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## Internal parasites that infected local rabbits

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### Abstract

Rabbits are animals affected by many different species of parasites, infection Lead to lower body weight gain compared with non-infected rabbits , while sever infection Lead to death , although rabbits are less likely to develop epidemic diseases, but they are exposed to diseases of care and malnutrition, as well as parasitic diseases . Turning to previous studies that dealt with the spread of internal parasites in rabbits such as (*Giardia*, *Cryptosporidium*, *Eimeria sp.*, *Cystecercus pisiformis*, *Passalurus ambiguous*). The current study aimed to defined of intestinal parasite in rabbit. Despite, the few of research on this subject for this study of intestinal parasites that Infection of rabbits and suggestion development of a database of studies of internal parasites affecting rabbits.

**Keywords:** Rabbits; Intestinal parasites; *Giardia*; *Eimeria*; *Cryptosporidium*

### 1. Introduction

Rabbits are one of the most common laboratory animals, used worldwide in experiments to evaluate different biological parameters, this animal is either conventionally maintained in animal facilities to be used in scientific research or is also available in pet shops and in backyard colonies for commercial purposes [1]. Rabbits are susceptible to a number of parasites [2]. Among the parasitic diseases of rabbits those which deserve special attention are coccidiosis, ear mange or ear canker, skin mange, and stomach-worm diseases. The common results are weakness, emaciation, wasting, and death. Other parasitic affections, such as irritations caused by fleas, lice, and intestinal worms of various sorts, while not commonly producing very marked symptoms in infested animals, may gradually render them weak and unthrifty, making them more susceptible to other diseases as a result of their lowered vitality. Internal parasites of rabbits include very minute organisms known as protozoa. Worms occurring in rabbits are of three kinds, namely, tapeworms, flukes, and roundworms. Tapeworms occur in rabbits as adults in the intestine and as larval forms, known as bladder worms, in various locations in the body outside the alimentary canal. Flukes occur in rabbits in the small intestine and in the liver. Roundworms are slender, cylindrical worms, and those in domestic rabbits occur in the digestive tract, including the stomach, small intestine, large intestine, and cecum, and also in the lungs [3].

### 2. *Eimeria* spp

Various *Eimeria* species can infest the intestine or bile ducts of rabbits. Young rabbits are particularly susceptible to intestinal coccidiosis, Coccidiosis is one of common diseases in rabbits which is caused by protozoan parasites [4]. So far at least 15 species of *Eimeria* in rabbit have been identified. Of these species of coccidiosis affecting rabbits, *E. stiedae* is the only one that invades the liver [5; 6]. The other species, namely *E. media*, *E. magna*, *E. irresidua*, *E. piriformis*, *E. exigua*, *E. intestinalis*, *E. coecicola*, *E. neoleporis*, *E. nagpurensis*, *E. leporis*, *E. flavescens*, *E. matsubayashii* and *E. perforans* parasitize the small intestine [7]. These coccidians canlead to retarded growth, diarrhoea, animals can develop bloat

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and appear dull and lose their appetite. In bile duct coccidiosis, severe infestation leads to a reduction in liver function. Affected animals are apathetic, lose weight, and are constipated. Some animals may also develop fever and become icteric [8; 9].

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### 3. *Giardia duodenalis*

Several species of *Giardia* have been named after the host species in which they were found. Others recognize only five morphologically distinguishable species. These include *Giardia duodenalis* (Syn. *G. intestinalis*, *G. lamblia*), which infects humans and other mammals; *G. muris* of rodents; *G. psittaci* and *G. ardeae*, both of which infect birds; and *G. agilis*, which is found in amphibians [10]. Genetic analyses reveal considerable heterogeneity within *G. duodenalis*, such that some genotypes eventually may be designated as distinct species [11]. A serious disease of rabbits has been described as being due to intestinal flagellates (*Giardia duodenalis*). These organisms occur in the small intestine and adhere firmly to the cell lining of the intestine [3]. *Giardia* spp. trophozoites are flattened, pear-shaped, and bilaterally symmetrical, with an adhesive disk on one side, two anterior nuclei, four pairs of flagella, and two axostyles [4]. *G. duodenalis* trophozoites are 9  $\mu$  to 21  $\mu$  long, 5  $\mu$  to 15  $\mu$  wide, and 2  $\mu$  to 4  $\mu$  thick. Cysts are oval, have four nuclei, and are 8  $\mu$  to 12  $\mu$  long and 7  $\mu$  to 10  $\mu$  wide [11]. *Giardia duodenalis* occasionally is found in rabbits. It also infects many other mammalian species, including dogs and cats, and is worldwide in distribution. It is one of the most common enteric parasites of humans and a frequent cause of diarrheal disease [12]. Cryptosporidium are intracellular extracytoplasmic parasites of the gastrointestinal tract. Replicative stages are located within the microvillus border of the host cell and protrude above its surface, rather than being located in the cytoplasm beneath the cell surface as is typical of coccidia in general [13]. Cryptosporidial oocysts contain four sporozoites, which are not contained within sporocysts [14]. Oocysts of *Cryptosporidium* spp. of mammals are similar in size and shape, ranging from 4.6  $\mu$  long by 4  $\mu$  wide (*C. felis*) to 8.4  $\mu$  long by 6.2  $\mu$  wide (*C. muris*) [14; 11]. *Cryptosporidium* spp. oocysts are rounded and measure 4.2 to 5.4  $\mu$ m in diameter. Sporozoites are sometimes visible inside the oocysts, indicating that sporulation has occurred. Staining of *Cryptosporidium* spp. oocysts can be variable. In particular, infections that are resolving can be accompanied by increasing numbers of non-acid-fast oocysts “ghosts” [15]. *Cryptosporidium cuniculus* was originally detected in rabbits and has been identified as an emerging human pathogen, but the occurrence, prevalence, and epidemiology in human and rabbit populations are poorly understood [16].

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### 4. Roundworms

Rabbits can become infected with a variety of worms and in many cases the adult worms are found in the gastrointestinal tract. Nematodes known to infect rabbits include *Passalurus ambiguus*. This is an oxyurid (or pinworm) commonly found in the caecum and large intestine of (domestic) rabbits. The presence of even relatively large numbers of pinworms is nonpathogenic. The adult worms measure up to 1 cm in length. Occasionally, some infections by *P. ambiguus* can cause rectal, anal and perianal irritation, rectal prolapse, restlessness and decreased weight gain. Diagnosis is by adhesive tape method or (rarely) coproscopy. Eggs are typically flattened along one side as for most oxyurid species. *Obeliscoides cuniculi*, *Graphidium strigosum* and *Trichostrongylus retortaeformis* are the most common species of gastrointestinal nematodes in wild rabbits, all with direct life cycles. In domestic rabbits, they are rarely found. [17].

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### 5. Tapeworms

The adult stage of several species of tapeworm can occur in the intestine of rabbits including *Cittotaenia ctenoides* and *Mosgovoyia pectinata*. They occur predominantly in wild rabbits but can occasionally be found in domestic rabbits. All have an indirect life cycle with free-living mites and other invertebrates as intermediate hosts. Rabbits can harbour the cystic stages of several adult tapeworms of dogs, the most common being *Taenia pisiformis* and *Taenia serialis*. The former causes liver, peritoneal or retrobulbar cysts (*Cysticercus pisiformis*) and the latter cystic lesions in muscle and subcutaneous tissue (*Coenurus serialis*). These cysts rarely cause health problems but can be surgically removed if necessary. Domestic rabbit infections originating from egg contamination from the faeces of urban foxes and other carnivores have been increasingly reported [18, 11].

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### 6. Review in the previous studies Distribution of internal parasites from Rabbits

Athraa (2014). who study the prevalence of gastrointestinal and blood parasites with some histopathological changes of local rabbits in Baghdad province, who found some intestinal protozoa (*Cryptosporidium* 17.5% and *Giardia* 5%). Whereas the pin worm *Passalurus ambiguus* recorded the infection rate of 10%. While the larvae of cestode (*Cysticercus pisiformis*) recorded an infection rate 38.75%. The following 10 *Eimeria* species in rabbits were recorded

in this study with the following infection rates: *E. perforans* 31.25%, *E. piriformis* 27.5%, *E. irresidua* 11.25%, *E. media* 17.5%, *E. flavescens* 28.75%, *E. coecicola* 13.75%, *E. exigua* 18.75%, *E. intestinalis* 23.75%, *E. magna* 28.75% parasitize the intestinal tract, and only one specie *E. stiedae* 17.5% parasitize the liver. As well as [20]. study has been carried out in order to investigate the presence of some endo and ecto parasites through the examination 30 of domestic rabbits of both sexes in 2-months to 2-years old, the results revealed that 23 were infected (76.6%). Oocysts of *Eimeria* spp. showed the highest percentage (73.9%) followed by the eggs of *Passalurus ambiguus* (52.1%) and Cestodes represented as our results diagnosed One species of larvae cestodes *Cysticercus pisiformis* at 8.6% in Mosul / Iraq [20]. No significant seasonal differences in the prevalence for any parasites were detected by [21] in Canary Islands (Spain). Also, their results showed that the percentage of infection with *Cysticercus pisiformis* was (38.75%), *Passalurus ambiguus* (10%) and *Eimeria steidae* (17.5%). According to the results of [22] study, 46.67% of 60 wild rabbits in East-Azerbaijan Province, north-west Iran, infected to endoparasites were distinguished and these endoparasites: *Passalurus ambiguus* 6(10%), *Cysticercus pisiformis* 2(3.33%), and *Eimeria steidae* 2(3.33%) were distinguished. This study has been carried out in order to investigate coccidiosis in the local breed rabbits. *Eimerial* infections have a worldwide distribution and are prevalent in a wide range of animals [4]. Fifteen specific rabbit-infecting *Eimeria* species have been demonstrated as yet [23;5] that are usually found in different anatomical regions of the intestinal epithelium of rabbit [24]. There are very few published data on the prevalence rate of *Eimeria* infection in wild or domestic rabbits [25]. Intestinal coccidia of the genus *Eimeria* were the most common protozoan parasites observed during the study [26]. In Egypt was recorded an overall prevalence of 70% (70/100) [27]. While [28] found high significant ( $p < 0.01$ ) rate 96.70% and the percentages of infection in Baghdad and Arbil was 98.42 and 95.2% respectively. The results of [29] indicated that 26.87% rabbits were infected by *E. stiedae*. Of those, 12.5% and 14.37% were male and female, respectively. The prevalence of *E. stiedae* was significantly higher in weanling rabbits (5-8 months) (9.69%) than other age groups ( $P < 0.05$ ). In adult rabbits (>12 months), *E. stiedae* was low and may serve as carrier (3.75%). There was no significant difference in the prevalence of *E. stiedae* between male and female rabbits ( $P > 0.05$ ). [6]. study records the most important coccidian parasite of domestic rabbits, *E. steidae* in the Eastern Province of Saudi Arabia. In general, 32.24% of examined rabbits were infected with *E. stiedae*. This reported that the rate of infection was considered high compared with other studies in Saudi Arabia, where there seven *Eimeria* species were reported from the central, eastern and western regions, but none of them was *E. stiedae* [30]. Also [31]. in their study ectoparasites and endoparasites of new zealand white rabbits from north west of iran they found the prevalence of Nematoda: *Passalurus ambiguus* 54%, *Trichostrongylus retortaeformis* 42%, *Nematodirus leporis* 32%, Cestoda: *Cysticercus pisiformis* 26%, Protozoa: *Eimeria steidae* 44%, *E. magna* 30%, *E. media* 12% and Arthropoda: *Sarcoptes scabiei* 18% and *Cheyletiella parasitivorax* 38%. No significant difference was recorded in infection rate between male and female rabbits. [32] recorded the infection rates of *Cryptosporidium* and *Giardia* were 2.38% (9/378) and 7.41% (28/378), respectively. Also Marhoon et al [33] in their study for Parasitic Infection in Wild Rabbits *Oryctolagus cuniculus* they found the protozoan *Eimeria* sp. (61.82%), *Giardia* sp. (16.36%) and *Cryptosporidium cuniculus* (38.18%), and the larva stage *cysticercus pisiformis* (54.55%) and finally the nematodes *Passalurus ambiguus* (32.73%).

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## 7. Conclusion

Rabbits are exposed to various parasitic infections during their lifetime. They act as intermediate or final hosts for these infections. Infection lead to lower body weight gain compared with non-infected rabbits, while sever infection lead to death. The study's advantage is a database on which researchers rely to analyze the types of internal parasites affecting rabbits.

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## Compliance with ethical standards

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### Disclosure of conflict of interest

There was no conflict of interest in this study.

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