PREVALANCE, OOCYCT OUTPUT AND PATHOLOGICAL CHANGES ASSOCIATED WITH EIMERIOSIS IN CAGED RABBITS

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SUMMARY

Three hundred and twenty for five caged rabbits comprising 56 kittens, 83 weaners, 74 growers and 112 adults were screened for coccidia oocysts using McMaster technique. Pathological changes and correlation between age and oocyst output were also evaluated. The overall prevalence of infection was 72.9%. The prevalence was significantly higher ($p<0.001$) in weaners (97.6%) and growers (89.2%) than in adults (53.6%) and kittens (51.8%). The mean oocyst outputs per gram of feaces were highest in growers (38970) and weaners (33590) and lowest in adults (4280) and kittens (6820). Generally oocyst outputs decreased with age. The major gross pathological lesions were thickening of intestinal walls, congestion of serosal vessels and accumulation of brownish mucus in the intestines with ecchymotic and petechial haemorrhages on the mucosa. Histologically the small intestine showed attenuation of surface epithelium and desquamation of tips of villi. The most common *Eimeria* species found in infected animals were *E. media,* (32.3%) and *E. perforans* (28.7%). Others were *E. periformis* (13.3%), *E. magna* (10.9), *E. stiedae* (7.9%), *E. flavescens* (4.7%) and *E. intestinalis* (2.2%).

INTRODUCTION

The increasing human population and urbanization in developing countries is forcing dietary changes

towards a high demand for food of animal origin (Fednandez-Rivers, 1996). Although the main source of animal protein in most of the tropical developing countries is meat and milk from ruminants, the inability of farmers to feed their animals adequately thoughout the year remains to be the most common constraint in improving the supply of animal protein in both rural and urban communities. This, therefore, calls for a need to look for alternative sources of animal protein.

The rabbit is increasingly becoming a potential source of meat supply (Owen, 1981). The reasons for the increasing popularity of rabbits include tenderness of meat, high reproduction rate and the relatively low cost of rearing the animals in the backyard management system (Costa, 1978; Owen, 1981). However, efforts to maximize rabbit meat production are often interfered by a variety of diaseses . Among the common diseases in rabbits are parasitic otitis characterized by aural crusty lesions (Kambarage, et al., 1996) and coccidiosis manifested by diarrhoea. Coccidial infection results in mortalities in young rabbits of up to 100% and reduced growth rates (Peters *et al.*, 1988; Chandra and Ghosh, 1990).

While parasitic otitis has recently received some attention in Tanzania (Maselle *et al.*, 1995; Jiwa *et al.*, Kambarage *et al.*, 1996), scanty information exists on the occurrence and pathology of coccidiosis known to be common in rabbit colonies reared under unhygienic and crowded conditions. The aim of this study was, therefore, to determine the prevalence, oocyst outputs and pathology of coccidial infections in domestic rabbits kept in cages.

MATERIAL & METHODS

Animals:

A total of 325 caged rabbits (New Zealand White) raised in four farms around Morogoro Municipality, Tanzania, were screened for *Eimeria* oocysts. The animals comprised 56 kittens (<5 weeks old), 83 weaners (5-7 weeks old), 74 growers (8-12 weeks old) and 112 adults (>12 weeks of age). With the exception of lactating does which were kept together with their kittens, all others were individually caged.

Prevalence and identification

of *Eimeria* species

Faecal samples were once collected from the different categories of animals using metal plates placed below the cages. The samples were kept under refrigeration or immediately processed for oocyst quantification using the standard McMaster technique (Soulsby, 1982; Jorgan, 1990). Positive samples with oocyst counts of over 1000 per gram of faeces were cultured by incubating the faeces in 4% potassium dichromate at room temperature for 3 to 5 days to initiate sporulation of oocysts for subsequent identification of the *Eimeria* species Levine, 1973; Soulsby, 1982. Identification of of species was based on the morphology (shape, size and presence or absence of micropyle and polar caps) of sporulated oocysts (Levine, 1973).

Determination of daily oocyst outputs

Twelve 6 weeks old individually-caged rabbits shown to be naturally infected with *Eimeria* species were randomly selected for this study. Morning (9 a.m.) and late afternoon (4 p.m.) oocyst outputs in individual animals were used to determine daily average oocyst outputs for 77 days.

Postmortem examination

Seven randomly selected infected rabbits (four diarrhoic and three non diarrhoic) were sacrificed and examined for gross lesions in the intestines and liver. Tissue samples of the duodenum, jejunum, ileum, caecum, colon and liver were fixed in 10% neutral buffered formalin for at least 48 hours. The fixed samples were than embedded in paraffin wax, sectioned into 5-6 µm thick sections and stained with hematoxylin and eosin (H&E) for light microscopy.

RESULTS

Prevalence and *Eimeria* species infecting the animals

The prevalences of coccidia infection in various age groups of the rabbits are shown in Table 1. The overall prevalence in all categories of rabbits in the four farms was 72.6%. The prevalences in the weaners (97.6%) and growers (89.2%) were significantly higher than those in the adults (53.6%) and kittens (51.8%) ($X2=68.90$, $df=3$, $p=0.000000$). Table 1 also shows that there were low oocyst outputs in

kittens and adults, whereas high outputs were evident in weaners and growers. Despite the high oocyst outputs in weaners and growers, diarrhoea was observed only in three weaners and one grower. Various *Eimeria* species infected the rabbits and these included *E. media* (32.3%) and *E. perforans* (28.7%). Others were *E. piriformis* (13.3%), *E. magna* (10.9%), *E. stiedae* (7.9%), *E. flavescens* (4.7%) and *E. intestinalis* (2.2%).

Daily oocyst outputs

Figure 1 shows the tranformed date (log counts) for daily avarage oocyst outputs in twelve rabbits over the 77 days of observation. During this period, the highest average oocyst output was 1.5×10^5 whereas the lower was 1.3×10^2. Oocyst production showed daily variations with peak levels decreasing with age. No diarrhoea was evident in the twelve rabbits during the entire period of observation.

Patho-morphologic findings

Major gross pathological changes were found only in the four rabbits that had diarrhoea; those with no diarrhoea had no lesions. Gross lesions included thickening of small intestinal walls congestion of serosal vessels and accumulation of thick brown to reddish mucus in the intestines. Areas of ecchymotic and petechial haemorrhages were observed on the mucosa.

Microscopically, common changes were found in the duodenum, jejunum and ileum of the four rabbits with diarrhoea. These included attenuation of the surface epithelium and desquamation of the tips of the vill (Fig. 2). Vacuolatin was observed in epithelial cells containing gaments/schizonts
Hyperplasia of epithlial cells of affected vill was also evident. Other changes included congestion and haemorrages in the mucosa and serosa as well as dilatation of intervillous spaces. These histological changes, albeit being mild were also evident in infected animals which showed no diarrhoea. On the other hand, foci of bile ductile epithelial proliferation which extended into the normal parenchyma were observed in the livers of all seven infected rabbits. No developmental stages of *E. stiedae* were demonstrable in the livers.

Table 1: Prevalence of coccidia infection and oocyst outputs in different age groups of rabbits in four farms in Morogoro Municipality, Tanzania.

Age group	No. of animals examined	Prevalence (%)	Range of oocyst output	Mean (±SE) oocyst output
Kittens	56	51.8(29)	100-371,400	6,820±0.86
Weaners	83	97.6(81)	200-180,000	33,590±047
Growers	74	89.2(66)	100-446,400	38,970±1.33
Adults	112	53.6(60)	100-30,700	4,280±0.61
Total	325	72.6(236)	-	-

Figures in parentheses indicate actual numbers of infected rabbits.
SE = Standard error of the mean.

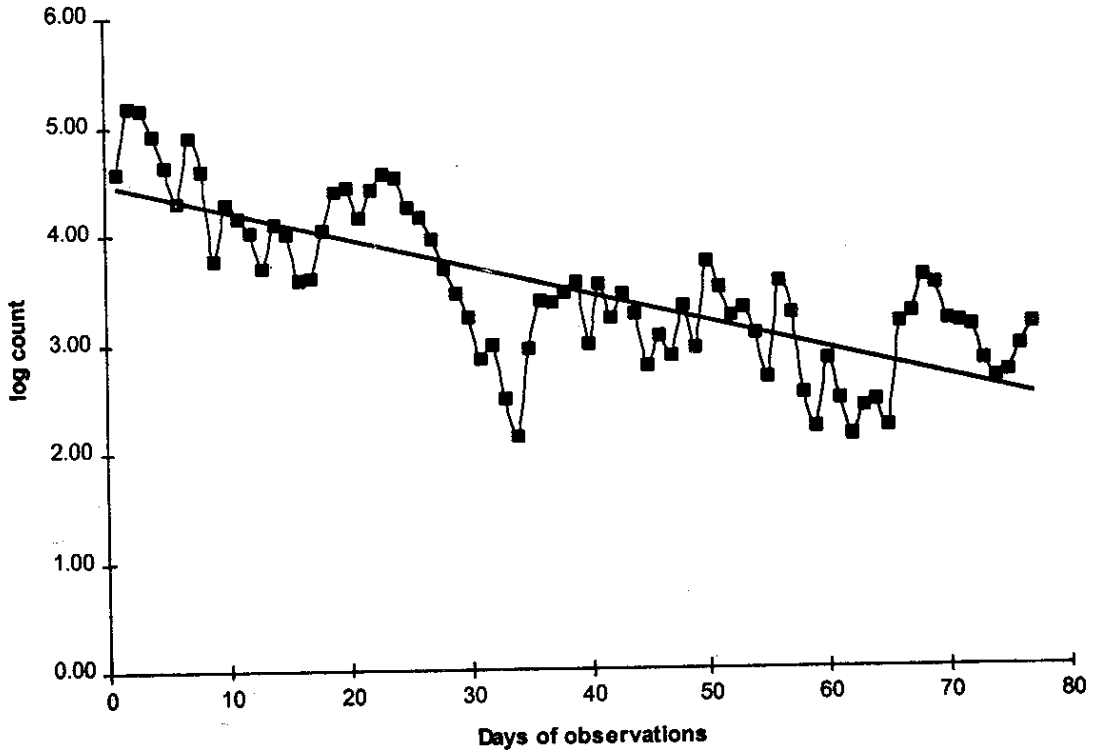

Fig. 1: Tranformed data (log counts) for daily avarage oocyst outputs in 12 rabbits over 77 day period. The highest average oocyst output was $1.5x10^5$, lowest was $1.3x10^2$.

Fig. 2: Small intestine of rabbit infected with *Eimeria* spp showing Desquamated epithelium Of the tip of a villus (arrows). H&E x 40

DISCUSSION

Despite the high prevalence of coccidia infection and oocyst output, diarrhoea was evident only in four rabbits indicating that coccidial infections in the studied rabbits were mainly sub-clinical. This form of infection is associated with reduced weight gains and hence increased slaughter age (Flynn, 1973; Ruprah, 1985). The sub-clinical status of the infection may partly be a reflection of an age-related acquired immunity or involvement of non-pathogenic species or those with low pathogenecity.

The prevalences of the disease varied with age and was highest in weaners and growers and moderate in other age groups. The age-related differences in prevalance have also been observed by others (Lipej, 1985; Sanyal *et al.*, 1986) and is highest in rabbits below 24 month of age with 6 to 7 week old animals being the most affected group (Sanyal *et al.*, 1986; Ruprah, 1985). The low prevalence of the disease in kittens especially below 2 weeks of age is attributed to delayed interest in water and feeds (the main source of the disease). Kittens start developing interest in feeds and water by the 16th day of

life (Ruprah, 1985), thus reducing the chances of early acquisition of infection from the environment (infected pens, feeds and water troughs). In old animals, immunity characterised by low oocyst output is maintained through continous re-infection (Soulsby, 1982) and high outputs are encountered only when the rabbits are exposed to the parasites for the first time (Blood and Radostits, 1989).

The patho-marphological features observed in the intestines of the diarrhoeic rabbits are similar to those observed in cattle infected with highly pathogenic coccidia such as *E. zuernii* and *E. bovis* (Jubb *et al.*, 1985). Thus, the lesions observed in the intestines were partly responsible for the clinical disease evidenced in diarrhoeic rabbits. The duration of a severe form of the disease in cattle infected with highly pathogenic coccidia is about 3-10 days, after which most cases recover spontaneously (Jubb *et al.*, 1985) and become carries of the infection. The decline in the daily oocyst outputs observed in the present study supports the above finding and conforms with the observations of other studies (Charlier *et al.*, 1984; Sanyal *et al.*, 1986; Bai *et al.*, 1985; Gregory and Catchpole, 1986). Sub-clinically infected animals often show minimal or no obvious pathological changes (Cohors (1967).

Although there were no gross lesions in any of the livers of the infected rabbits, foci of bile ductile epithelial proliferation were observed. These lesions have also been reported by Cohors (1967) and are considered to be the initial lesions in hepatic coccidiosis caused by *E. stiedae*. Established lesions appear as soft abcess-like nodules.

In conclusion, despite the observed clinical cases the high prevalence of infection and associated oocyst outputs, call for further studies to evaluate the influence of sub-clinical coccidiosis on the production performance of rabbits. In addition, cost effective analysis of disease control strategies needs to be carried out.

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