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THE PREVALENCE OF CHICKEN COCCIDIOSIS AMONG LOCAL BREEDS IN GEIDAM LOCAL GOVERNMENT AREA OF YOBE STATE, NORTH EASTERN NIGERIA

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Abstract: Faecal samples and intestinal scrapes of local breed of chickens in Geidam were examined microscopically for oocysts, following the flotation technique to determine the rate of infection and common species causing the infection.

Out of the 133 chickens examined, 109 (81.95) were infected by the *Eimeria* species. Eight (8) species of Eimeria were isolated and identified. These isolates include; *Eimeria praecox, Eimeria mitis, Eimeria tenella, Eimeria mivati, Eimeria acervulina, Eimeria necatrix, Eimeria brunette and Eimeria maxima.*

Distribution pattern of the species in the gut regions is uniform. *Eimeria maxima* was found to have the longest sporulation time of approximately 30 hours, while *Eimeria mivati* had the shortest oocyst sporulation time of 12 hours on average. Morphological study of the oocysts shows the presence of micropyle in *Eimeria acervulina* and that of *Eimeria mivati*. The largest oocyst was that of *Eimeria maxima* measuring approximately (29.37 to 35.65 x 23.16 to 26.2um), whereas the oocysts sizes of the other species were similar (16.87 to 27.90 x 15.33 to 22.8um) on average. Oocysts of all the *Eimeria* species identified were ovoid, but the oocyst of *Eimeria mitis* is uniquely rounded.

Keywords: Prevalence, Coccidiosis, Eimeria species, Oocysts, Sporulation time, Mortality, Morbidity.

1.0 Introduction

1.1 Background of the study

Chicken as a meat has been depicted in the Babylonian ages carving from around 600BC. Chicken has been one of the most common meats available in the middle ages. It was eaten over most of the Eastern hemisphere and a number of different kinds of chickens such as caprons, pullets and hens were eaten (Fernando; 1973).

Local chickens are widely distributed in the rural areas of tropical and sub-tropical countries where they are kept by the majority of the rural poor. Local or indigenous chickens in Africa are generally hardy, adaptive to rural environments (such as temperature), surviving on little or no inputs and adjust to fluctuations in feed availability (Challey; 1959).

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Local chicken products are preferred by many mainly because of the pigmentation, taste, leanness and suitability for special dishes.

Chicken eggs and meat are readily available to villagers and people in urban areas, thereby serving as a good source of protein in their diet as well as good source of income.

However, in Geidam, local chickens dominate flock composition and make up of about 98% of the total poultry raised (chickens, ducks and turkey) kept in Geidam local government area (MallumGana; 2015).

Local or indigenous chickens in Geidam and Nigeria as whole are becoming seriously endangered owing to the high rate of genetic erosion resulting from diseases and predation. Thus, one of the most serious and dangerous disease that causes adverse loss to poultry farmers is the coccidiosis. This was in accordance with findings of Journal of Nigeria Association of Veterinary Students (The Veterinary Speculum, 1989).

Coccidiosis is a parasitic disease of domestic animals associated with infection by protozoa belonging the family *Eimeriidae*, a division of the order Coccidia which is a member of the class sporozoa. There are a number of species of coccidiosis and their effects vary from harmless to life threatening.

Coccidia of three genera were recognized as important causative agent of coccidiosis. These are *Eimeria, Isospora and Tyzzeria* (Hammond and Long; 1973, Levine, 1973 and Pellerdy, 1974).

These are distinguished by the characteristics of the sporulated oocysts:

Isospora: 4 sporocysts each containing 4 sporozoites

Eimeria: 4 sporocysts each contains 2 sporozoites

Tyzzeria: 8 free sporozoites

All these are parasites of alimentary tracts of chickens and the regions they invade vary with the species of the parasite. These parasite lack specialized locomotory organelles. Each Coccidian species produces different host parasite interaction (Hammond and Long; 1973)

1.2 Forms Of Coccidiosis

Basically, there are two forms of Coccidiosis; these are the Caecal Coccidiosis and Intestinal Coccidiosis

Caecal Coccidiosis – this is due to Eimeria tenella and infection is usually limited to the caeca, it occur most common in young chickens. Heavy infections are characterized by the presence of blood in droppings, and high morbidity and mortality. Schizonts and free

merozoites can be seen in smears from the caecal mucosa, gametocytes and oocysts may be found during recovery.

Intestinal Coccidiosis- this form of disease may be associated with several species of *Eimeria*. It tends to be more chronic than caecal coccidiosis. It occurs generally in slightly older chickens. Mortality may not be heavy but morbidity may retard growth significantly and reduce egg production as well. Infection with single species is rare. Identification of species responsible for the disease is based on the nature and location of the predominating lesions and careful oocysts examination from fresh smears (Pellerdy, 1974)

1.3 Kinds and Degrees of Coccidiosis

There are many kinds and degrees of Coccidiosis. Non-pathogenic species or extremely light infections of pathogenic species may produce only Coccidiasis, which indicates an absence of clinical or sub-clinical Coccidiosis without detectable economic loss.

In poultry management, Coccidiosis indicates a flock condition in which economic losses are obtained, and is caused by infection of pathogenic species. It occurs in practically all kinds of birds (Fernando and Remmler, 1973; Pellerdy, 1974).

1.4 Seasonal Incidence or Occurrence of Coccidiosis

Unlike the organisms of many other poultry diseases, Coccidia are almost universally found where chickens are being raised. The resistant oocysts are readily transported in live birds, which sometimes remain carriers for long period of time.

The identification of these parasites is by microscopic examination of oocysts in the host's faecal material and intestinal scrapes from various regions of the host's gastro intestinal tract (GIT).

The pathogenicity of the coccidian parasites is also of great interest (Pellerdy; 1974)

1.5 Aim and Objectives ofthe Study

There are no available literatures on the chicken coccidiosis in Yobe State. However, Elizabeth N. Gadzama and Girish. Srivastava (1982/83) worked on the prevalence of intestinal parasites of market chickens in Borno State. But their work gave little attention on *Eimeria*, but much more centralized on helminthes parasites.

As such the aim and objectives of this research includes;

I. To study the various species of Eimeria infecting chickens in Geidam local government area of Yobe State,
II. To study the prevalence or seasonal incidences of the disease coccidiosis and

III. To proffer control strategies to be adapted in the prevention and control of the parasite causing the disease among local breeds in Geidam.

Materials and Methods

3.1 Samples Collection

Faecal samples were collected directly from different parts of intestines of 133 slaughtered chicken into specimen bottles containing diluted formaldehyde solution.

Gastro – intestinal tracts (GIT) from freshly slaughtered chicken were equally collected into clean specimen bottles containing same diluted formaldehyde solution (fixative) to avoid contamination. All these samples were taken to laboratory for oocyst examination and identification.

3.2 Examination of Oocysts

Faecal Sample

The method used for eggs and oocysts examination was the 'Floatation Concentration Technique'. About 3g of faeces was mixed with 50ml of water to make a semi – solid suspension. The resulting suspension was then filtered through a wire mesh of 0.15mm aperture and the filtrate was collected in a clean beaker.

The filtrate was then mixed thoroughly to ensure uniform suspension of the faecal matter and then followed by microscopic examination of oocysts.

3.3 Gastrointestinal tracts samples (GIT)

Intestinal scrapes were also collected from various parts of the intestines (Rectum, Caeca, Lower intestine, mid intestine and Upper intestine) of freshly slaughtered chickens into clean petri dishes, then the samples were examined microscopically for the presence of oocysts.

3.4 Oocysts Identification

The main characteristics used for identifying different species of the coocidian oocysts were; sizes and shape of the oocysts and sporocysts, distinctness of the micropyle, thickness of the oocysts wall and presence or absence of residual bodies in an oocysts or sporocysts.

3.5 Oocysts size measurement

An object micrometer and eye piece micrometer (eye piece and stage graticule) were used in measuring the sizes of the oocysts.

3.6 Sporulation of Oocysts

One of the methods used to differentiate species of coccidian oocysts was the sporulation of the oocysts.

Cultures of faecal samples were prepared and examined daily for complete sporulation. Sporozoites formation within sporocysts marks sporulation and the technique used to induce sporozoite formation is referred to as sporulation.

Images of the oocysts were produced using BMS C – mount camera.

Data analysis

Data were subjected to analysis of variance (ANOVA) and means separated by least significance difference (LSD) at 5% probability level, using SPSS 2009.

Presentation of Results

During this study 133 local breed of chickens in Geidam were examined, out of which 109 (81.95%) were found to be positive for coccidiosis.

Table 1 shows the positivity of different parts of the intestinal tracts of the chickens for coccidiosis.

The highest rate of infection occurred in the lower intestine (24.93%) while the lowest rate occurred in the rectum (14.56%). However, there was no significance difference between *Eimeria* positivity rates of the different parts of the intestine tracts

Eight (8) *Eimeria species* were identified from the different regions of the intestinal tracts of the chickens. The percentage occurrence of the different *Eimeria species* in local breed of domesticated poultry in Geidam is shown in table 2.

Table 3 shows the average numbers of different *Eimeria* oocysts isolated from different intestinal regions of the chickens examined. Some oocysts examined found in 3 regions were those of *Eimeria acervulina, Eimeria necatrix, Eimeria mitis and Eimeria brunette* while oocysts of *Eimeria tenella, Eimeria maxima* and *Eimeria praecox* occurred in two (2) regions of the gut. Only *Eimeria mivati* occurred in all the gut regions except middle intestine of the gut.

Table 4 shows the distribution pattern of *Eimeria species* from different sections of the intestinal tracts of domesticated poultry in Geidam.

Five (5) *Eimeria species* were isolated from both middle and lower intestines while the other three (3) had four (4) species each. Although the species combinations were different in different parts of the gut, the number of species showed little or no variation.

Table (5) illustrates the data obtained on morphological and morphometric details of *Eimeria species* of the chickens. The *Eimeria species* listed according to decreasing order of their oocysts sizes were as follows: *Eimeria maxima, Eimeria brunette, Eimeria praecox, Eimeria tenella, Eimeria mitis, Eimeria necatrix, Eimeria acervulina* and *Eimeria mivati.*

The longest sporulation time occurred in *Eimeria maxima (*30 hrs. on average) while the shortest sporulation time occurred in *Eimeria mivati* (12 hrs. on average). The rest of the *Eimeria species* have similar sporulation time of approximately 18 hrs. However, *Eimeria praecox* and *Eimeria acervulina* have approximate sporulation time of 16 and 17 hours respectively.

Table 1: POSITIVITY OF DIFFERENT PARTS OF THE INTESTINAL TRACTS OF CHICKENS FOR COCCIDIOSIS IN GEIDAM, NORTH EASTERN NIGERIA

Gut Regions Parasitized	Number of Oocysts observed	Percentage number positive (%)
Upper Intestine	74	20.73
Middle Intestine	78	21.85
Lower Intestine	89	24.93
Caeca	64	17.93
Rectum	52	14.56
TOTAL	357	100

Table 2: PERCENTAGE OCCURRENCE OF DIFFERENT EIMERIA SPECIES IN LOCAL BREED OF DOMESTICATED POULTRY IN GEIDAM, NORTH EASTERN, NIGERIA

Eimeria Species	Total number of oocysts isolated	Percentage (%)
Eimeria acervulina	12	16.22
Eimeria maxima	14	18.92
Eimeria necatrix	8	10.81
Eimeria mivati	7	9.46
Eimeria mitis	5	6.76
Eimeria praecox	3	4.05
Eimeria tenella	13	17.57
Eimeria brunette	12	16.21
TOTAL	74	100.00

Table 3: NUMBER OF DIFFERENT EIMERIA OOCYSTS ISOLATED FROM DIFFERENT GUT REGIONS OF DOMESTICATED POULTRY IN GEIDAM, NORTH EASTRN NIGERIA

Gut Regions Examined	*Eimeria acervulina*	*Eimeria tenella*	*Eimeria necatrix*	*Eimeria maxima*	*Eimeria praecox*	*Eimeri a mitis*	*Eimeria brunette*	*Eimeria mivati*
Upper Intestine	7	-	-	-	2	2	-	2
Middle Intestine	2	-	3	10	1	-	2	-
Lower Intestine	3	-	-	4	-	1	6	1
Caeca	-	9	4	-	-	2	-	2
Rectum	-	4	1	-	-	-	4	2
TOTAL	12	13	8	14	3	5	12	7

Table 4: DISTRIBUTION PATTERN OF EIMERIA SPECIES FROM DIFFERENT SECTIONS OF THE INTESTINAL TRACTS OF DOMESTICATED POULTRY IN GEIDAM, NORTH ESTERN NIGERIA

Intestinal Regions	Number Oocysts Isolated	Percentage (%)
Upper Intestine	4	18.20
Middle Intestine	5	22.70
Lower Intestine	5	22.70
Caeca	4	18.20
Rectum	4	18.20
TOTAL	22	100

Discussion

The local breed of poultry in Geidam is mainly raised as a free range system. This management practice exposes the chickens to various degrees of infectious agents including Coccidia (Eimeria species). This probably explains the extremely high rate of infection of chickens by Eimeria species.

However, unrestricted movement of chickens in the free range system allow high encounter of the chickens with oocysts leading to high transmission of infection. Under these

circumstances contact between infected and non-infected chickens will be high leading to infection because infection begins when chicken ingest matured viable sporulated oocysts in food or drink. Ingestion of unsporulated oocysts does not cause infection because oocysts do not develop further in the gut until passed outside the host. Here, the specific environmental conditions permit sporulation (Hammond and Long 1973; Levine 1973 and Pellerdy 1974).

There is no available literature on the prevalence of coccidiosis in Yobe State. Although diagnosis of coccidiosis has been made routinely at the veterinary clinic of University of Maiduguri and the Federal Diagnostic Laboratory in Maiduguri, these investigations have been based on pathological lesions observed in the gut and the location of the lesions.

This is the first study that has attempted to identify and document the various species of Eimeria responsible for coccidiosis in local breed of chickens.

However, the present study extends the investigation and provided information on the distribution, positivity, oocyst morphology, oocyst sizes as well as sporulation time of different oocysts of Eimeria species.

The data provided in this report is useful for identification of the Eimeria species infecting local breed of chickens in Geidam area.

It is obvious from the present data that some *Eimeria* species occur most frequently in certain parts of the gut. However, the conditions which determine the distribution of these *Eimeria* species in the various parts of the gut which perhaps may include pH, carbon dioxide, temperatures and enzyme systems of the various gut regions have not been investigated during this work.

In terms of number of species, there are no significant differences between the numbers of species found in the different regions of the gut even though the species composition differed from one region to another as compared to the findings of Hammond and Long; 1973.

The longest sporulation time (30hrs on average) was found in oocyst of *Eimeria maxima,* while the shortest sporulation time (12hrs on average) was found in the oocyst of *Eimeria mivati.*

Eimeria brunette, Eimeria mitis, Eimeria necatrix and Eimeria tenella have the same average sporulation time of 18 hours. *Eimeria acervulina and Eimeria praecox* has an average sporulation time of 17 and 16 hours respectively. This was similar to the findings of Hammond and Long; 1973, Levine; 1973 and Pellerdy; 1974.

It is possible to differentiate the species of *Eimeria maxima* and *Eimeria mivati* from the rest of the species based on the mean sporulation time. However, the other species with the same

sporulation time cannot be differentiated on this basis. It is equally possible to identify oocysts of *Eimeria maxima* base on their relatively large size (Hammond and Long; 1973, Levine; 1973 and Pellerdy; 1974.)

The morphological study of the oocysts also shows the possibility of identifying two (2) species; *Eimeria acervulina* and *Eimeria mivati* by the presence of micropyle while the rest have no micropyle.

Furthermore, the oocysts of *Eimeria mitis* are uniquely rounded, while those of the other *Eimeria species* are ovoid. Gross lesions observed in the gut were mostly haemorrhage, mucous exudate, watery faeces and ballooning. In some cases, no lesions were observed.

These information could be useful in diagnosis of *Eimeria* infection, in addition to microscopic examination for the presence or absence of oocysts.

Conclusion and Recommendation

The control of chicken coccidiosis involves good management practices. Here, in Yobe State, poultry men of repute may rank coccidiosis as one of the top threats to his flock. But despite its worldwide recognition and availability of proven drugs management practices to keep it (coccidiosis) in check, this disease still costs poultry men a fortune yearly in weight loss, poor feed utilization and even death.

Factors, which determine the distribution of the Eimeria species in this study such as pH, temperature, carbon dioxide, and enzyme systems, have not been investigated. Thus, there is need for further research in this subject area.

Likewise, the mechanisms of the infection by this parasites including possible action of enzymes on oocysts wall that may lead to liberation of sporozoites inside their host chickens need further investigation. Also, the mechanisms of binding of the sporozoites to cells leading to invasion need to be studied for possible interference with this crucial step in the infection process.

Examined chickens in this work were obtained from Geidam market, therefore, the precise source of the chickens from different wards or nearby villages of Geidam were not known; as such the most predominant *Eimeria species* in Geidam in a particular ward or village remain unknown.

Immune status of the studied chickens was not investigated in this work, but literature has it that day – old chicks are susceptible to coccidiosis but may be partially protected by parental immunity and dosage of single or very few oocysts to chickens for a period of say 10 – 12

days may induce strong immunity (Levine 1973; Pellerdy 1974). There is need to investigate the infection rates among breeds obtained from crossing local breed and improved breeds.

All the examined chickens were of breed reared under free range system. This is associated with intense exposure to infection.

Acknowledgement

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Appendix

Fig 1: DATA ON THE MORPHOLOGICAL AND MORPHOMETRIC DETAILS OF *EIMERIA* SPECIES OF LOCAL BREED OF DOMESTICATED POULTRY IN GEIDAM, NORTH EASTERN NIGERIA

Eimeria spp.	Oocysts size mean (range) = L X B	Sporulation time, mean (range) in hours	Characteristic morphology of unsporulated oocysts
Eimeria maxima	31.6 x 24.57 (29.37-35.65x23.16-26.25)	30(28 – 31)	Ovoid, no micropyle, thick wall and brownish
Eimeria brunette	24.9 x 19.07 (22.9-27.08x17.8-20.8)	18(17 – 19)	Ovoid, no micropyle, thin wall, smooth and brown yellow
Eimeria praecox	23.25x21.36 (20-25x18-22.5)	16(14 – 16)	Ovoid, no micropyle, thin wall, smooth and brown
Eimeria tenella	22.8x18.8 (21.75-24.38x16.25-19.38)	18(17 - 19)	Ovoid, no micropyle, thin wall, smooth, brown-yellow
Eimeria necatrix	20.7x17.5 (20.4-23x16.8-18.75)	18(17 – 19)	Ovoid, no micropyle, thin wall, smooth and brown
Eimeria mitis	20.54x17.17 (17.75-20x16.3-18)	18(18 – 19)	Round, no micropyle, thin wall, brown
Eimeria acervulina	20.28x17.30 (19.25-23.25x16.66-18.30)	17(17 – 18)	Ovoid, visible micropyle, thin wall, yellow-brown
Eimeria mivati	17.11x15.33 (16.87-17.25x15.25-15.50)	12(11 – 12)	Broadly ovoid, thick wall, presence of micropyle, brown - yellow

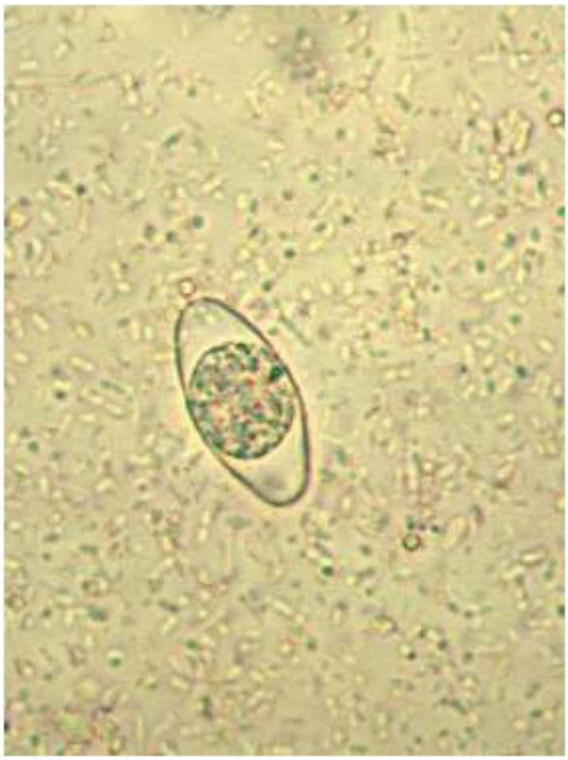

Fig. 2 Image of oocyst showing residual bodies obtained using C-Mount Camera

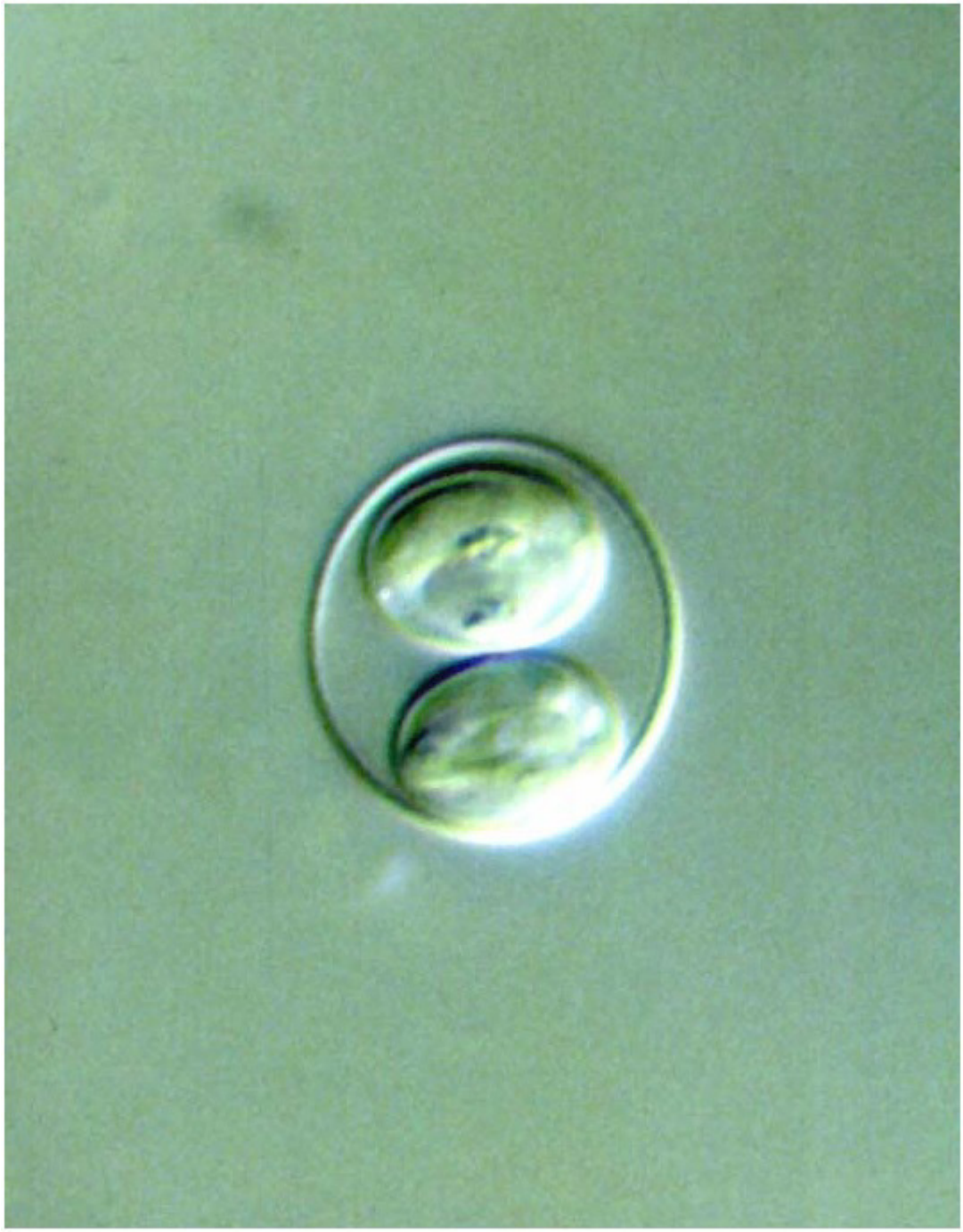

Fig. 3 Image of an oocyst showing sporozoites obtained using C-Mount Camera

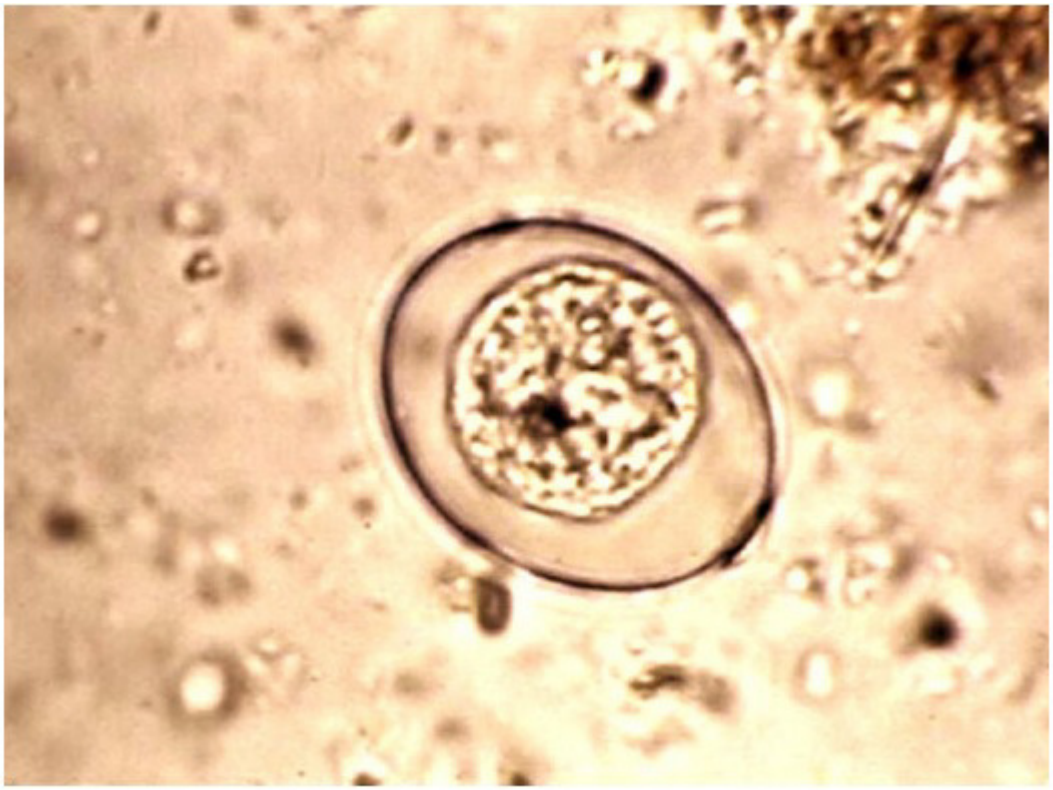

Fig. 4 Image of oocyst showing residual bodies obtained using C-Mount Camera

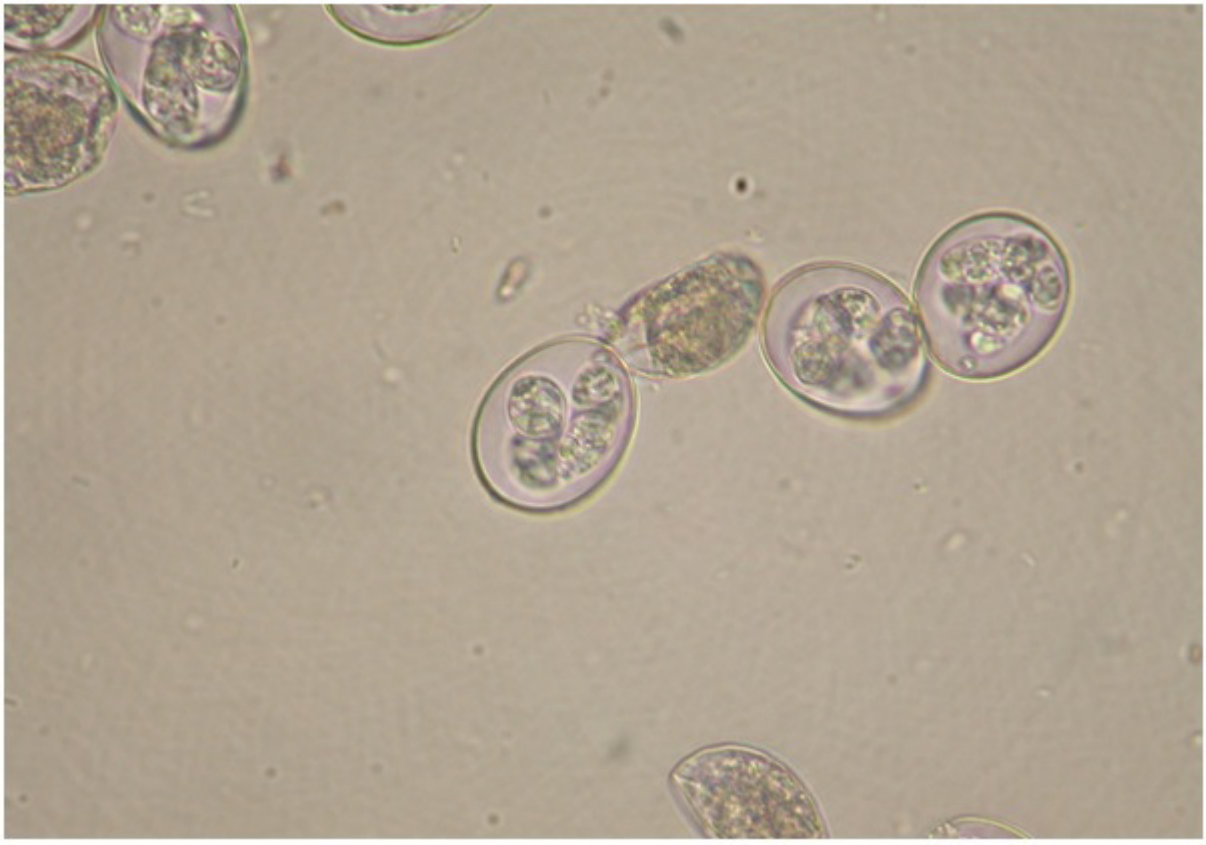

Fig. 5. Micrograph of *Eimeria* oocysts examined

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