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Short communication

Parascaris equorum in foals and in their environment on a Swedish stud farm, with notes on treatment failure of ivermectin

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Abstract

Environmental contamination and the egg excretion pattern of the ascarid *Parascaris equorum* (Nematoda) was investigated in relation to anthelmintic treatment on a Swedish stud farm. Faecal samples from 15 foals, dewormed every 8th-week with a paste formulation of ivermectin at the standard dose rate of 0.2 mg/kg bodyweight, were collected at five sampling occasions between August and November 2006. In addition, soil samples were obtained from four paddocks used by these foals in November 2006. The number of eggs per gram (epg) was counted in both faeces and soil. Egg excretion started when the foals were 3–4 months, and reached the highest levels when they were approximately 5-month-old, and was then followed by a decline. Egg excretion seemed to be unaffected by ivermectin despite these foals were dewormed at regular intervals. In four out of five foals examined 10 days after treatment, epg actually increased. In contrast, when either fenbendazol or pyrantel embonate were used instead of ivermectin, treatments were effective. The number of eggs in soil was significantly higher in the permanent paddock compared to in the temporarily used soil paddock and in the summer paddocks.

Keywords: Horse-nematoda; Foals; Anthelmintic resistance; Epidemiology; Soil

1. Introduction

The large roundworm of horses, *Parascaris equorum*, is an important cosmopolitan nematode parasite of foals. The prepatency period of *P. equorum* is about 10–15 weeks (Clayton, 1986). Attempts to demonstrate lactogenic or prenatal transmission have been unsuccessful (Andersson, 1992). Thus, ingestion of infective eggs in the environment is the major route of transmission (Boyle and Houston, 2006). Moderate to high infection levels may cause respiratory symptoms and bad appetite associated with weakness, decreased growth, enteritis and occasionally obstruction and peritonitis (Boyle and Houston, 2006).

Problems with control of strongyles that are resistant to anthelmintics including macrocyclic lactones (ML) have increasingly been documented wherever horses are grazed intensively (Kaplan, 2004). Lately, reduced

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efficacy of ML to *P. equorum* has also been reported from a stud farm in the Netherlands in foals treated with either moxidectin or normal and double doses of ivermectin (Boersema et al., 2002). Also, Hearn and Peregrine (2003) observed a high number of ascarid eggs as soon as 12–13 days after treatment. Furthermore, according to Slocombe et al. (2007) the overall efficacy of ivermectin was only 34% in foals treated with ivermectin in Canada. Recently similar observations have been made both in Denmark (Schougaard, 2005) and Germany (von Samson-Himmelstjerna et al., 2007).

In temperate regions, eggs of *P. equorum* become infective from spring to late autumn, and in conjunction with when a high number of foals spend most of their time outdoors in paddocks and/or on pasture. *P. equorum* infected horses may shed several thousands of eggs per gram faeces. Thus in a single day a foal can contaminate the environment with millions of eggs (Clayton and Duncan, 1979). Still, few environmental studies have been conducted concerning where roundworm eggs occur and for how long they remain infective. According to Bello (1982), eggs of *P. equorum* survive for many years in the soil. DiPietro et al. (1988) reported that soil samples from a paddock, which had been used by foals for the previous 25 years, contained on average 30 epg soil but only 52% of these were embryonated. In a Norwegian study (Ihler, 1995), 15 paddocks without grass cover at 12 different stud farms were investigated. Soil profiles were taken to a depth of 15 cm and it was found that paddocks with gravel had a lower total content of eggs compared to paddocks with clay or moraine soil.

The aim of this study was to provide baseline data on: (1) the egg expulsion pattern in foals on a Swedish stud farm, and (2) the egg content in soils from different paddocks used by these foals. The efficacies of oral paste formulations of commonly used anthelmintic compounds were also examined.

2. Materials and methods

Between August and November 2006, foals were examined for roundworm eggs on a commercial stud farm in south central Sweden. On this farm approximately 30 mares were housed in single-box stalls, whereas the younger horses were kept in loose housing. Between mid May and October the dams and their foals were on pasture for 24 h a day.

At the stud farm, the standard recommendations, starting with a treatment of the dams with a paste formulation mainly of ivermectin at foaling, followed by deworming of the foals every 2nd month, had been adopted for many years. The study was initiated because a massive burden of *P. equorum* was discovered at necropsy, in one foal that died in November 2005, despite it had been dewormed.

The occurrence of ascarid eggs was investigated by monitoring the faecal egg excretion pattern for 6 months in all 15 foals born in 2006, and by analyses of ground surface soil samples from four paddocks (see below). The foals that were born between early March and late June, were all subjected to faecal egg counts on five occasions at monthly intervals. Accordingly, all foals were examined on the same days but they were between 1.5 and 5 months old at the first sampling occasion. Information about the management of the paddocks and of foals and dams, as well as the crop rotation, was gathered by interviewing the stud farm manager.

Throughout the study period, all foals were dewormed every 8th-week with a paste formulation of ivermectin (Ivomec®, Merial) according to the recommended dose rate of 0.2 mg/kg bodyweight (bw). The doses were determined based on the heaviest individual using a girth measuring tape. The five foals with the largest epg counts at the ivermectin treatment the 1st-week in August 2006 were, in addition to the regular monthly samplings, re-examined 10 days after treatment in August. As the ivermectin treatments were ineffective, all 15 foals received paste formulations containing either pyrantel embonate (Banminth®, Pfizer) at a dose rate of 19 mg pyrantelpamoat per kg bw, or 7.5 mg fenbendazole per kg bw (Axilur®, Intervet), in late October 2006.

The soil sampling was conducted to investigate the level of contamination by ascarid eggs in paddocks that had been used by the foals. In general all foals spent some time in all four paddocks beginning with paddock A, with the exception of the three youngest foals (number 1, 2 and 3) that never had access to paddock B. All paddocks (A, B, C and D), were investigated in November 2006. Paddock A was a 0.2 ha paddock with clay soil and no grass cover, while paddocks B, C and D were larger (2.5, 7 and 7 ha, respectively) and mainly covered by grass. The time spent in paddock A could be up to 2–3 weeks for those foals that were born early in spring (March–April), but usually only 1–3 days for those born later in the spring (May). Paddock B was only temporarily used until mid May, before the foals were turned out to their summer pastures (paddocks C and D). Paddock C was a natural pastureland with a mixture of grass areas, rocky parts, bushes and trees and all foals grazed it more or less simultaneously. Also paddock D had a grass cover