



RESEARCH COMMUNICATION

The establishment, composition and severity of infection of gastro-intestinal parasites and their impact on productivity of Tswana kids in southern Botswana

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ABSTRACT

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The presence of gastro-intestinal parasites in Tswana kids ($n = 7$) aged 1–3 weeks was studied for a period of 6 months at the Botswana College of Agriculture. The aims of this study were to find the time when they first contracted internal parasite infections, as well as to determine the severity of the infections and also its relation to production indicators (body mass and packed cell volume) of the kids as they grew older. The results indicate that they contracted coccidial and roundworm infections at approximately one month of age or immediately thereafter. The most prevalent internal parasite was coccidia, which occurred throughout the study period followed by roundworms and the least was the tapeworm, *Moniezia expansa*. Generally, the infection levels of all internal parasites were lower than the critical mean log (faecal oocyst/egg count + 1) of 3.3 inferred to cause reduced production in small stock. The correlation coefficients were all positive; 0.4–0.9 for individual internal parasites and production indicators, indicating that these internal parasites did not have any adverse effects on production. It was concluded that there was no need to treat kids of this age group for internal parasites.

Keywords: Body mass, coccidia and *Moniezia expansa*, goat, internal parasites, kids, packed cell, roundworms, volume

INTRODUCTION

Annual reports compiled by the Botswana National Veterinary Laboratory from disease cases reported by farmers (Botswana National Veterinary Laboratory Annual Reports 1990–1996) show that internal parasitism is one of the major constraints on the health and productivity of goats in all parts of the country.

However, there is no single comprehensive study on the adverse effects of internal parasites on goat production during normal growth and development in Botswana. Such information would indicate variation in the composition of internal parasites and the severity of infection during the farming calendar.

The objectives of this study were:

- To determine the age at which kids of Tswana goats are first infected by internal parasites and the severity of infections
- To relate productivity measures (i.e. packed cell volume and body mass) to internal parasite burdens in the kids.

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MATERIALS AND METHODS

Animals

Seven kids of Tswana goat aged 1–3 weeks were used in this study. The kids were born outside at pasture in August–September. The dams of these kids were raised under animal husbandry conditions typical of the traditional management systems in Botswana i.e. browsing and grazing with little or no feed supplementation. In addition, no control measures for external and internal parasites are applied unless these are considered to be warranted when animals actually are sick. During the experiments the kids, remained enclosed in a 1-haetre paddock during the day while their dams went out to browse and graze natural pastures. The kids were with their dams at night. During the day the kids freely nibbled pasture composed of local grasses and shrubs. The kids were weighed; blood and faecal samples were collected every 2 weeks for a period of 6 months.

Packed cell volume (PCV) analysis

Blood from each kid was drawn from the jugular vein into 10 ml vacutainers containing EDTA (Becton Dickinson Vacutainer System Europe, Meylan, Cedex-France). It was mixed by inverting the tubes several times, and capillary tubes were filled and sealed with Crista Seal (Hawskley & Sons Ltd, Sussex, UK). The capillary tubes were then centrifuged at maximum speed for 5 min in a haematocrit centrifuge (Damon/IEC Division, MA, USA) and PCV determined using a Hawskley Micro-Haematocrit Reader (Hawskley & Sons Ltd, Sussex, UK).

Faecal collection and analysis

The faecal samples were taken from the rectum and placed in a clean sampling bottle. In the laboratory, 5 g of faeces from each individual kid were weighed into a clean sampling bottle and then crushed with a spoon. Forty-five glass beads were placed in the crushed faecal sample to further improve crushing. Twenty-eight millimetres of water were added to the bottle, which was then tightly closed and shaken well. The mixture was sieved through a coarse sieve into a clean beaker. The sieved material was mixed well, transferred to centrifuge tubes and centrifuged for 3 min at 1 500 revolutions per minute. The supernatant fluid was then decanted and saturated aqueous sodium chloride solution was added to fill the tube up to the former level of the decanted supernatant. Using a pipette a McMaster slide was filled and examined for the presence of eggs and oocysts under a light microscope using a 10X objective lens. These were counted according to the modified McMaster method. Eggs and coccidial oocysts occurring on or within the engraved lines on both halves of the slide were counted and the counts multiplied by 50 to calculate the eggs or oocysts per gram of faeces per kid.

STATISTICAL ANALYSIS

A General Linear Model was fitted to the data. Faecal oocysts/egg counts (fec) were transformed to $\log(\text{fec} + 1)$ because the original data were not normal. The only fixed effect fitted was age in weeks. Mass at birth was fitted as a covariable when the parameter of interest was body mass. Least squares means were separated using *t*-test in Statistical Analysis System (SAS 1988). Coefficients of correlation of least squares means were calculated to relate parameters of interest in Minitab (Minitab 1996).

RESULTS AND DISCUSSION

As shown in Table 1, the oocysts observed in the faecal specimen were those of coccidia and the eggs were those of roundworms and the tapeworm, *Moniezia expansa*. Between the period of 22 and 36 days of age, only one kid was infected with coccidia. The fact that such a young kid can be infected is supported by Smith & Sherman (1994) who stated that kids could be infected as early as 2 weeks of age. The infection might have been due to the kids licking objects that had come into contact with faeces of infected animals and also from contaminated pasture and water (Hall 1994). The rate of infection from coccidia increased with age until January when all kids were infected, after which it slightly decreased and leveled off.

Roundworms were detected when kids were aged slightly over one month. The infection increased until all kids were infected by November (Table 1) and could have resulted from the kids ingesting the infective stages of the parasites while grazing contaminated pasture, forbs and herbs that had just started emerging in late spring and early summer.

Moniezia expansa (milk tapeworm) eggs were first detected at the age of 64 days and its infection levels differed slightly but were not statistically significant ($P > 0.05$) as the kids grew older (Table 1). These findings agree with those of Horak, Knight & Williams (1991) who found that kids born during September were infected with this species and showed no real increase in infection until April and May of the following year.

Generally, the mean $\log(\text{fec} + 1)$ of internal parasites over time within species did not differ significantly ($P > 0.05$) during the period of study (Table 1). The peak infection levels of the internal parasites under review coincided with the summer rains, high temperatures and humidity that are conducive for internal parasite multiplication (Kibirige-Sebunya & Diteko 1994; Hall 1994).

Generally, the levels of infection i.e. $\log(\text{fec} + 1)$ were low (Table 1) and were less than the critical level of 3.3 above which Gray (1991) inferred would reduce

TABLE 1 Least squares means (\pm standard error of mean) of body mass, packed cell volume (PCV) and internal parasites of kids after birth

Post birth age (month)	Mass (kg)	PCV (%)	Coccidia ^a	Round worms ^a	<i>Moniezia expansa</i> ^a
October	6.14 \pm 0.72	24.69 \pm 1.52	2.30 \pm 0.30	– ^b	–
November	7.80 \pm 0.53	26.00 \pm 1.11	2.53 \pm 0.13	1.71 \pm 0.20	–
December	10.38 \pm 0.59	27.33 \pm 1.24	2.77 \pm 0.09	2.05 \pm 0.08	1.81 \pm 0.16
January	14.40 \pm 0.77	27.86 \pm 1.63	3.11 \pm 0.11	1.93 \pm 0.08	1.71 \pm 0.19
February	16.72 \pm 0.62	27.09 \pm 1.30	2.63 \pm 0.09	1.92 \pm 0.07	1.71 \pm 0.16
March	16.96 \pm 0.77	27.29 \pm 1.63	2.49 \pm 0.11	2.03 \pm 0.08	2.16 \pm 0.19

^a Characterized as log (faecal egg/oocysts count + 1)

^b A dash indicates that kids were not infected by that parasite species at that time

production in small stock. This indicates that there was no need to treat animals for parasitism. Such an inference, however, applies to adult goats and not kids. Kids are more susceptible to infection by internal parasites than adult goats (Borne & Monicat 1991), hence farmers need to monitor the growth of their kids constantly and to treat them with internal parasite remedies when necessary.

The PCV measured within a week after birth of kids was 26.72 \pm 0.47%. According to Jain (1993) the initial PCV of healthy newly born goat kids should be as high as 30–38% and this significantly differs with what was found in this study. The low PCV could be due to the fact that the kids were born weak with average birth mass of 1.81 \pm 0.33 kg as opposed to the 2.7 kg recorded for Tswana goat kids by Adogla-Bessa (1994). This could imply that their dams had not been well fed during the gestation period. The low PCV could also have been due to iron deficiency anaemia associated with a milk diet (Smith & Sherman 1994). The lack of information concerning PCV values in Tswana goat kids renders the results obtained in the present study inconclusive. However, this could imply that there are breed differences in the aforementioned parameter. Such a hypothesis is supported by figures reported by Smith & Sherman (1994) for indigenous Indian and Nigerian breeds that had mean PCVs of 27.9% and 25.1%, respectively, for 0–6-month-old kids; these are similar values to those of the present study. The latter breeds are tropical breeds like the Tswana used in this study.

A positive correlation between the PCV values and the body mass of 0.79 was obtained in this study. This indicates that the PCV increased as the body mass increased. There were also positive correlations of 0.4 and 0.9 between body mass and the PCV on one hand and individual internal parasite on the other. These latter positive correlations are contrary to those reported in the literature (Rodostits, Blood & Gray 1995) that reported negative correlations between these parameters for kids of similar ages to those of the present study. Lack of these correlations for kids in the literature makes the results of the present study inconclusive.

CONCLUSIONS

Most kids were infected with internal parasites at approximately one month of age or immediately thereafter. Coccidia was detected throughout the study period, followed by roundworm eggs recovered from October and *Moniezia expansa* eggs recovered from December onwards. The monthly internal parasite burdens were generally less than the critical mean log (faecal oocyst/egg count + 1) level of 3.3, assumed to reduce productivity in goats. There was also no negative impact of the internal parasites on the productivity of the kids. Therefore, treatment for internal parasites is not recommended. Faecal samples should be cultured to identify internal parasites present since different internal parasite species have different pathogenicity. This experiment should be extended to cover the whole of the productive period of Tswana goats in order to obtain a more holistic picture.

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