PREVALENCE AND INTENSITY OF COCCIDIOSIS IN ADULT AND WEANING DOMESTIC RABBITS UNDER INTENSIVE SYSTEM

PROJECT REPORT SUBMITTED TO THE UNIVERSITY OF NAIROBI IN PARTIAL FULLFILMENT OF BACHELORS DEGREE IN VETERINARY MEDICINE (BVM)

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J30/2073/2010

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Date of submission …. /….. / 2015.

DECLARATION

This report is my original work and has not been presented for a degree in any university.

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SUPERVISOR: DR. PAUL OKUMU

Signature …… Date….....

DEDICATION

This work is dedicated to my parents Rebbeca Wanjiru and Richard Mwangi and to all my family members not forgetting my friends!

ACKNOWLEDGEMENT

I sincerely thank my supervisor Dr. Okumu Paul for his guidance and encouragement from the development of the project proposal, through my project and eventual preparation of this report.

Am also grateful to the Department of Pathology, Microbiology and Parasitology and Department of Animal Production University of Nairobi for all the assistance accorded.

All glory to God for sailing me through all my education.!

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OPG; Oocyst Per Gram of faeces

ABSTRACT

Coccidiosis is a highly contagious disease caused by *Eimeria* species through ingestion. This disease has been detected in domestic rabbits and has been a cause of high mortalities. It presents as intestinal form or hepatic form.

The study was conducted to determine the *Eimeria* oocyst load (OPG) in healthy weaner and adult rabbits under intensive system with no previous treatment.50 Fresh fecal samples were collected and analyzed.30 samples from adult rabbits and 20 from weaner rabbits of different ages. The main breeds used in the study were California White and Newzealand White. The samples were then processed by floatation method and *Eimeria* OPG counted using the MacMster Technique.

Data was then entered and analyzed using Excel for descriptive statistics and then presented using tables and bar graphs.

The study indicated that *Eimeria* oocyst are a normal finding in rabbit fecal samples, the oocyst load increases with increase in age and adult rabbits can tolerate high levels of *Eimeria* OPG (average of 600 OPG) as compared to weaners (average of 300 OPG). No clinical signs presented within these ranges of OPG. Proper hygiene was also noted to lower the *Eimeria* OPG levels.

This study however, suggested that weaning should not be done earlier than 6 weeks of age and proper hygiene should be practiced to reduce the rate of infection. This will reduce morbidity and mortality rate and therefore lowers the cost of production. Prophylactic treatment may also be considered if *Eimeria* OPG levels exceeds above ranges and is accompanied by a clinical sign.

CHAPTER ONE

1.0 INTRODUCTION

Coccidiosis is a parasitic disease of many animals, including cattle, swine, sheep, dogs, cats, and poultry, but rarely of humans, resulting from infestation of the alimentary canal by protozoans of the order Coccidia or any intestinal infection of birds and domestic animals that is caused by a parasitic sporozoan of the order Coccidia (Mifflin,.2000.)

Coccidiosis in rabbits

Coccidiosis is a highly contagious sporozoal infection in rabbits. It is caused by *Eimeria* species, protozoa parasites that are microscopic, one-celled organisms. Twelve species of the family *Eimeria* have been reported to affect rabbits, however, only a few actually create disease. *Eimeria* spp. invade the epithelial cells of the intestinal wall and cells lining certain ducts within the rabbit. Each species is highly host, organ and tissue specific, and the species that affect rabbits are rarely a zoonotic danger to humans. (Halls, 2005)

Coccidiosis is responsible for high incidences of morbidity and mortality making farmers to incur a lot of losses and hence increasing the cost of production as reported by Coudert et al. (1995), lowers the health of rabbits by suppressing immunity and therefore predisposing the animal to other infections, Condemnation of affected livers in cases of hepatic coccidiosis

1.1 Rabbit Coccidiosis in Kenya

A number of studies have been done in Kenya to determine the prevalence of *Eimeria* species in domestic rabbits. In a study done by Okumu *et al*. (2014) revealed ubiquitous infection of domestic rabbits with coccidian parasites with overall prevalence of *Eimeria* spp. infestation was 85.1% in the study area and 90.2% in the individual rabbits. The prevalence was higher than

reported by Aleri *et al.* (2012) in Kenya and Jithendran and Bhat., (1996) in India. Both clinical and subclinical coccidiosis occur in domestic rabbits in Kenya and are major causes of diarrhea and death (Rashwan and Marai 2010; Rosell *et al. (*2010). Moreover mixed infection with more than one *Eimeria* species is also common (Jithendran and Bhat 1996).

1.2 HYPOTHESIS

- *Eimeria* oocysts are normal flora in healthy adult and weaner rabbits
- Adult rabbits has a high *Eimeria* oocyst load than in weaner rabbits

1.3 GENERAL OBJECTIVE

To improve rabbit production through management of coccidia infection

1.3.1 SPECIFIC OBJECTIVES

I. To determine the *Eimeria* oocysts per gram of faeces (OPG) in healthy adult and weaner rabbits

II. To determine trends of *Eimeria* oocysts excretion in weaning and adult rabbits

1.4 JUSTIFICATION

In recent years rabbit rearing in Kenya has been gaining popularity. This has been attributed to their short kidding intervals, low production costs and cheap source of protein. Rabbits are reared in both intensive systems and also in small scale both in rural and peri-urban areas. Both clinical and subclinical coccidiosis occur in domestic rabbits in Kenya, Rosell et al. (2010).This has been a major hinderance to domestic rabbit production due to high mortalities.

This study aims to determine the intensity of *Eimeria* infection in healthy domestic rabbits of various ages. In this regard the findings of this study will inform the farmer, animal health service providers on the best time and level of infection to initiate medical treatment in these rabbits. This will help in reducing mortality and hence reduction in costs of production.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Aetiology

Coccidian species causing Coccidiosis in rabbits can be grouped into three; these are non-pathogenic to slightly pathogenic coccidia (*Eimeria media, Eimeria exigua, Eimeria perforans, Eimeria coecicola),* moderately pathogenic *(Eimeria irresidua, Eimeria magna, Eimeria piriformis)* and very pathogenic coccidia *(Eimeria intestinalis, Eimeria flavescens).* Hepatic coccidiosis is caused by *Eimeria stiedae* (Coudert *et al*. (1985).

2.2 Predisposing factors

A study done established that, group housing of rabbits of different ages and inadequate control of concurrent infections are the likely risk factors associated with coccidiosis in domestic rabbits in Kenya (Okumu *et al* (2014), Age: Healthy young rabbits are more susceptible to disease than older rabbits, but if a concurrent illness is present, if antibiotics have been given for a long period of time, or when exposed to a large coccidia burden then disease may also occur in adults. Hepatic disease can affect rabbits of any age (Fraser, 1986).

2.3 Types of coccidiosis in rabbits

Coccidiosis in rabbits presents in two forms; Hepatic coccidiosis or Intestinal coccidiosis.

2.3.1 (a) Hepatic coccidiosis

This is caused by *Eimeria stiedae* which parasitizes the liver. Transmission is by ingestion of sporulated oocysts. Severity depends on the number of oocysts ingested, young animals being the most susceptible. May occur only as sudden death in acute cases, but more likely appears as

stunted growth, anorexia and weight loss, diarrhea and abdominal pain. Depression and general malaise is also seen (Jacobs, 2007).

At necropsy, small, yellowish white nodules are found throughout the hepatic parenchyma. In the early stages, they may be sharply demarcated, while in the later stages they coalesce. The early lesions have a milky content; older lesions may have a more cheese-like consistency. Microscopically, the nodules are composed of hypertrophied bile ducts or gallbladder.

Diagnosis of this form of coccidiosis is by: gross and microscopic changes, along with demonstration of the oocysts in the bile ducts. An impression smear of a lesion in the liver examined under light microscopy often reveals oocysts. The oocysts may also be demonstrated by fecal flotation (Fraser, 1986).

Treatment is difficult, and control rather than cure is expected. Sulfaquinoxaline administered continuously in the drinking water (0.04% for 30 days) prevents clinical signs of hepatic coccidiosis in rabbits heavily exposed to *Emeria stiedae* (Fraser, 1986).

2.3.1 (b) Intestinal coccidiosis

Intestinal coccidiosis is caused by *E magna, E irresidua, E media, E perforans, E flavescens, E intestinalis, or other Eimeria spp*. Transmission of intestinal forms is by ingestion of the sporulated oocysts (Fraser, 1986).The intestinal form of coccidiosis mainly affects youngsters from the age of 6 weeks to 5 months and is attributed to stress, noise, transport or immunosuppression. It is mainly observed in young newly weaned rabbits, but is also found in older rabbits.

Symptoms are a rough coat, dullness, decreased appetite, dehydration, loss of weight and (profuse) diarrhea, 4 to 6 days post-infection. If the loss of weight reaches 20%, death follows within 24 hours. It is preceded by convulsion or paralysis. During necropsy, inflammation and

edema are found in the ileum and the jejunum portions of the intestine. It is sometimes accompanied by bleedings and mucosal ulcerations. (*Esther van Praag, 2013)*

Every coccidium has a preferential place to develop where it causes a reaction of the intestinal epithelium varying in visibility according to the bacterial species. The duodenum and the jejunum are parasitized by *E. perforans*, *E. media* and *E. irresidua.* The latter species is the only one which, at high concentrations, causes macroscopic lesions visible at autopsy. *E. magna, E. vejdovskyi* and *E. intestinalis* multiply in the ileum. *E. intestinalis* causes the most spectacular macroscopic lesions. The ileum becomes bruised and whitens; segmentation appears very clearly, especially in the part nearest the caecum. The appearance of the lesions is the same with high concentrations of *E. magna.* The caecum is the domain of *E. flavescens,* which at medium dose levels produces lesions on the colon. The caecum wall thickens and changes appearance according to whether there is microbial infection or not. It may look whitish in heavy infestations with no complications, but very frequently reddish striations, necrotic plaques or generalized congestion appear. The most constant factor is the emptiness of the caecum. Lesions can be caused in the colon by *E. flavescens* (FAO, 2013).

Intestinal coccidiosis is generally diagnosed by fecal flotation and microscopic identification of the *Eimeria* oocysts (Fraser, 1986).

Treatment is similar to that for hepatic coccidiosis except that sulfaquin-oxaline is given for 7 days and repeated after a 7-day interval (Fraser, 1986).

CHAPTER THREE

3.0 MATERIALS AND METHODS

3.1 Study area and experimental animals

Clinically healthy domestic rabbits kept under intensive system with no previous treatment were used for the study. The rabbits were kept in the rabbitry unit in the Department of Animal Production of the University of Nairobi. These rabbits consisted of purebreds of California White and Newzealand White with proper breeding and health records. These rabbits were kept in individual cages and also in grouped cages which also represents the common housing methods in Kenya. The rabbits used in the study were grouped into two weaner groups (6 and 8 weeks of age) and 8 and 10 weeks of age and adults (more than 10 weeks). The groups consisted of 15 healthy adult rabbits in individual cages and 10 healthy weaner rabbits in each cage.

3.2 Determination of the *Eimeria* OPG

Fresh fecal samples were collected below the cages at an interval of 2 weeks. Fecal samples were then processed using the MacMaster Technique as described by (Soulsby, 2005) to determine the oocyst per gram of faeces (OPG). The following materials were used during the process:

Floatation fluid (10% sodium chloride solution) , Plastic containers, Tea strainer, Measuring cylinder, Spatula, Mac Master counting chamber, Microscope, Pasteur pipette

Mac Master Procedure; 2gms of fecal sample placed in container 1, Measure 28mls of sodium chloride solution, To the 2gms of fecal sample add sodium chloride solution, Stir thoroughly the contents with a spatula, Filter the fecal suspension through a tea strainer, Allow the filtrate to settle, Take a sample with pipette and fill both sides of MacMaster counting chamber, Examine

under microscope at X10 and then X40, Count all coccidian oocysts in both chambers, To get total number of oocysts add the two totals in the two chambers and multiply by 50

3.3 Data analysis and presentation

The data was entered in excel and analysed for descriptive statistics including the mean of OPG in various age groups. Data was then presented in bar graphs and line graphs.

CHAPTER FOUR

4.0 RESULTS

The following results of *Eimeria* oocyst excretion (OPG) in rabbits were obtained. The rabbits used were grouped into 5 weaners at 6 weeks of age and 5 weaners at 10 weeks of age and 15 adults above 10 weeks of age. The breeds collected from were Newzealand White and California White each housed in a separate cage. A total of 50 fecal samples were analyzed for *Eimeria* oocyst load (OPG); 20 samples from healthy weaners rabbits and 30 from healthy adults collected at an interval of 2 weeks.

Eimeria OPG of weaners at 6 and 8 weeks of age was as shown in table1. At 8 weeks of age the *Eimeria* oocysts started to appear in fecal material of these weaners.

Table1. Fecal OPG in rabbits at 6 and 8 weeks of age.

WEANERS	6WEEKS OLD				
Rabbit identity	1	2	3	4	5
Eimeria OPG at **6wks of age**	0	0	0	0	0
Eimeria OPG at **8wks of age(after 2 wks)**	0	100	0	0	200
Average *Eimeria* oocyst load	0	50	0	0	100

In the following table, the average oocyst load at 8 and 10 weeks of age increased significantly from 0 to 300. This showed that *Eimeria* OPG was increasing with age.

Table2.Average OPG in weaner rabbits at 8 and 10 weeks of age.

WEANERS	8WEEKS OLD				
Rabbit identity	1	2	3	4	5
Eimeria OPG at **8 wks of age**	100	0	100	0	200
Eimeria OPG at **10 wks of age(after 2 weeks)**	300	0	300	100	400
Average Eimeria oocyst load	**200**	**0**	**200**	**50**	**300**

Figure 1 below shows the trend of oocyst excretion in weaning rabbits at 8 and 10 weeks of age. It shows a raising trend as they advanced in age.

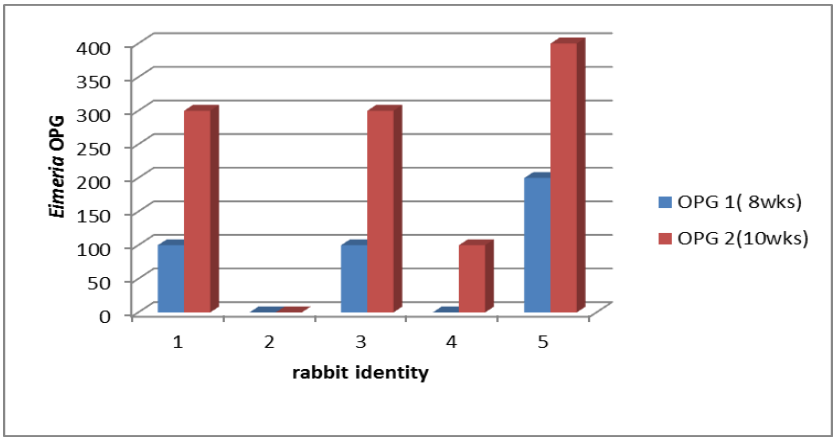

Figure1. OPG in weaner rabbits at 8 and 10 weeks of age

The average oocyst load in adult rabbits is shown in table 3. The averages are higher in adults than in weaners as shown in table 2.

Table3.Average OPG in adult (more than 10 weeks of age) rabbits

ADULTS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sample 1(*Eimeria* OPG)	0	0	0	100	0	400	300	100	0	0	0	0	0	0	0
Sample 2(*Eimeria* OPG after 2weeks)	200	1000	0	200	0	800	700	600	0	0	0	200	100	100	0
Average *E. oocyst* load	**100**	**500**	**0**	**150**	**0**	**600**	**500**	**350**	**0**	**0**	**0**	**100**	**50**	**50**	**0**

As adults continue to advance in age, the intensity of *Eimeria* increases as shown in figure 2. The levels went high significantly from 0 to a 1000.

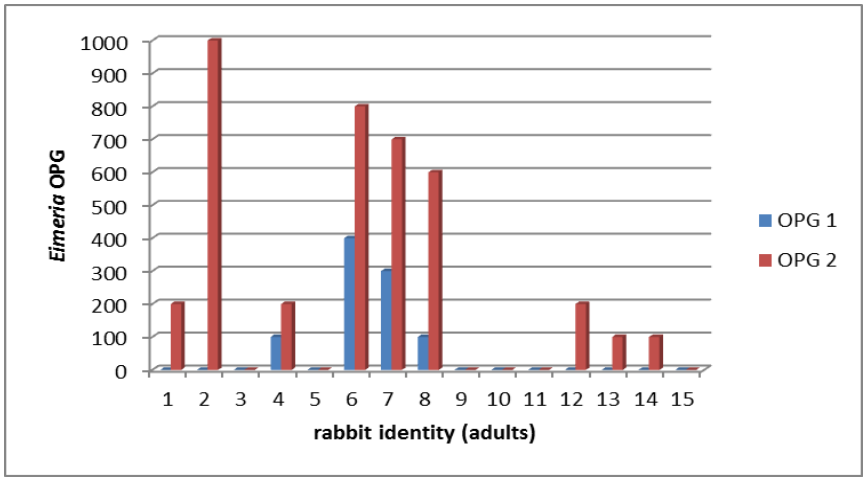

Figure 2. Coccidia oocyst excretion in adult rabbits at 2 weeks interval

CHAPTER FIVE

5.0 DISCUSSION

Weaner rabbits at 6 and 8 weeks of age

In this study, fecal analysis showed no *Eimeria* oocyst load in weaner rabbits 6 weeks of age. However, at 8 weeks of age less than 200 *Eimeria* oocysts were recoverd.

In another group of weaners, at 8 weeks of age the number of *Eimeria* OPG was still less than 200 while at 10 weeks of age *Eimeria* OPG increased significantly with OPG less than 400.

From the two groups of weaners, it was found that the number of oocyst load (OPG) increased with increase in age ranging from 0 at 6weeks to 400 at 10 weeks of age. This could be due to; first, high immunity from maternal antibodies at 6 weeks of age compared to lowered maternal immunity at 8 weeks of age. It is reported that suckling rabbits cannot be infested by coccidiosis prior to three-week of age. (Pakandl and Hlásková, 2007).

Secondly, increased time of exposure to the environment. Hygiene of one cage varying to that of another, could have led to some rabbits having higher load of oocyst as compared to others, rabbits housed in poor environmental sanitation and poor hygienic practices has high levels of oocysts. (González-Redondo et al. 2008)

From the two groups of weaners, no clinical sign of sickness was seen.

Adult rabbits

From the study, the second fecal *Eimeria* oocyst excretion significantly differed with the first fecal *Eimeria* oocyst excretion collected from the previous 2 weeks. The OPG ranged from 0 to a 1000. Within this range no clinical signs of illness were exhibited. Adult rabbits are highly immune to infections than in weaner rabbits. However , stress factors such noise, transport and mishandling of the rabbits increases their chances to come down with infection. Proper hygiene was however noted to reduce the *Eimeria* oocyst load. In a study done by Coudert et al., (2000) concluded that, a fair control of hygienic conditions is sufficient to maintain a low level of coccidia.

From the above results, it can also be noted that, adult rabbits remain carriers and spread the infection to weaners. Coudert et al., (2000) reported that, adult rabbits which are usually symptomless carriers of coccidial infestation, serve as potential source of severe infestation for younger ones, especially after weaning.

From the study it was also observed that there was no breed predisposition to coccidiosis in the two breeds (California White and Newzealand White) used during the study.

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

Conclusion

Results show that:

- *Eimeria* oocysts are a normal finding in rabbit fecal samples
- Oocyst load increases with increase in age
- Adult rabbits are able to tolerate higher levels of *Eimeria* OPG than weaning rabbits
- Proper hygiene in cages helps reduce the levels of *Eimeria* load in rabbits
- Presence of *Eimeria* oocysts in fecal sample does not always mean it is a clinical case warranting treatment.

Recommendations

This study therefore recommends:

- More studies at higher and very low hygienic conditions in rabbitry
- Weaning time not to be earlier than 6 weeks of age
- Proper hygiene as a control measure of coccidiosis
- Prophylactic treatment if the OPG levels exceeds the ranges shown above and is accompanied by a clinical sign.

REFERENCES

Aleri JW, Abuom TO, Kitaa JM, Kipyegon AN, Mulei CM. (2012). Clinical presentation, 60:149_152.

Coudert P, Licois D, Drouet-Viard F. (1995). Eimeria species and strains of rabbits. Biotechnology: guidelines on techniques in coccidiosis research, Part. I: Eimeria and Isospora. Office for official publications of the European communities: Luxembourg; pg. 52_73

Coudert, P; Licois, D.; Drouet-Viard, F. Coccidiosis. In: Rosell J.M (2000). Enfermedades del conejo. Madrid: Mundi-Prensa, 2000. v.II, p.219-234.

Esther van Praag, Ph.D, (2013) Protozoal enteritis: Coccidiosis 2013 medirabbit.com http://www.medirabbit.com/EN/GI_diseases/Protozoal_diseases/Cocc_en.htm

Fraser, Clarence (1986). The Merck veterinary manual. Edition 6. Merck & Co, 1986

Fox, M and Jacobs, D. (2007) Parasitology Study Guide Part 1: Ecto-parasites Royal Veterinary College

González-Redondo P, Finzi A, Negretti P, Micci M. (2008). Incidence of coccidiosis in different rabbit keeping systems. Arquivo Brasileiro de Medicina Veterinaria e Zootecnia. 60:1267–1270.

Hanks, Patrick. Stephen J. Perrault (2009). Merriam-Webster's Advanced Learner's English

Dictionary. *International Journal of Lexicography* 22.3 (2009): 301-315.

Halls, Amy E (2005). "Enteric Diseases in Rabbits." 2005, http://www.nutrecocanada.com/docs/shur-gain---specialty/enteric-diseases-in-rabbits.pdf

Jithendran KP, Bhat T. (1996). Subclinical coccidiosis in angora rabbits, a field survey in Himachal Pradesh, India. World Rabbit Science. 4:29_32.

Lebas, F., Coudert, P., De Rochambeau, H., & Thébault, R. G. (1997). The Rabbit Husbandry. Health and Production. FAO Animal Production and Health Series No. 21, Rome, Italy.

Houghton_Mifflin_Harcourt (2000). The American heritage dictionary of the English language. 5th edition. http://en.wikipedia.org/wiki/

Martel, J. L., and M. Coudert (1993). "Bacterial resistance monitoring in animals: the French national experiences of surveillance schemes." *Veterinary microbiology* 35.3 (1993): 321-338.

Okumu, P. O., Gathumbi, P. K., Karanja, D. N., Mande, J. D., Wanyoike, M. M., Gachuiri, C. K., ... & Borter, D. K. (2014). Prevalence, pathology and risk factors for coccidiosis in domestic rabbits (*Oryctolagus cuniculus*) in selected regions in Kenya. *Veterinary Quarterly*, (just-accepted), 1-18.

Pakandl M, Hlásková L, Poplštein M, Chromá V, Vodička T, Salát J, Mucksová J. (2008). Dependence of the immune response to coccidiosis on the age of rabbit suckling. Parasitol Res. 103:1265–1271

Rashwan AA, Marai IFM. (2000). Mortality in young rabbits: a review. World Rabbit Science. 8:111_124

Rosell JM, de la Fuente LF, Badiola JI, Fernández de Luco D, Casal J, Saco M. (2010). Study of urgent visits to commercial rabbit farms in Spain and Portugal during 1997–2007. World Rabbit Science. 17:101–127.

Soulsby EJL. (2005). Helminthes, arthropods and protozoa of domesticated animals. 7th edition. Baillure Tindal: The English Language Book Society.