



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

Sudan University of Science and Technology

College of Graduate Studies



Study of Coccidiosis in Quial in Khartoum State-Sudan

دراسة مرض الكوكسيديا في طائر السمان بولاية الخرطوم – السودان

By

Suzan Omer Mohammed Alameen

B.V. Sc College of veterinary Science

University Of Bahri (2013)

**A thesis submitted to the College of Graduate Studies in partial Fulfillment of
the Requirement for the Degree of Master in Preventive Veterinary Medicine
(MPVM)**

Supervisor:

Dr: Iman Mohammed EL Nasri Hamza

October, 2017

الآية

(وَأَنْزَلْنَا عَلَيْهِمُ الْمَنَّانَ وَالسَّلْوى كُلُوا مِنْ طَيِّبَاتِ مَا رَزَقْنَاكُمْ وَمَا ظَلَمُونَا وَلَكِنْ كَانُوا أَنْفُسَهُمْ يَظْلِمُونَ)

سورة الأعراف / 160

صدق الله العظيم

DEDICATION

To my father

To my darling mother, sisters and my brother

To my husband who always support me

With respect and love

Acknowledgments

First of all thanks to Allah who gave me the strength and ability to complete this work. I deeply indebted to my supervisor Dr Iman ELnasri for her keen interest ,advice, help and encouragement.

I would like to thank the researchers and all the technical staff members of the department of Avian Pathology and Diagnosis

Special thanks are Extended to the Staff of the faculty of Veterinary medicine Sudan university of science and technology and director of the Central Veterinary Research laboratories (CVRLC) for their help and support.

Finally , I wish to express my thanks to all my colleagues .

Table of content

No	Subjects	Page
	الآية	I
	Dedication	Ii
	Acknowledgement	Iii
	Contents	Iv
	List of tables	Vii
	List of figures	Viii
	Abstract	Ix
	Arabic Abstract	X
	Introduction	1
	CHAPTER ONE :Literature Review	
1.1	The quail	3
1.1.1	Quail diseases	4
1.2	Coccidiosis	4
1. 2.1	Life cycle	4
1.2.2	Eimeria species	5
1.2.2.1	Eimeria Tsunodia	6
1.2.2.2	Eimeria uzura	6
1.2.2.3	Eimeria bateri	7
1.2.3	Transmission	7
1.2.4	Clinical signs	8
1.2.5	Necropsy technique	8
1.2.6	Diagnosis	8
1.2.6.1	Differential Diagnosis	9
1.2.7	Treatment	9
1.2.8	prevention	9

1.3	Other quail disease	9
1.3.1	Bacterial diseases	10
1.3.1.1	Ulcerative enteritis	10
1.3.1.2	Infectious coryza	10
1.3.1.3	Nonspecific omphalitis	10
1.3.1.4	Staphylococcus and <i>E coli</i>	11
1.3.2	Viral diseases	11
1.3.2.1	Quail Bronchitis	11
1.3.2.2	Quial Pox	11
1.4	Mycotic Diseases	11
1.4.1	Aspregullosis	12
CHAPTER Two :Materials and Methods		
2.1	Study area	13
2.2	Samples	13
2.3	Clinical examination of live birds	13
2.4	Postmortem Techniques	13
2.4.1	Equipment for postmortem	13
2.4.2	Postmortem Technique	13
2.4.3	Microscopic examination	14
2.4.3.1	Preparation of Wet smear	14
2.4.3.2	Examination of wet smear	14
CHAPTER THREE:RESULT		
3.1	Samples positive to Emirea species	16
3.2	Clinial signs	17
3.3	Postmortem lesion	17
3.4	Detection of coccidian oocyst	21
3.4.1	Distribution of <i>Eimeria</i> species	21
3.4.1.1	<i>Eimeria. tsunodai</i>	21

3.4.1.2	<i>Eimeria.uruza</i>	21
3.4.1.3	<i>Eimeria. bateri</i>	21
3.5	Types of infection	24
Chapter Four : Discussion		
	Discussion	29
	Conclusion	31
	Recommendation	32
	Reference	33

LIST OF TABLES

NO	Title	Page
2.1	Distribution of samples according to location, sex and age	15
3.1	Number of birds showing clinical sign	16
3.2	Distribution of postmortem lesions in examined birds	19
3.3	Number of positive and negative samples	20
3.4	Distribution of Eimeria species according to site of infection	23
3.5	Type of Eimeria infection in different sample	26

List of Figures

Fig No	Title of figure	Page
1.1	life cycle of coccidai	5
1.2	E.Tsunoda	6
1.3	E.uzur	7
1.4	Eimeria bateri	7
3.1	Distended ceca and congested duodenum	18
3.2	E. tsunodai oocyst found in cecum	22
3.3	E.bateri found in large intestine	25
3.4	E. uzura oocyst found in duodenum	27
3.5	E.bateri found in large intestine	28

Abstract

This investigation was made to determine the coccidial infection in Quails reared on different farms in Khartoum state. In this study 100 samples of Quails were processed by clinical , postmortem and microscopic examination during period from February to may 2017 . Samples were collected from three farms in Khartoum state . Results revealed that 20 samples of Quails were positive . High infection was found in females and young birds . The higher infection rate and intensity Was recorded in small intestine , Microscopic examination showed presence of three type of Eimeria (*E.tsunodai*, *E.uzura* , *E.bateri*). Clinical examination showed raffled feather , diarrhea , macroscopic lesion of infected birds revealed hemorrhage in intestinal mucosa , gases in ceacal tonsils , enlarge and congested duodenum .

المخلص

تم اجراء هذه الدراره لمعرفه اصابه طيور السمان بمرض الكوكسيديا المأخوذه من مختلف مزارع ولايه الخرطوم . تم أخذ 100 عينه من طيور السمان الحيه في الفتره من فبراير الي مايو 2017 من ثلاثه مزارع بولايه الخرطوم . تم فحص العينات بواسطه الفحص الخارجي والتشريح كما تم تحديد وجود 20 عينه ايجابيه.

كانت اعلي نسبة اصابه قد سجلت في الاناث والطيور الصغيره . كما اظهرت النتائج وجود ثلاثه انواع من الایمیریا (*E.tsunodai*, *E.uzura* , *E.bateri*) كما اظهرت الطيور المصابه اعراض نفش في الريش ، اسهالات ونزيف الغشاء المخاطي للامعاء وغازات في لوزتي الاعور بلاضافه الي تضخم واحتقان في الاثني عشر .

Introduction

The Quail belongs to the family Phasianidae that inhabits woodland and forest areas around the world. More than 15 different species were identified, each species being found in different parts of the world and all have slightly different appearances depending on how they have adapted to their environment. Quails range in size depending on the species from the Japanese quail which is around 10cm tall to the larger mountain quail that can grow up to 25 cm tall. Quails do not tend to migrate and therefore spend their lives within the same area. In some parts of the world, Quails are kept as poultry birds for the small amount of meat that they contain and for the quail's brightly coloured eggs.

Quails are characterized by fast body weight gains and short rearing periods until egg production (6-7 weeks) (Sokol *et al.*, 2014). They are able to mate normally at 2 months old. Quails tend to breed in more open areas such as farmland and lay their eggs in nests. The number of eggs varies between one and 12 depending on the species of Quails. The baby quails hatch out of their eggs in less than a month. Although quails are omnivorous birds, they tend to have a primarily vegetarian diet eating seeds, wheat, barley, flowers and fruits but they will also eat insects such as worms and grasshoppers. Humans domesticated Quails for their meat and egg production. The most common domesticated breed is the *Coturnix* quail (also known as the Japanese quail), due to their large size. This breed contains more meat and produces more eggs than the others. Button quails (also known as King Quail, Chinese-Painted Quail and Blue-Breasted quail) are rarely kept for food production because they are smaller and produce fewer eggs. Although they are kept in large aviaries to clean the leftover seeds that fall to the floor. Other types of Quails such as California, Gambel, Bobwhite, Scaled quails, etc. are less common and are rarely kept as pets. Coccidiosis is one of the

major intestinal parasitic disease that has the greatest economic losses. Several *Eimeria* species were described from different species of quails in different countries such as *E coturnicis*, *E uzura*, *E Tsunodia*, *E Tahamensin*, *E Taldykuganica* and *E bateri* (Roa., 1992., Teixeira et al., 2004., Amoudi., 1987., Tsutumi., 1972., Abdel Rahman et al 2010). Infection is rare in birds younger than 1 month. The rate of infection up to 80% was detected in birds 7-9 weeks old while decrease to 21-4% in birds older than 10 weeks (Abdel_Rahman et al 2010).

In Sudan chicken coccidiosis was intensively studied five species of *Eimeria* were identified in broiler and layer chickens (Mohammed *et al.*, 1990., Ali *et al.*, 1991 and Khaier *et al.*, 2015). No available Information about Quail Coccidiosis in the country.

Objective of this study is:

- To investigate the coccidial infection in domesticated quails in Khartoum state.
- To determine the species of *Eimeria* that infectd the domesticated quails in Khartoum state.
- To increase the Knowledge of the quail coccidiosis.

Chapter one

Literature Review

1.1 Quail

The Quail is belong to *Kingdom / Animalia Phylum/ Chordata Class/ Aves Order/ Galliformes Family/ Phasianidae Genus/ Coturnix* .the family phasianidae that inhabits woodland and forest areas around the world. More than 15 different [species](#) were identified, each [species](#) being found in different parts of the world and all have slightly different appearances depending on how they have adapted to their environment. Quails range in [size](#) depending on the [species](#) from the Japanese quail which is around 10cm tall to the larger [mountain](#) quail that can grow up to 25 cm tall. Quails do not tend to migrate and therefore spend their lifes within the same area. In some parts of the world, Quails are kept as poultry [birds](#) both for the small amount of meat that they contain and for the quail's brightly coloured eggs ,its characterized by fast body weight gains and short rearing period until egg production (6-7weeks) (sokol et al ., 2014) . At 2month old they are then able to mate normally, Quails tend to breed in more open areas such as farmland and lay their eggs in nests. The number of eggs vary between one and 12 eggs depending on the [species](#) of Quails , the baby quail hatch out of their eggs in less than a month. Although quails are omnivorous birds, they tend to have a primarily vegetarian [diet](#) eating seeds, wheat, barley, flowers and fruits but they will also eat [insects](#) such as worms and [grasshoppers](#). Humans domesticated Quail for its [meat](#) and [egg production](#) . The most common domesticated breed is the [Coturnix](#) quail (also known as the [Japanese quail](#)), Due to their large size. This breed contains more meat and produces more eggs than the others. Button quails (also known as [King Quail](#), Chinese-Painted Quail and Blue-Breasted quail) are rarely kept for food production because they are smaller and produce fewer eggs. Although

They are kept in large [aviaries](#) to clean the leftover seeds that fall to the floor. Other type of Quails such as [California](#), [Gambel](#), [Bobwhite](#), [Scaled quails](#), etc. are less common and are rarely kept as pets.

<https://a-z-animals.com/animals/quail/> .

1.1.1 Quail disease

Free living quail serve as hosts to a large number of protozoan , helminth, And arthropod parasite , none of which are considered to be significant causes of disease in wild quail . It is beyond the scope of this article to Cover these organism (Bennett .,1982).

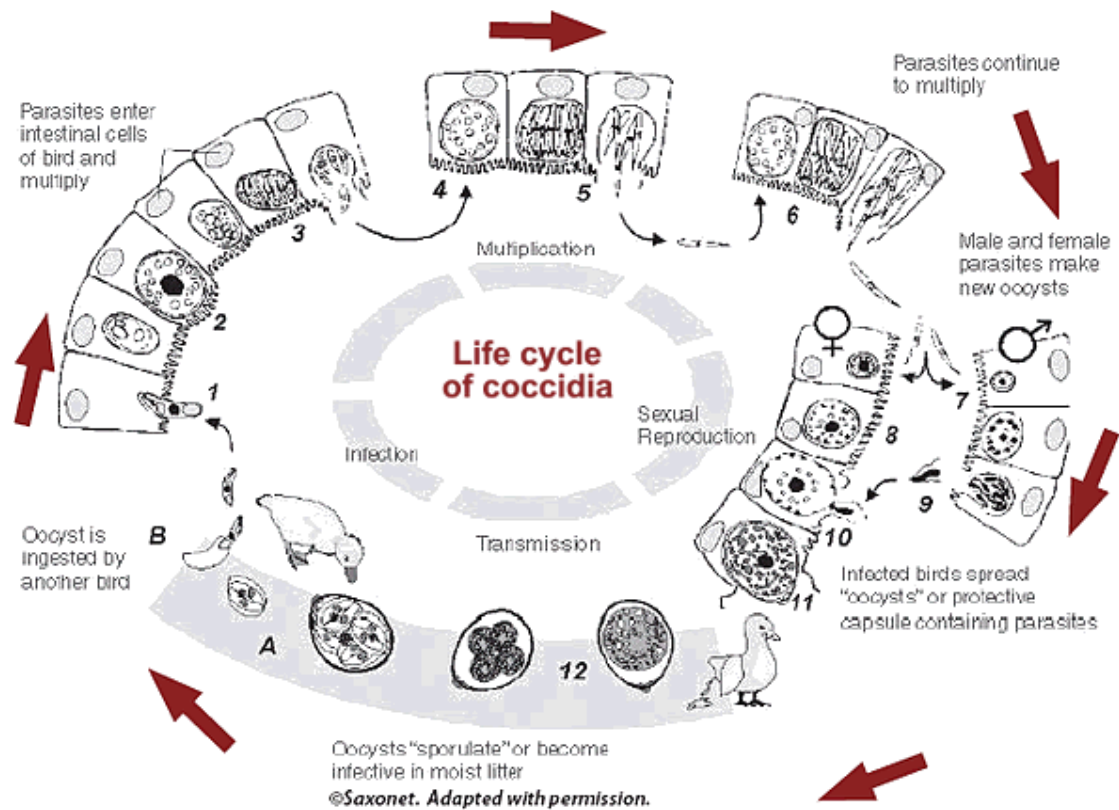
1.2 Coccidiosis

It is one of the major parasitic disease, several *Eimeria* spp were described from different species of quails in different countries such as *E.coturnicis*, *E.uzura* and *E.bateri* in India (Rao and sharma1992). *E.uzura* and *E.Tsunodia* in Japan (Teixeria et al 2004) *E.Taha mensin* from Arabian quail in Sudia Arabia (Amoudi ,1987) . From Japanese quail all over the world including *E.uzuria* ,*E.bateri* and *E.Taldy kuganica* in small intestine and *E.Tsunodia* in the caecum (Tsutsumi ,1972 ,Bashtar *et al* 2010) . Infection is rare in birds younger than 1 month .infection rate up to 80% was detected in birds 7-9 weeks old while decrease to 21-4% in birds older than 10 weeks (Abdel_Rahman *et al* 2010) .

1.2.1 Life cycle

The life cycle of coccidai is similar in all species and contain two stages sexual and Asexual. Stage of life cycle in diagram No (1)

Digram No (1.1)



1.2.2 *Eimeria* species:

Descriptions of *Eimeria* date from the beginning of the last century, and ever since means for an appropriate characterization and identification of the species have been discussed. Several parameters can be used emphasized and encouraged precision in the description of species, and established basic characteristics for an appropriate description of the oocysts. However, Some *Eimeria* species with similar morphology were initially excluded because of the differences in the size of the oocysts. The measurements, in the beginning of the investigation, the measurements allowed distinguishing from closely related species. Initially, *E. coturnicis*, *E. tahamensis* (Amoudi, 1987) and *E. fluminensis* (Teixeira & Lopes, 2004).

1.2.2.1 A. *Eimeria tsunodai*

Sporulated oocysts were ovoid. Oocyst wall was smooth, double layered, with brownish inner layer and colorless outer layer. Despite usually only one polar granule was present. Micropyle (Minute opening believed to exist in the investing membrane of certain oocyte) and residual body of the oocyst were absent. The sporocysts varied from ovoid to ellipsoid. They had a finer end where a small and faint Stieda body projected. The residual body (a cytoplasmic vacuole (lysosome) containing accumulated particulate products of metabolism, for example, lipofuscin). of the sporocyst was present and dispersed among the sporozoites, which were in pairs with globules visible at the enlarged extremity. Teixeira and lopes.,2004) (Harith et al.,2014).



Figure (1.2): E.Tsunoda

1.2.2.2 *Eimeria uzura*

Sporulated oocysts were ovoid. Oocyst wall was smooth, double layered, with brownish inner layer and colorless outer layer. Two to five polar granules were observed in the oocysts, sometimes with a massive aspect, but not refractive). The micropyle and residual body of the oocysts were absent. The sporocysts were ovoid with a finer end, where a piriform Stieda body projected. The residual body of the sporocysts was present and had concentric granules between the sporozoites, which had refractive globules at the enlarged extremity. Teixeira and lopes.,2004), (Harith et al.,2014).

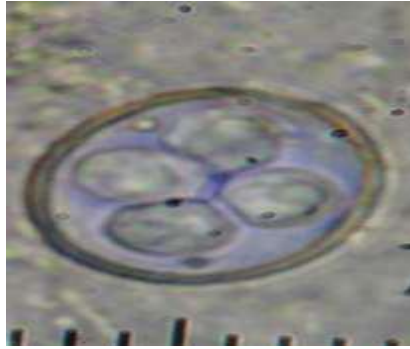


Figure (1.3): *E.uzura*

1.2.2.3 *Eimeria bateri*

Sporulated oocysts were subspherical, ovoid or ellipsoid. Oocyst wall was smooth, double layered, with brownish inner layer and colorless outer layer. A single and refractive polar granule was present, but micropyle and the residual body of the oocyst were absent. Sporocysts were ovoid and measured with a prominent knob-like Stieda body. The residual body of the sporocyst was dispersed among the sporozoites, which had refractive globules at the enlarged extremity(Teixeira and lopes,2004).



Figure (1.4): *Eimeria bateri*

1. 2.3 Transmission

Coccidiosis is transmitted by direct or indirect contact with droppings of infected birds. When a quail ingests oocyst, the organisms invade the lining of the intestine and produce tissue damage as they undergo reproduction. Within a week after infection, the coccidia shed immature descendants that are referred to as oocysts. The oocysts shed in the droppings are not capable

of infecting another bird unless they pass through a maturation process (sporulation) in the litter. This sporulation occurs within a one to three day period if the litter is warm and damp but can take much longer if the conditions are cool and dry. After sporulation the coccidia are infective if consumed by a new host bird.

The number of infective coccidia consumed by the host is a primary factor as to the severity of the resulting infection. An infection may be mild enough to go unnoticed while a large infective dose of coccidia may produce severe lesions that can cause death. Coccidia survive for long periods outside the bird's body. They are easily transmitted from one house to another on contaminated boots, clothing, free-flying birds, equipment, feed sacks, insects and rodents.

<http://www.howtoraisequail.com/coccidiosis-can-infect-quail.html>

1.2.4 Clinical sign

Most cases of coccidiosis in growing quail are characterized by low mortality, slow growth, and poor feed utilization (higher feed conversions). Young quail are more severely affected than older ones. Egg production is decreased when -adult quail contract coccidiosis, but weight is unaffected. (Tsutsumi Y., 1972) .

1.2.5 Necropsy finding :

Thickening in the intestinal mucosa, hemorrhage in ceacum and softening feces this reported by (Mohammad.,2012) .Congested intestine and filled by brownish color reported by (Anbarasi.,2014).

1.2.6 Diagnosis

Clinical examination , Microscopic examination for intestinal scraping , or fecal samples collected from infected birds ,flotation technique and sporulation(Teixeira et al.,2004) flotation and direct smear (Mohammad et al.,2012) direct smear(Harith et al.,2014). flotation (p_anbarasi et al.,2015).

1.2.6.1 Differential diagnosis

Ulcerative enteritis (clostridium colinum) .

1.2.7 Treatment

Different drugs were used for treatment and prevention of coccidiosis. This medicine was applied in water by oral route such as Amprolium and Toltrazuril (Baycox) .

<https://www.backyardchickens.com/articles/quail-diseases-health-issues-and-keeping-your-quail-healthy.67379/g>.

1. 2.8 Prevention

Prevention of coccidiosis by sanitation alone is not adequate, It is best prevented by addition of a drug (coccidiostat) to the feed that controls the growth of coccidia in the digestive tract. Many coccidiostats are available commercially. Coccidiostats should not be indiscriminately used and recommendations must be followed precisely.

A coccidiosis vaccine is now available for chicken. The product is useful only in certain types of poultry operations and must be used as recommended.

<http://www.howtoraisequail.com/coccidiosis-can-infect-quail.html>

1.3 Other quail disease

Quail are generally quite hardy little birds and don't get sick often if kept properly. Belong to the bacterial disease. There are two forms of quail disease. The first form is highly chronic and a mortality rate of 100% is observed among the infected birds. The major symptom is diarrhea, with white colored feces. The second form of quail disease prevails for a longer period of time. Loss of appetite is the major symptom. Birds affected with this disease will die within 6 to 10 months due to gradual weight loss.

<https://www.backyardchickens.com/articles/quail-diseases-health-issues-and-keeping-your-quail-healthy.67379/>

1.3.1. Bacterial diseases of quail:

Occur as (A) septicemia (fowl cholera,(Hinshaw WR.,1943)

Panigrahy B.,1982) *salmonellosis*, 4 *erysipelas*, (Panigrahy B.,1977) *staphylococcosis*, (Shane .,1985) *streptococcosis*, *pseudotuberculosis*, *Proteus* infection,(Sah RL, 1983)*Pasteurella anatipestifer* infection Vallee A.,1973);(B) enteritis (quail disease, Panigrahy B.,1977); (C) omphalitis (*salmonellosis- pullorum*, fowl typhoid, and paratyphoid); (D) sinusitis Environment and management are also important contributors to primary bacterial diseases. Introduction of the diseases into a flock often occurs following lapses in recognized good management procedures.(Zander .,1984).

1.3.1.1 Ulcerative Enteritis

Also known as quail disease although the disease occurs in other avian species, is a widespread, common, and significant disease of quail, especially bobwhite. It is caused by *Clostridium colinum* or, less commonly, by *C. perfringens*.(Itoh H.,1985) Clinical course of the disease in a flock and signs in acutely affected individual birds are similar to those described for the septicemic diseases . Chronically affected birds show weight loss and have an unthrifty appearance. Mortality may approach 100 per cent in young quail .

1.3.1.2 Infectious coryza

This is a bacterial infection that is mainly spread to Quail from Chickens. Its caused by *Haemophilus paragallinarum* Quail with infectious coryza also experience conjunctivitis and keratitis. Air sacculitis occurs in quail infected with *M. gallisepticum*(Reece ., 1981)

1.3.1.3 Nonspecific omphalitis

Is a major cause of early quail mortality.(Arora 1979, Serafin 1982 , Shane 1985) .Gram-negative bacteria such as *Proteus*,*Pseudomonas*, and *Escherichia coli* are typically recovered when affected chicks are cultured. Gram-positive bacteria, especially *Streptococcus* and *Staphylococcus*, can

also be found in some cases but are less common. Reduced hatchability and weak chicks are often associated with omphalitis.

1.3.1.4 Staphylococcus and *E. coli*

Are most frequently isolated from quail with cellulitis and abscesses. These infections follow injuries. Reduce picking, accidents, and injuries and providing a clean, sanitary environment will aid in the reduction and prevention of these lesions. (Shane.,1985)

1.3.2 Viral disease

1.3.2.1 Quail Bronchitis

This is a disease of Bobwhites only. Japanese Quail are resistant as are most other species of Quail. Symptoms include rattles while breathing and coughing. There can also be conjunctivitis, (inflammation of the eye). This is mainly transmitted through wild birds. So keep the wild birds out of your aviaries. There is no treatment for this disease.

<http://www.google.com/url?q=https://www.backyardchickens.com/articles/quail-diseases-health-issues-and-keeping-your-quail-healthy>.

1.3.2.2 Pox in quail

Is a serious disease that may result in very high mortality . (Shane 1985) Losses as high as 90 per cent have occurred in bobwhite flocks in the south east United States. The disease is seasonal, being most prevalent during the warmer periods of the year when ornithophilic biting arthropods are most numerous (Shane 1985).

1.4 Mycotic Diseases

Quail are susceptible to the common mycotic diseases that affect poultry, Including crop mycosis, *Aspergillosis*, and *Dactylariosis*. Young birds under 4 weeks of age are most commonly affected with diseases in this group. Mortality is more common in outbreaks of *Aspergillosis* and *Dactylariosis*; Unthriftiness and poor growth with occasional mortality occur in flocks with crop mycosis.(Olson .,1969) .

1.4.1 Aspergillosis

Can involve the brain, lungs, trachea, air sacs, or eyes. The disease follows exposure and inhalation of high numbers of infective spores. Often this occurs in the incubator or Hatcher from fungal growth in contaminated eggs or on residual debris in the warm, moist environment, or during early brooding when chicks are placed on previously wet litter containing high numbers of spores. Incubating dirty or cracked eggs containing *aspergillus* growth is a prime source for hatchery contamination. Problems such as stress during brood concurrent infections increase the like life hood of *aspergillosis*. (Olson.,1969).

CHAPTER TWO

Materials and Methods

2.1. Study area

Three farms located in Western area Gobra, Northern area ALhalfaia and South area Kalakla in Khartoum state were investigated . Samples were collected according to The farmer willing, during the period from February to May 2017.

2.2. Number and Type of samples:

One hundred live quails with different age and species were collected including 71 males and 29 females table (1). Samples were processed in department of Avian pathology and diagnosis Central Veterinary Research Laboratory

2.3 Clinical examination of live birds

Birds were examined clinically for general body condition, external parasite, skin dehydration, nasal and lachrymal discharge, ruffled feather, wings paralysis and diarrhea. any symptoms were further recorded.

2.4 Post mortem examination

2.4.1. Equipment for Postmortem

All equipments such as Scissors; knives forceps, gloves, containers. used in postmortem examination were washed with soap and water then Sterilized by hot air oven in 160 °C for 1 1/2 hour.

2.4.2. Postmortem Technique

After euthanasia for the birds, carcasses were damped in a disinfectant Solution to limit the dispersion of infected dust and feathers .Birds were laid on its back with feet towards the operator . Skin over the abdomen was removed, Breast and thigh muscles were carefully examined. Abdominal muscles, ribs and coracoids bone were cut and removed from the chest to expose the internal organs and the chest cavity. Liver, lung, heart and air sac were also examined. Respiratory system, trachea and bronchi, lungs and air

sacs were also examined for any changes. Finally gastrointestinal tract were separated and removed by cutting between the oesophagus and the proventriculous down to the cloaca. Proventriculous and gizzard are cut open to detect the presence of feed and any submucosal haemorrhage. Necropsy was concluded with the examination of the mucosal surfaces of the oesophagus, crop, and intestine with special focus to lymphatic tissue such as peyers patches and cecal tonsils (haemorrhage, thickening or any other abnormalities were recorded). Spleen, kidney, brain and ovary and/or testes were also examined.

2.4.3 Microscopic examination

2.4.3.1 Preparation of Wet smear

Intestines were open with sterile scissors and forceps scraping from inside layer of the intestine were placed in a clean glass slide. wet smear were prepared by adding drop of sterile distilled water then covered with cover slip.

2.4.3.2 Examination of wet smear

The wet smear were examined under the microscope (lens 40). To identify the oocyst of *Emiria* species.

Table (2.1) Distribution of samples according to location, sex and age

Location	Adult		Young		Total number
	Male	Female	Male	Female	
Gobra	13	2	5	5	25
Kalakla	1	0	0	0	1
Al halfaia	40	11	11	12	74
Total number	54	13	16	17	100

CHAPTER THREE

Result

3.1 Samples positive to *Emireia* species

In the current study and according to morphology of the oocyst and pathological characteristics of infection twenty samples were found positive for *Eimeria* spp including 8 females,12 males. Female had a highly infection rate as 28% Of the female examined were found positive while only17% of male were positive table (3.1) .

Table (3.1) Distribution of positive samples

Sex	Positive(%)	Negative(%)
Male (n=71)	12 (17%)	59 (83%)
Female (n=29)	8 (28%)	21 (72%)
T N (n=100)	20 (20%)	80 (80%)

3.2 Clinical signs

Total of 14 Quails showed clinical signs, including ruffled feather and dullness were the predominant signs observed, in addition nervous sign, drop in wings, diarrhea, dehydration and emaciation were also seen table (3.2).

3.3 Postmortem lesions

During Postmortem examination 62 birds showed lesions, The most obvious lesions seen in most of birds examined were distended ceca with gases and congested duodenum Fig (3.1) which is detected in 26 and 11 birds respectively table (3.3).



Fig (3.1): Distended ceca and congested duodenum

Table (3.2) Number of birds showing Clinical signs

Clinical signs	No of quails sample
Nervous sign	3
Drop in wings	2
Diarrhea	1
Dehydration	1
Emaciation	0
Ruffled feather	4
Dullness	3

Table (3.3): Distribution of postmortem lesions in examined birds.

post mortem lesion	No of birds	(%)
Congested duodenum	11	18%
Fragile liver	9	15%
Intestinal gases	9	15%
Haemorrhagic enteritis	7	11%
distended Cecal with gases	26	41%
Total number	62	100%

3.4 Detection of coccidian oocyst

Three different *Eimeria* species were detected namely *E. tsunodai* , *E. bateri* ,*E. uzura* in both male and female samples .

3.4.1 Distribution of *Eimeria* species

3.4.1.1 *E. tsunodai*

it was detected in 7 samples which found only in ceca *E.tsunodai* has an ovoid sporulated oocyst , with a smooth double layer, no polar granule Fig(1).

3.4.1.2 *E.uruza*

was found in the duodenum of 6 samples .It has an ovoid , double layer wall the inner one is brownish and the outer was colorless , two to five polar granule were present Fig(2).

3.4.1.3 *E. bateri*

It was seen in 8 samples .It has an ovoid or ellipsoid shape, single and refractive polar granule were present .It was found in duodenum and large intestine Fig (3.2) .

Regarding the site of Infection in the digestive system of the birds examined, small intestine showed higher rate table (3.4).

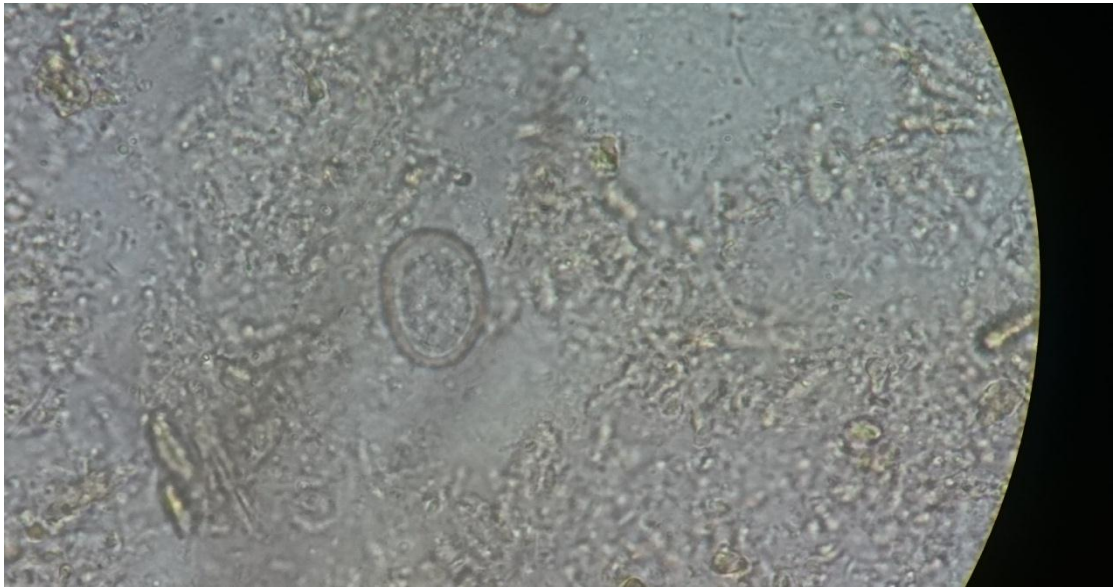


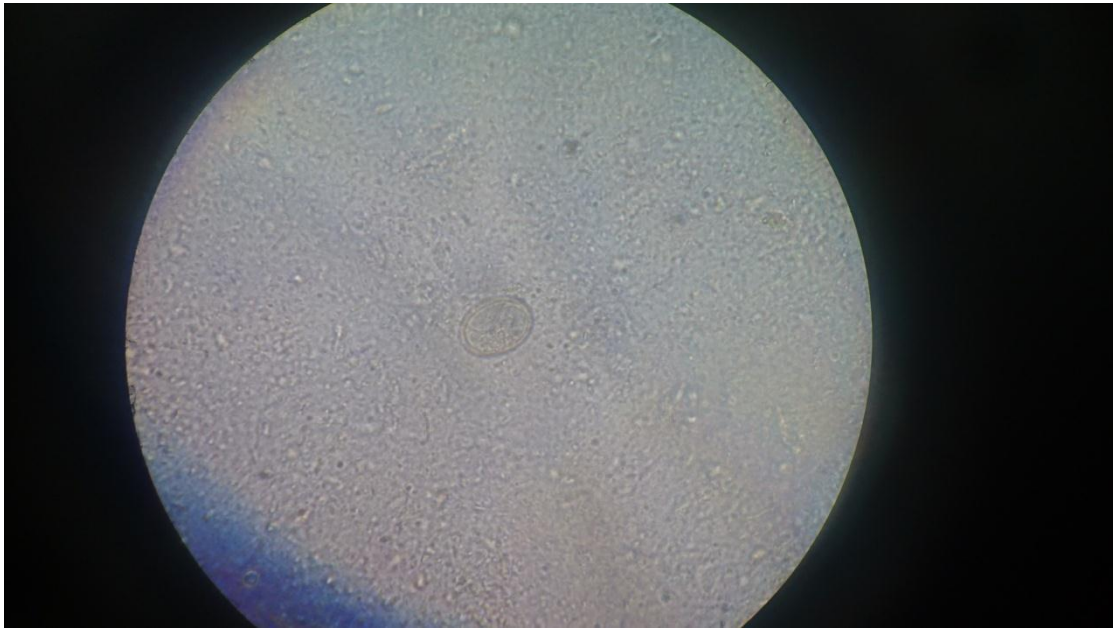
Fig (3.2): *E. tsunodai* oocyst found in cecum

Table (3.4) Distribution of Eimeria species according to site of infection

species	positive sample	Site of infection		
		Duodenum	Ceca	Large intestine
<i>E. tsunodai</i>	7	-	+	-
<i>E. uruza</i>	6	+	-	-
<i>E. bateri</i>	8	+	-	+

3.5 Types of infection

Results showed that three types of infection were detected in the positive birds. three samples were infected with single type of *Eimeria* species while 16 birds were infected with two type of *Eimeria* species while only one sample showed the presence of the 3 species recovered during this study table (3.5).



Fig

(3.3) *E. coli* found in large intestine

Table (3.5) Type of Eimeria infection in different samples

Type of infection	No of +ve birds	Rate of infection
Single	3	15%
Double	16	80%
Mixed	1	5%

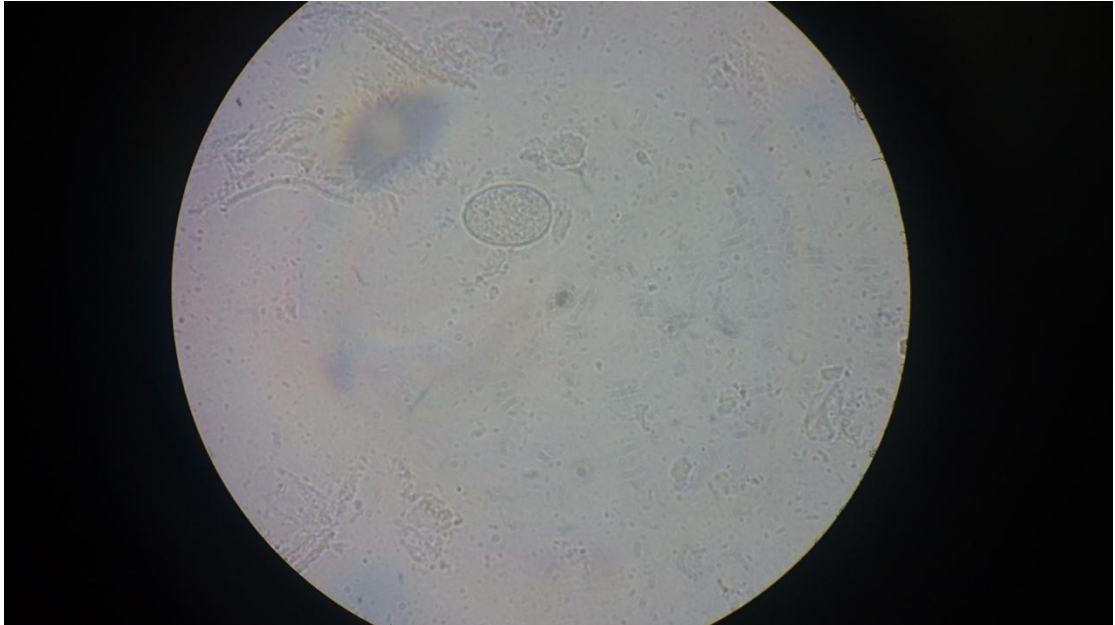


Fig (3.4) *E. uzura* oocyst found in duodenum

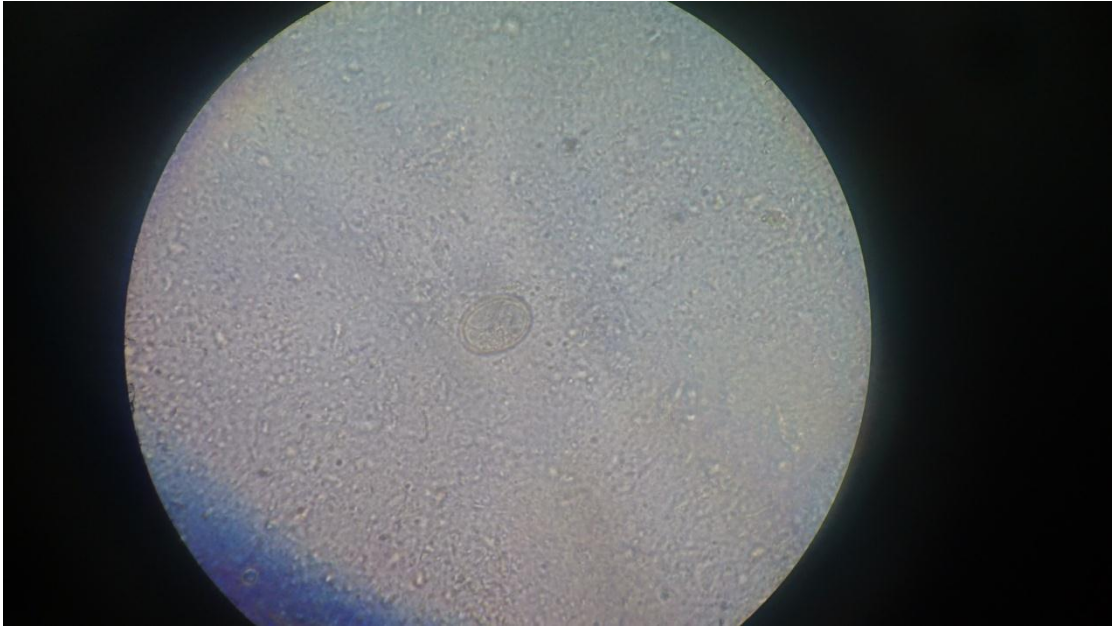


Fig (3.5) *E.bateri* found in large intestine

CHAPTER FOUR

DISCUSSION

Quails considered a branch of the modern poultry industry in Sudan. Several *Eimeria* spp are highly pathogenic to their host causing great economic losses in quail breeding and limiting development of this industry (Mohammed.,2012). For diagnosis of quail coccidiosis, detection of oocyst is used as the most easily accessible stage in many coccidians species (Mehlhorn2008). The current study described the presence of coccidiosis in quail by morphological characteristic of the *Eimeria* oocyst and pathological lesions of infection. Quails were examined clinically and by intestinal scraping collected from mucosal surface of small and large intestine, results revealed that 20 samples were infected with *Eimeria* spp.

During this study infection rate was 20% which is lower than result reported previously (78%) by Harith et al (2014) ,However nearly similar infection rate (29%) was recorded by Bashtar et al (2010).

In the current study only three cases were found infected with single *Eimeria* species namely *E. tsunodai* this was online with (Mehlhorn 2008)

Infection with single *Eimeria* species is rare.

However double and mixed type of infection were observed in 17 birds this result is agreed with (Mohammed., 2012).

Results showed that females had highly infection rate compare to male this is disagree with Hairth *et al* (2014) who reported that male was more susceptible to the diseases. on the other hand young birds was found more susceptible than older ones; this result is agreed with Anbarasi et al (2014).this may be due to development of immunity in grown up quails. Quails are found to be affected by subclinical form of coccidiosis this was confirmed by (Texeira and lopes.,2004) .Necropsy finding show congested

intestine and filled with brownish contents this finding reported by (Abarasi .,2014)

Three eimeria species were found in this study with different rate this agreed with Mohmmmed et al (2012), Teixeira.,(2004), Bashtar.,(2010). other species which is not detected during this study was *E .fluminensis* reported by Harith et al (2014) *E.bateri* had high infection rate while *E.uruza* is low which similar to Harith et al (2010) . On the other hand presence of *E. bateri* disagree with Mohammad.,(2014) .

Coccdiosis in quails remains to a significant problem because coccidian are resistance to popular antiprotozoal drugs agent and the chronic form of disease had economic impact (Anbarasi et al 2014).

The difference in the percentage of infection in many studies may be related to different factors such as, environmental conditions , type of anticoccidial drugs may have contributed to this difference (Nematollahi A,2008) .

Conclusion

This study indicated the presence of coccidiosis in quail farms in Khartoum state. Three species were found. Crowdedness and poor management in farms leads to subclinical infection in adult which spread the infection to young through contaminated food. The diagnosis of coccidiosis in early stage help in control of disease. proper diagnosis, vaccination, antiprotozoal drugs and good management and knowledge of the diseases may decrease the infection.

Recommendation

1. Good management and sanitation (cleaning, disinfecting, avoid the humidity and crowdedness).
2. Farmer must be aware about quail diseases specially coccidiosis to decrease economic losses and control of the diseases.
3. Proper application of Biosecurity measures and avoid rearing of chicken and quail in the same vicinity.

REFERENCES

- Amoudi MA *Eimeria Taha mensis* nsp. (Apicomplexa Eimeriidea) from the Arabian quail (*conturnix delegorguei arabica*). *J.protozool*, (1987) 34: 455-456.
- Ali SF, Abdalla HS , Osman AY , Salim Al. Survey of *Eimeria* species in poultry in Khartoum province . *The Sudan journal of Veterinary Research* (1991);10:44-45 .
- Anon. Manual of veterinary parasitological Laboratory Techniques . Ministry of Agriculture, Fisheries and Food (MAFF).. Her Majesty Stationary Office , London. Reference Book (1984); 418:11-12 .
- Awaad MHH, Hafez HM, El-Dimerdash MZ, et al: Some epidemiological aspects of *Sal71Wnella gallinarum* infection in Japanese quail (*Coturnix coturnixjaponica*). *Zentrablatt Fur Vetmed B*(1981); 28:704-712.
- Arora KL Blood sampling and intravenous injections in Japanese quail (*Coturnix coturnix japonica*). *Lab Anim Sci*, (1979); 29:114-118.
- Bashtar, A.R.;Abdel-Ghaffar, F.; Al-Rasheid, K.A.; Mehlhorn, H. and Al Nasr, I.. Light microscopic study on *Eimeria* species infecting Japanese quails reared in Saudi Arabian farms. *Parasitol. Res* (2010); 107(2):409-416.
- Bennett GF, Whiteway M, Woodworth-Lynas CB: A Host-Parasite Catalogue of the Avian Haematozoa. *Mem. Univ. Newfoundland Occ. Papers in Biology*, No. 5, St. Johns Newfoundland, (1982), pp 110-116.
- Bigland CH, DaMassa AJ, Woodwan:J AE: Diseases of Japanese quail (*Coturnix coturnix Japonica*)--A flock survey and experimental transmission of selected avian pathogens. *Avian Dis* (1965) 9:212-219,
- Chew-Lin M: Adult coturnix quail bronchitis. *Avian Dis* (1980) 24:520-526,.

- Davidson WR, Kellogg FE, Doster GL: Seasonal trends of helminth parasites of bobwhite quail. *J Wildl Dis* (1980) 16:367-375, 30
- Duszynski DW, Gutierrez RJ: The coccidia of quail in the United States. *J Wildl Dis* 17:371-379, (1981)
- Dalloul RA, Lillehoj HS. Poultry coccidiosis : recent advancements in control measures and vaccine development. *Expert Review of vaccines*; 5:143-163.doi: (.2006) 10.1586/14760584.5.1.143 .
- Harith. Epidemiological study of coccidiosis in quail in Baghdad city. (2014).
- Hinshaw WR, Emlen JT: Pasteurellosis in California valley quail. *Cornell Vet* (1943) 33:351-354
- <https://a-z-animals.com/animals/quail/>
- <https://www.backyardchickens.com/articles/quail-diseases-health-issues-and-keeping-your-quail-healthy.67379/>
- <http://www.google.com/url?q=https://www.backyardchickens.com/articles/quail-diseases-health-issues-and-keeping-your-quail-healthy>.
- Itoh H: Ulcerative enteritis in Japanese quails (*Coturnix coturnix japonica*) with *Clostridium perfringens* type A. *J Jpn Vet Med Assoc* (1985) 38:301-305,
- Khaier MAM, Salih MA, Abukashawa SMA. Molecular Characterization of *Eimeria acervulina* in broiler Chickens . *Qurr .Res . Microbial . Biolechnol* .(2015) 6;3(1) :569-572 .
- Mohammed A, Osman AY, Gasmir Gs , Aziz AA, multiple infection with *Eimeria* spp. In Chicken in Khartoum province . *Sudan journal of Veterinary Science and Animal Husbandry*.(1990); 29:31-38

- Madclen DL, Henderson WH, Moses HE: Case report: Isolation of *Mycoplasma gallisepticum* from bobwhite quail (*Colinus virginianus*). Avian Dis,(1967) 11:378-380
- Mehlhorn,H. Encyclopedia of parasitology ,3rd edition, Berlin Springer (2008) .
- Mohammad, N.H. A study on the pathological and diagnosis of EIMERIA species infection in Japanese quail. Bas .J .Vet. Res (2012); 11:1-7.
- Nascimento MGF, Nascimento ER: Infectious sinusitis in coturnix quail in Brazil. Avian Dis, (1986) 30:228-230.
- Olson LD:
- Case report -Aspergillosis in Japanese quail. Avian Disease (1969) 13:225-227,.
- Qesek, M, Welenc J, Tylicka Z ,Otrocka Domagala 1 , Pazdziork , Rothiewicz A .. Path morphological changes in the alimentary system of Japanese quail naturally infected with Eimeria Tsunodai. Bull Vet Inst Pulawy(2014) 58:41-45.
- Panigrahy B, Glass SE: Outbreaks of fowl cholera in quail. Avian Disease (1982) 26:200-203,.
- Peckham MC: Quail enteritis. In Hofstad MS, et a) (eds): Diseases of Poultry. Edition 8. Ames, Iowa State University Press, (1984), pp 242-250
- Panigrahy B, Hall CF: An outbreak of erysipelas in coturnix quails. Avian Dis (1977) 21:708-710,
- Reece RL, Barr DA, Owen AC: The isolation of *Haemophilus paragallinarum* from Japanese quail. Aust Vet J 57:350-351,(1981)
- Rao JR, Sharma NN (1992) coccidiosis in coccidian quail in india. india J Anim Sic 62:51-52

- Seok S, Park J, Cho S, Baek M, Lee H, Kim D. coccidian (*Eimeria* spp) in small intestine of Japanese quail (*Coturnix coturnix japonica*). Kor J Lab Ani Sci, (2003); 19(2):90-91.
- Sokol. R, M. Gesck; M. Norynska, M Michal 3yk. Polish journal of veterinary sciences Toltrazuril (Baycox) treatment against coccidiosis caused by eimeria spp in Japanese quails (*Coturnix coturnix Japanese*). (2014) vol .17, NO.3:465-468.
- -Sulaiman EG, Talib Q, Daham E, Arsalan S H. Study of some eggs and oocysts of internal parasites in sheep in Mosul. Iraqi J Vet Sci, (2005); 19(1):21-32. 31.
- -Serafin JA: Reduced mortality among young endangered masked bobwhite quail fed oxytetracycline- supplemented diets. Avian Dis, (1982). 26:422-425
- -Shirley MW, Long PL. Control of Coccidiosis in Chickens Immunization with Live Vaccine . In Long PL , editor. Coccidiosis of man and Domestic Animals CRC Press , Boca Raton , Florida . (1990):321-341
- Shane SM: Common diseases and other conditions of quail. Avian/Exotic Pract, (1985) 2:13-23
- -Sah RL, Mall MP, Mohanty GC: Septicemic proteus infection in Japanese quail chicks (*Coturnix coturnix japonica*). Avian Dis (1983) 27:296-300,
- Teixeira, M.; Teixeira-Filho, W.L. and Lopes, C.W.G. Coccidiosis in Japanese quails (*Coturnix japonica*): Characterization of a naturally occurring infection in a commercial rearing farm. Rev. Bras. Ciênc. Avíc; (2004). 6:129-134.
- -Tsutsumi Y: *Eimeria tsunodai* sp. nov. (Protozoa: Eimeriidae) a cecal coccidium of Japanese quails (*Coturnix coturnix japonica*). Jpn J Vet Sci (1972) 34:1-9.

- Vallee A, Le Turdu Y, Guillon JC, et al: Natural *Pasteurella anatipestifer* infection in a Hock of quail. Abstract. Vet, Bull (1973) 43:183,
- Winterfield RW, DuBose RT: Quail bronchitis. In Hofstad MS, *et al* (eds): Diseases of Poultry. Edition 8. Ames, Iowa State University Press, (1984), pp 508-510
- Winterfield RW, Reed W: Avian pox: Infection and immunity with quail, psittacine, fowl, and pigeon pox viruses. Poultry Sci, (1985) 64:65-70.
- Zander DV: Principles of disease prevention: Diagnosis and control. In Hofstad MS, Diseases of Poultry. Edition 8. Ames, Iowa State University Press, (1984), pp 1-37.