visited the mineral feeder during the first and second treatment periods, respectively. Individual daily mineral and FBZ intake for the first and second treatment periods was 52.9 ± 6.6 g per day and 10.1 ± 1.2 mg/kg BW; 72.3 ± 8.4 g per day and 11.8 ± 1.4 mg/kg BW, respectively. FBZ animals were separated into three groups during each treatment period based on the recommended dose (RD) of FBZ (5 mg/kg/BW), those that received >the RD, those that received <RD but >50% RD and those that received <50% of RD. Nematode egg counts and the number of animals infected with nematodes was reduced ($p < 0.05$) in all cattle that consumed FBZ as compared to control animals. In contrast to nematode eggs, numbers of *Giardia* cysts was not reduced ($p > 0.05$) by FBZ as compared to controls in either treatment period. These results may be a reflection of *Giardia* re-infection occurring following treatment and highlight the need for variation in treatment regimes specifically targeted at the parasite of interest.

Keywords: Giardia; Nematodes; Fenbendazole; Cattle; Intake; Mineral

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1. Introduction

Parasitic infections of cattle and control methods are two areas of considerable research and interest within the livestock industry. Parasites that are included within this group are a protozoan parasite, *Giardia* sp. and parasitic nematodes (Garossino et al., 2001). Prevalence of *Giardia* in cattle has been reported to be up to 100% in young dairy and beef calves (O'Handley et al., 1999; Ralston et al., 2003a), and 82% in yearling steers (Ralston et al., 2003b). *Giardia* infections have been associated with reduced intestinal enzyme activity, decreased micrivillus surface area and increased intestinal transit resulting in malabsorptive diarrhea and weight loss in cattle (O'Handley et al., 2000). Giardiasis in food producing animals may also serve as a possible source for human infections (O'Handley et al., 2000). *Giardia* cysts have been reported to remain viable in water, soil and feces for periods up to 9 weeks, thereby increasing the likelihood that pasture run-off could contaminate surface and ground water sources (Olson et al., 1999).

Gastrointestinal nematode infections in ruminants have been reported to impair performance through their effects of appetite depression; changes in gastrointestinal function; and alterations in protein, energy and mineral metabolism (Fox, 1997). Consequently, cattle producers are interested in cost effective, unobtrusive methods of treating parasites in cattle on range. Traditionally, in Canada nematode infections have been controlled utilizing pour-ons and injections which involve the restraint of cattle for administration of product, causing animal stress and adding to the operator's work load (Garossino et al., 2001). Until recently, there has been little documentation in the scientific literature of free-choice anthelmintic medication of cattle on range. Concerns of variations in individual intake causing improper dosages, resulting in possible drug resistance or toxicity exist with this method of treatment (Garossino et al., 2001).

Fenbendazole (FBZ) is efficacious against both gastrointestinal nematodes (Williams and Broussard, 1995; Bauer et al., 1997) and *Giardia* (Xiao et al., 1996; O'Handley et al., 1997). It has also been shown to have no toxic effects at dosages in cattle up to 2000 mg/kg of body weight, 400 times the recommended dosage of 5 mg/kg (Muser and Paul, 1984).

The purpose of the present study was to monitor the individual intake of pastured steers consuming mineral containing FBZ. The efficacy of FBZ against *Giardia* and gastrointestinal nematodes was evaluated based on reductions in fecal egg/cyst counts and percentage of infected animals.

2. Materials and methods

2.1. Experimental location

The study was conducted from June 25, 2001 to September 27, 2001 at the University of Calgary, Spy Hill Farm, Calgary, Alta., Canada. The pasture was approximately 160 acres split into two 80 acre fields, one containing the control steers and the second containing the treatment group. The pastures consisted of a mixture of alfalfa, smooth brome and timothy grass. Available forage was not limited at any time during the experiment. No pasture parasite contamination history was available, however, cattle had grazed the pastures in previous years. The only major water source for each pasture was an automatic waterer. Water was provided by the City of Calgary and was flocculated, filtered and chlorinated. The water was located approximately 12 m from the mineral feeder.

2.2. Animals and experimental periods

One hundred and twenty steers were randomly allocated into two groups; treatment with FBZ in the mineral ($n = 60$) and control, no FBZ in the mineral ($n = 60$) for this study. All animals were 1-year-old and weighed an average of 311.9 ± 2.38 kg at trial initiation. The control group had access to the non-medicated mineral throughout the study period (95 days). The FBZ group was provided with non-medicated mineral during the 14-day adaptation period (July 23–August 5) and a post medication period (September 17–24). The intake of FBZ was monitored for two 14-day periods; August 6–19 and September 3–16, separated by a non-medicated period, August 20–September 2. Fourteen-day FBZ treatment periods were selected to target *Giardia* control. Steers were weighed upon completion of the experiment on September 27. Animals were cared for