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## Review On Elucidation Of The Risk Factors Associated With The Prevalence Of Coccidiosis In Buffaloes

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## Review on elucidation of the risk factors associated with the prevalence of coccidiosis in buffaloes

<p><b>Authors Names</b> Zainab A. Makawi</p> <p><b>Article History</b> Received on: 2/6/2021 Revised on: 15/6/2021 Accepted on: 17/6/2021</p> <p><b>Keywords:</b> buffaloes, <i>Eimeria</i> spp, prevalence, Risk factors, protozoan.</p> <p><b>DOI:</b> <a href="https://doi.org/10.29350/jops.2021.26.4.1316">https://doi.org/10.29350/jops.2021.26.4.1316</a></p>	<p><b>ABSTRACT</b></p> <p>The research was performed in order to investigate the prevalence of <i>Eimeria</i> spp in buffalo. Coccidiosis, is a common livestock disease include water buffaloes and nothing is known about the most pathogenic species of <i>Eimeria</i>. Since the highest prevalence oocyst shedding and incidence of disease occurs in buffalo calves less than one year of age. The omnipresent occurrence and negative effects of the infection on health and buffalo growth output are taken into account. Therefore, both farmers and veterinarians should pay greater attention to infections with <i>Eimeria</i> spp. And there is little analysis of data reported in Iraq and the world regarding <i>Eimeria</i> infection in river buffalo spp.</p>
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### 1. Introduction

*Eimeria* spp. It is a protozoan genus that causes the parasitic disease known as coccidiosis, which is widely spread across the world. cause decreased weight and deaths of young animals, infection by this protozoan causes economic losses. So far, more than 12 different species of *Eimeria* have been recorded in cattle and buffalo animals. (Daugshies and Najdrowski 2005). Buffaloes are the most important species of domestic livestock as a source of milk, meat, manure and drought power in Iraq, therefore parasitic diseases are no less important in buffaloes than other infectious diseases. These include primarily gastro-intestinal coccidiosis (Griffiths, 1974). Protozoan diseases, especially in developing countries, are major constraints on the development of dairy farming worldwide (Om *et al.*,2010 ; Farooq *et al.*,2012). Coccidiosis caused by the *Eimeria* species plays an important role in calf diarrhoea various parasitic causes. Coccidiosis is a generic term used in the family Eimeriidae for a group of sporozoa that are usually parasitic in the intestinal tract of the host, but also sometimes

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present in the liver and kidneys. *Coccidia* infection causes enteritis in all animals, but, depending on their pathogenesis, the clinical picture varies between animals. Acute invasion and degradation of the intestinal mucosa, anorexia, weight loss, diarrhoea, emaciation, and occasionally death characterize the infection in calves (Coetzer and Justin, 2004). The aim of this study was to obtain information on the prevalence of *Eimeria* spp. among river buffalo in the region's farms and to determine which *Eimeria* spp.

## 2. Iraqi buffaloes

Buffalo are considered an important field animal in tropical and subtropical regions such as India, Pakistan, Southeast Asia, Mali, Iran, Iraq, Egypt, and some Eastern European countries, despite their small numbers and restricted range (Al-Sayegh *et al.*, 1987). The buffalo is a member of the Bovidae tribe, which is subdivided into the Bovinae family (Mahdi and Georg, 1969). There are four species of wild buffalo, all of which are members of the *Bubalus arnee* genus. Buffaloes were domesticated in India during the Wadi Civilization, according to archaeologists. Buffaloes Swamp is thought to have been domesticated independently in China after about 1000 years from that time, while buffalo were identified in Egypt during the Pharaonic period, i.e. up to 800 years BC. Then there was the issue of buffaloes being transported to different countries. The other was distributed steadily and gradually across Southeast Asia, Europe, Australia, and South America. (Al-Sayegh *et al.*, 1987).

Buffaloes come in two varieties: swamp buffaloes and river buffaloes, both of which were once popular in the marshlands and along the banks of the Tigris and Euphrates rivers, especially in Iraq's southern regions. In terms of genetics, The Asian swamp buffalo has 48 chromosomes, while the river buffalo has 50, resulting in individuals with 49 chromosomes when they mate (Al-Sayegh *et al.*, 1987). Buffaloes that live near marshes and swamps are more susceptible to parasite infection, especially internal parasites like primary animals.

## 3. Classification of *Eimeria*

According to Donald *et al.*, (2010) *Eimeria* classified into :

Kingdom : Chromista

Infrakingdom: Alveolata

Phylum: Apicomplexa

Class: Conoidasida

Order: Eucoccidiorida

Family :Eimeriidae

Genus: *Eimeria*

#### 4. Species

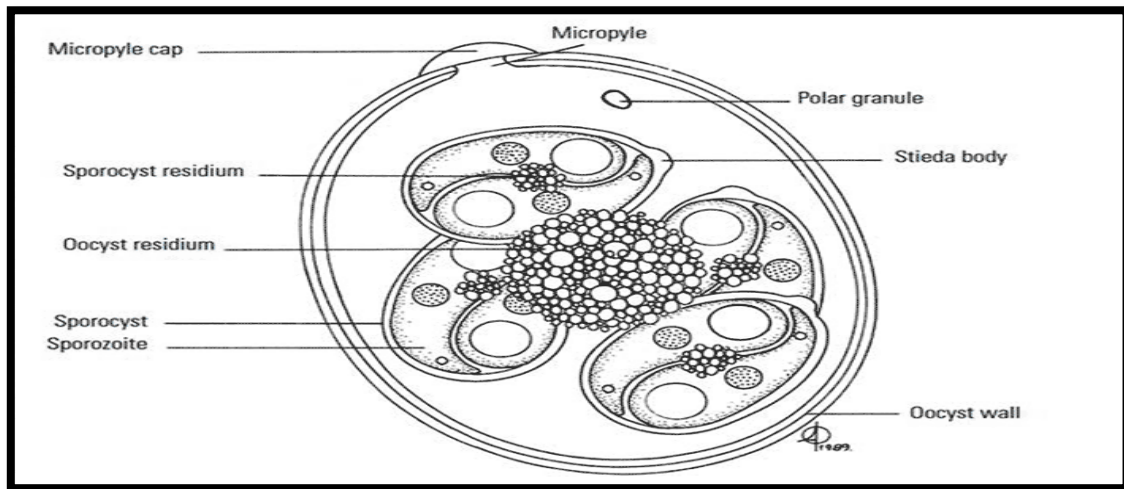
The species *Eimeria alabamensis*, *E. bovis* , *E. bareillyi* , *E. brasiliensis*, *E. bukidonensis*, *E. zurnii* *E. ellipsoidalis*, *E. canadensis*, *E. subspherica*, *E. wyomingensis*, and *E. cylindrica*, have been detected in buffalos. All these species, with the exception of *E. bareillyi*, are hosted by cattle and buffalos (Bhatia, 1992, Griffiths, 1974). Among the species that cattle and buffaloes can handle, *E. zuernii* and *E. Bovis*. the most pathogenic. In general, Coccidian species have host specificity, and the *Eimeria* species in this regard. *E. ankarensis*. From Azerbaijan, *Bareillyi*, *Egokaki*, *E. Ovoidalis* as well as *E. Thianethi* has been reported in buffalo water. Moreover, species found in cattle, such as *E. canadensis*, *E. wyomingensis*, *E. auburnensis*, *E. bovis*, *E. brasiliensis*, *E. bukidonensis*, *Eimeria alabamensis*, *E. cylindrica*, *E. subspherica*, *E. ellipsoidalis*, and *E. zuernii* have also been reported in the water buffalo (Levine 1985).

#### 5. Morphology and Life cycle of *Eimeria*

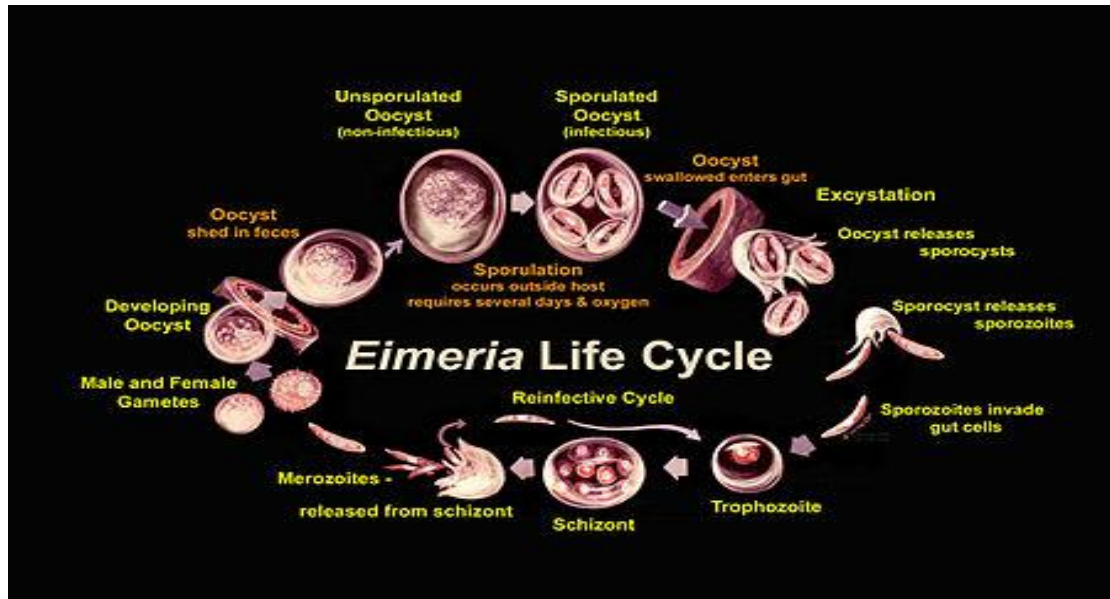
The morphologic features of *Eimeria spp.* The oocysts were comparable to those in the literature, its characterized pyriform, yellow to brown, were *Eimeria bareillyi* oocysts. There was a thin, smooth, and homogeneous double-layered wall and a 5-6- $\mu$ m-wide micropyle in each oocyst. There were elongated ellipsoidal sporocysts with flat Stieda bodies. The residue of the sporocyst was clustered or scattered. There was a single large refractile body of each sporozoite . As seen in (Figure 1), *Eimeria* goes through a competitive life cycle that occurs both in the setting and within one host. When in the atmosphere and during ingestion, they are in the stage of the oocyst. When it is released into the atmosphere by the previous host, the oocyst is in an early, unsporulated form. The oocyst 's tough outer walls shield it from harmful environmental conditions ( Allen and Fetterer, 2002). When it forms spores through asexual development, the oocyst enters a late phase. In each oocyst, four sporocysts are produced (with two sporozoites each).

This formation of spores requires an aerobic environment and takes one day or so. With the aid of stomach matter such as bile, trypsin, and CO<sub>2</sub>, these oocysts are then ingested by an animal and enter the intestine, where they are broken down. Newly shaped sporozoites circulate through the intestine, where epithelial cells in the walls are invaded. Depending on the species, sporozoite growth can occur in those cells or at another location (intestinal crypts). (Johnstone,2000 ; Allen and Fetterer, 2002). The sporozoites are collected as a trophozoite

and become larger to become a schizont. Merozoites are expelled by the schizont, leaving the cell to invade other epithelial cells. For a few more years, this period continues, during which the merozoites turn into male or female forms and conduct sexual reproduction. The outcome is an early, unsporulated oocyst, released in the form of feces by the animal. Thus, the cycle starts again. The whole cycle lasts approximately 4-7 days and varies between species (Figure 2) ( Allen and Fetterer, 2002).



(Figure 1): Structure sporulated of *Eimeria* spp (Levine, 1985).



(Figure 2 ): Life cycle of *Eimeria spp* (Donald *et al.*, 2010).

## 6. Pathogenicity and risk factors of *Eimeria spp*

The intensity of the disease depends directly on the amount of ingested infectious *Eimeria* oocysts (Lindsay *et al.*, 1989) Infection pathogenesis ranges from mild to extreme, and is mostly dependent on the extent of infection (Hernández-Velasco *et al.*, 2014) .

In light infections, the damage to the gut can only be minimal and repaired quickly as the body replaces cells quickly. However, it can only take two weeks for several intestinal epithelial cells to become infected with either *Eimeria* meronts or gametocytes in severe infections. These cause the epithelial cells to burst, causing significant damage to the epithelial layer of the intestine, resulting in blood, fluid, and electrolytes being released into the intestine. (Maas, 2014). Coccidiosis is an intestinal disease affecting cattle, sheep, goats, cats, water buffalo, dogs, rabbits, and poultry, including many different animal species. Since the disease can lead to death in young animals in particular, it is the cause of significant economic losses for farm animals worldwide (Levine, 1985).

In addition, there have been clinical cases of coccidiosis where high concentrations of ammonia, CO<sub>2</sub> and humidity have been found due to lack of aeration in pens and groups or accumulation of faeces on the ground due to improper slatted flooring (Grafner *et al.*, 1985). Cicek *et al.*, (2007) recorded that younger animals (27.23 %) have higher coccidial infection prevalence than older animals (15.65 %). While coccidiosis is unique to the host, at the same time, each host can be infected with many species of *coccidia* (Andrews, 2002). Stressed

conditions such as poor sanitation, poor nutrition and overcrowding decrease the resistance of animals, which may increase coccidial infections (Oluwadare *et al.* 2010). In animals held in overcrowded and enclosed environments, coccidiosis is more likely to occur (Abebe *et al.*, 2008). The principal causes of transmission of *Eimeria* are also fecal contaminated feed and water (Taylor *et al.*, 2007). Coccidiosis is the normal outcome of diarrhoea and dehydration and lead to death. (Pilarczyk and Balicka-Ramisz, 2004).

## 7. Review in the previous studies Distribution of *Eimeria* species in different area of Iraq and word.

In Iraq, a research conducted by Sabaa (1989) was conducted in Baghdad, where 12 species of the genus *Eimeria* were described as *E. Zuerni*, diagnosed with *E. Cylindrical*, with *E. brasiliensis*, *E. bukidnonensis*, *E. auburnensis*, *E. Bovis* *E. alabamensis*, *E. Canadensis*, *E. subspherca*, *E.ellipsoidalis*, *E. Bareillyi* and *E. Wyomingensis*. Khawla Hussien Sabbar recorded infection rate with *Eimeria* spp was (53.9 %) in AL-Qadisiyah Province, Iraq.

Arrive on. Bastianetto *et al.*(2007) and Antonio *et al.*(2009) have confirmed infection with *Eimeria* spp Water Buffalo in Brazil. Nalbantoglu *et al.*,(2008) has confirmed infection with *Bubalus Bubalis* (Coccidian Species in the Water Buffalo) in Turkey. Bahrami and Alborzi, (2013) and Jahanzaib *et al.*, (2017). Who reported coccidiosis prevalence in river buffalo in southwestern Iran and Pakistan, respectively.

## 8. Diagnoses and Identification of *Eimeria* oocysts

**A-Parasitological Examination:** A part of feces weighing 5-10 g was mixed with a small amount of saturated salt solution (NaCl) and triturated with a pestle and mortar. The mixture was then sieved into a floatation tube with a flat bottom, filled to the brim with a saturated salt solution, and covered with a glass slide. After 20 minutes, the slide was jerked out, rotated, and covered with a cover slip before being inspected under a microscope at 10x and 40x for the presence of *Eimeria* oocysts.

Different *Eimeria* oocysts were photographed, and micrometry was performed using a trinocular digital microscope.

**B-Sporulation of *Eimeria* Oocysts:** In a Petri dish, a 2.5 percent potassium dichromate solution was applied to each positive faecal sample and thoroughly mixed with a wooden applicator. To enable sporulation, each Petri dish was placed in a BOD incubator set to 28°C. Following that, the oocyst culture was thoroughly mixed with the aid of a Pasteur pipette every 24 hours, and a drop of the culture was examined under the microscope to determine the sporulation. Sporulation of oocysts was completed after 17 days. The Petri dish containing oocysts was stored in a refrigerator at 4°C until needed.

**C-Identification of Eimeria Oocysts:** The identification of different oocysts was done based on the morphological features of the sporulated oocysts (size, shape, colour and texture of oocyst wall, presence or absence of micropyle, polar cap) and time of sporulation with the help of taxonomic keys (Soulsby, 1982; Kennedy and Kalka, 1987; Sommer, 1998).

**D- Molecular technique :** The development of molecular biology has added available tools to detect parasite molecules, which are important in Veterinary Diagnostic Parasitology (Zarlenga and Higgins, 2000). It technique have been proven useful for the species identification or classification of this genus to overcome the limitations of traditional methods and have furthermore demonstrated the phylogenetic position of each Eimeria spp. and host-parasite relationship by forming some Phylogentic clades (Zhao and Duszynski ,2001 and Morrison *et al* .,2004).

## 9. Treatment and prevention

In certain conditions, the prolonged presence of *Eimeria* oocysts is impossible due to the organisms' self-limiting life cycle. However, when reinfection happens in another species, this process is elongated. Medicines exist in infected animals and include medications such as sulfonamides, pyridinols, nitrobenzamides, nitrofurans, and others (constable and peter, 2016). The prevention of coccidiosis depends on the animals' successful feeding and housing characteristics. They need to have plenty of room and adequate, nutritious food. Their surroundings (away from any fecal contaminants) should be kept sanitary. When an animal becomes sick, the other animals should be isolated.

Another strategy is to expose a sporulated oocyst to young animals so that it gains immunity but not infection. If necessary, any extreme stress such as weaning, shipping, or shift in diet should be restricted (Ahmad *et al* .,2002). As is the case for other viruses, infection avoidance is much superior to attempting to monitor the spread of an epidemic that occurs.

## 10. Conclusion

The present study provided evidence that coccidia is widely prevalent in farms Iraq. The high prevalence of coccidian infection in farms indicates that it is necessary to carry out suitable control programs. Integrated strategies should be undertaken to eliminate potential risk factors in farms. Also, this work includes subjects such as the Eimerian life cycle and biological processes, as well as the best ways to use drugs and vaccines to prevent and treat coccidiosis. Although administration of live attenuated vaccines is currently the safest and



most successful method of treating coccidiosis, new technology can provide other options in the future and further decrease the prevalence and effect of *Eimeria* on vertebrate animals. In conclusion, coccidiosis is a serious and economically important disease.

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