Notes and records

The effects of time of day on the prevalence of coccidian oocysts in antelope faecal samples

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Introduction

Relatively few studies have documented coccidian infection levels in free-ranging wild bovids (e.g. Penzhorn, Knapp & Speer, 1994; Penzhorn, 2000; Waruiru *et al.*, 1995), despite the fact that coccidia can be highly pathogenic in bovids and are important causes of disease in domestic stock (Urquhart *et al.*, 1996; Bowman, 1999). Much of the information currently available on the prevalence and intensity of coccidian infections in wild bovids comes from studies focusing on gastrointestinal helminth distributions that also recorded the presence of coccidia. In most cases coccidian infections are diagnosed using coprological techniques, thus the true distributions of these parasites could be masked because of inadequate faecal sampling procedures not particularly suited to the study of coccida specifically. This paper presents results suggesting that the time of day in which faecal samples are collected affects the prevalence rates of coccidia in three species of African antelope. These results are part of a larger study on gastrointestinal parasitism in African bovids, and they highlight the importance of controlling for factors like sample collection time in such studies.

Materials and methods

Faecal samples were collected at the Mpala Research Centre, Kenya, between August 1999 and July 2000. During this period 455 samples were collected from impala (*Aepyceros melampus*), 157 from hartebeest (*Alcelaphus buselaphus*) and 30 from Thomson's gazelle (*Gazella thomsoni*). Faecal samples were collected after an individual animal was seen defecating or after a group of animals left an area. Fresh samples were placed in a labelled plastic bag and transported to the laboratory for processing. Samples were usually processed the same day but in a few instances, the samples were stored at 4 °C and processed on the following day. Samples collected between 06:00 and 12:30 hours were designated as morning samples and those collected between 16:00 and 19:00 hours were designated as evening samples. The prevalence (percentage of samples infected) and intensity (oocysts per gram faeces [OPG]) of coccidia in each sample were determined using a modification of the McMaster faecal egg counting technique (MAFF, 1980), with saturated sodium chloride (specific gravity 1.2) used as the flotation solution. Because the distribution of OPG values was aggregated in each host population, values were log transformed for statistical analysis.

Results and discussion

Coccidian oocysts were more prevalent in samples collected in the afternoon in all three host species (Fisher's exact test: hartebeest, $\chi^2 = 12.941$, df = 1, $P = 0.0018$; impala, $\chi^2 = 10.798$, df = 1, $P = 0.0018$; Thomson's gazelle, $\chi^2 = 6.887$, df = 1, $P = 0.0307$; Table 1). However, despite a higher prevalence of coccidia in faecal samples collected later in the day, there was no significant difference in the mean number of oocysts (log [OPG + 1]) shed in the morning and afternoon by either hartebeest (ANOVA: $F_{1,33} = 0.3$, $P > 0.1$), impala ($F_{1,156} = 0.15$, $P > 0.1$) or Thomson's gazelle ($F_{1,4} = 0.38$, $P > 0.1$) (Fig. 1).

Temporal variation in oocyst prevalence has previously been found in birds (Boughton, 1937; Brawner & Hill, 1999), and is hypothesized to result from the periodic release of oocysts from host tissues (Boughton, 1937). After oocysts are passed out in a host's faeces they undergo sporulation, a process during which each oocyst divides into infective sporocysts that can then be ingested by a new host. Successful sporulation depends on

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Table 1 The number of morning and evening faecal samples collected from three antelope species and the percentage of these samples infected with coccidian oocysts. Oocysts were more prevalent in evening samples

	Morning samples (*n*)	% infected	Evening samples (*n*)	% infected	*P*-value
Hartebeest	146	18	11	64	0.0018
Impala	442	33	13	77	0.0018
Thomson's gazelle	23	4	7	43	0.0307

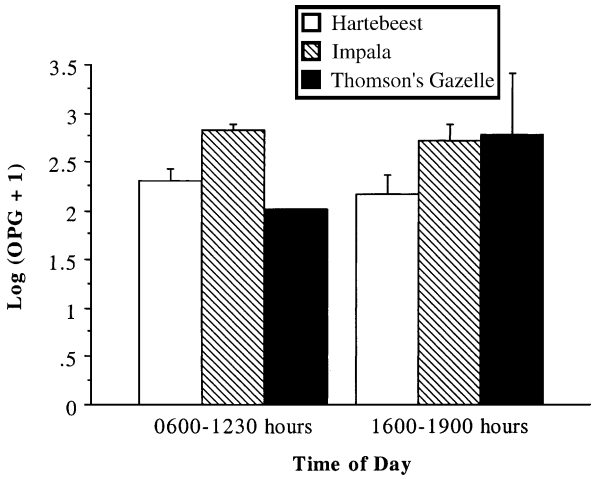

Fig 1 Mean number of oocysts per gram (log [OPG + 1] ± SE) in faecal samples collected from hartebeest, impala and Thomson's gazelle in the morning (06:00–12:30 hours) and evening (16:00–19:00 hours). There was no significant effect of time of day on oocyst intensity.

adequate moisture and moderate temperatures (Bowman, 1999), therefore oocysts released in antelope faeces late in the day may avoid desiccation and have improved chances of survival because critical initial stages of development do not coincide with maximum diurnal temperatures. If sporocyst survival is increased in this manner, then temporal variation in oocyst shedding may facilitate coccidia transmission.

The oscillations in the shedding of coccidian oocysts can be a serious confounding factor in studies seeking to describe patterns of parasite infestation in hosts. The findings presented in this study demonstrate that in order to survey levels of coccidian infection in bovids, researchers should first collect preliminary data on study species to screen for periodicity in oocyst shedding. If variation exists, then sampling times should be standardized as much as possible, and sampling should be conducted during the time of day most appropriate to the objectives of the study.

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