



Study of Some Hematological Parameters of Dogs Infected with Toxocariasis, before and after the Treatment with Tetramisole, in Al-Diwaniyah Governorate, Iraq

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Abstract

The presented investigation was carried out to understand the status of the blood parameters, before and after deworming of *Toxocara* infection in dogs. For performing the study, 15 pet dogs were recruited from some residential areas in Al-Diwaniyah Province, Iraq. These dogs were exposed to fecal - microscopic - based detection of *Toxocara* eggs and hematological based evaluation of white blood cell (WBC), red blood cell (RBC) and differential counts before and 10 days after the treatment with tetramisole. The helminthes eggs in the feces of dogs were detected by flotation method. In case of egg detection, deworming was carried out with tetramisole. The results revealed that the egg number significantly ($p < 0.05$) decreased in all age groups (<2, 2 to <4, and ≥ 4 years old) after using the deworming drug. For the hematological features, WBCs and lymphocytes (LY) significantly ($p < 0.05$) decreased, while the granulocytes (GR) and RBCs significantly ($p < 0.05$) increased after utilizing the anthelmintic drug. No changes were detected at the hemoglobin (HB) levels and platelets (PLs) after the use of tetramisole. The results may indicate a strong deworming effect of tetramisole against *Toxocara spp.* adult worms, that led to decrease the egg counts in the feces of the studied dogs, accompanied with the correction of the hematological picture regarding WBCs, LY, GR, and RBCs.

Keywords: Dogs, Diwanyiah province, Hematological parameters, Tetramisole, *Toxacara spp.*

دراسة بعض المعايير الدموية للكلاب المصابة بطفيلي التوكسوكارا قبل وبعد العلاج بالتراميزول في محافظة الديوانية، العراق.

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الخلاصة

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تم إجراء البحث لفهم حالة معايير الدم، قبل وبعد علاج الإصابة بطفيلي التوكسوكارا في الكلاب. لإجراء الدراسة تم جمع 15 كلب من بعض المناطق السكنية في محافظة الديوانية بالعراق. تم فحص براز هذه الكلاب للكشف المجهرى لبيض التوكسوكارا وتقييم دمي لكرات الدم البيضاء وخلايا الدم الحمراء والتعداد التفاضلي قبل وبعد 10 أيام من العلاج بالتيتراميزول.

تم الكشف عن بيض الديدان الطفيلية في براز الكلاب بطريقة التعويم. في حالة اكتشاف البيض، تم إجراء التخلص من الديدان باستخدام التيتراميزول. أظهرت النتائج أن عدد البيض انخفض معنوياً ($p < 0.05$) في جميع الفئات العمرية (أصغر من 2 سنة، سنتان إلى أقل من 4 و 4 سنوات وإكبر) بعد استخدام عقار التخلص من الديدان.

بالنسبة للخصائص الدموية، انخفضت خلايا الدم البيضاء والخلايا الليمفاوية ($p < 0.05$) بشكل ملحوظ ($p < 0.05$)، بينما زادت الخلايا الحبيبية وكرات الدم الحمراء بشكل ملحوظ ($p < 0.05$) بعد استخدام دواء الديدان. لم يتم الكشف عن أي تغييرات على مستويات الهيموجلوبين والصفائح الدموية بعد استخدام التيتراميزول.

قد تشير النتائج إلى تأثير قوي للتخلص من الديدان من التيتراميزول ضد الديدان البالغة لطفيلي التوكسوكارا، والتي أدت إلى انخفاض تعداد البيض في براز الكلاب المستخدمة في البحث، مصحوبة بتصحيح الصورة الدموية المتعلقة بالكرات البيضاء، والخلايا اللمفاوية، والخلايا الحبيبية وكرات الدم الحمراء.

1. Introduction

Toxocariasis is a common zoonotic disease that has a devastating effect on the lives of those living in low-income areas all over the globe. *Toxocara canis* and *Toxocara cati* are the two species of nematode parasites that cause the illness in dogs and cats respectively, and a severe disease in humans. These parasitic roundworms live in the intestines of dogs and cats where they emit *Toxocara* eggs in their feces [1]. These roundworms are an excellent examples of an animal-to-human transmission of a parasite. *Toxocara spp.* is instead disseminated to people by environmental contamination. Dogs and cats serve as an essential part in this process, particularly in reduced-income and rural areas. Due to the reason that humans are only accidental hosts for these worms, *Toxocara spp.* larvae cannot mature into adult worms within the human intestine [2-4].

Toxocara spp. eggs can be found in soil, contaminated food or in the tissues (encapsulated larvae) of paratenic hosts, such as cows, sheep and chickens that have been poorly cooked. Larvae hatch from the embryonated eggs in the small intestine, infiltrate the intestinal wall, acquire passage into the circulatory system and then spread across the body, resulting in a strong inflammatory reaction and diverse clinical manifestations, according to the organ affected [5-7]. However, despite the fact that the *Toxocara* parasite has a recognized predisposition to produce extra-intestinal diseases, infection in humans may be completely asymptomatic. Four distinct clinical types of toxocariasis may cause major health complications. The medical and public health effects of this illness may be underestimated because of its non-specific symptoms. Toxocariasis can be identified depending on the patient's symptoms. Although a laboratory examination is necessary to increase the validity of the diagnosis [8, 9].

Almost 100 countries was infected, with the first human infection had occurred in 1950. Toxocariasis has recently attracted worldwide awareness and has been classified by the US Centers for Disease Control and Prevention (CDC) as one of the five most ignored parasitic illnesses. In-depth investigations of *T. canis* molecular features have been made possible by the recent sequenced genome and transcriptomic analysis. Also, new diagnostic biomarkers have been established for understanding the parasite genetic diversity. Toxocariasis is becoming more widely recognized as a public health problem, and these accomplishments are a reflection of this scientific and medical attention [10, 11].

To measure some blood parameters before and after the treatment with tetramisole, the present investigation of the toxocariasis infection in dogs was conducted in Al-Diwaniyah Governorate, Iraq.

2. Materials and Methods

2.1. Samples and Examination Tests

For performing the study, 15 pet dogs were recruited from some residential areas in Al-Diwaniyah Province, Iraq, during the year 2021. These dogs were exposed to fecal - microscopic based detection of *Toxocara spp.* eggs and hematological based evaluation of WBCs, RBCs and differential counts before and 10 days after treatment with tetramisole. The helminth eggs in the feces of dogs were detected by the flotation method [8]. Deworming was carried out with tetramisole.

The tetramisole was used in oral dose of 20 mL/kg. Concentrations used for the treatment was 10%, each envelope contained 30 gm dissolved in 300 ml of water for preparing 10% concentration. The dose was used according to following formula:

$$\text{Volume} = \frac{\text{Specific dose} \times \text{Body weight}}{\text{Percentage} \times 10} \text{ ml}$$

The results of current study were examined by SPSS program (version 25) using Stander error and a P values of were considered to report statistical significance ($P < 0.05$).

3. Results

The findings regarding the eggs of the parasite showed that they were round and larger (up to 75 μm) than fertilized eggs that belong to other *Ascaris* family members. The egg outer shell was thick, dense, pitted, thimble-surface-like with light brown to dark brown in color.

The results revealed that the egg number significantly ($p < 0.05$) decreased in all age groups (<2, 2 - 4 and >4 years old) after using the deworming drug (Table 1).

Table 1: Effectiveness of tetramisole deworming of domestic dogs from *Toxocara spp.* (Mean \pm SD)

Age (Years)	Number	Number of <i>Toxocara spp.</i> eggs/gram of feces	
		Before administration of tetramisole	After Administration of Tetramisole
<2	4	186.5 \pm 20.2	38.5 \pm 24.2
2-4	6	173.2 \pm 31.2	36.5 \pm 20.6
>4	5	146.5 \pm 20.2	41.1 \pm 10.2

For the hematological features, WBCs and lymphocytes (LY) significantly ($p < 0.05$) decreased, while the granulocytes (GR) and RBCs significantly ($p < 0.05$) increased after utilizing the antihelmintic drug. No changes were detected in hemoglobin (HB) levels and platelets (PLs) after the use of tetramisole (Table 2).

Table 2: Hematological parameters of infected 2 dogs before and after treatment for a 10-day treatment period (Mean \pm SD)

Hematological parameters/ Treatment status	WBC x 10 ⁹ /L	LY x 10 ⁹ \L	GR x 10 ⁹ /L	RBCs x 10 ¹² /L	HB G/L	PLs x 10 ⁹ \L
Before	14 ±3.4	1.9±0.95	3.2±2.9	9 ±3.1	170.0±32. 2	610.0±134 .1
After	8.6±2.4	0.7±3.4	8.1±3.4	11.0±3.4	170.0±3.4	610.0±84. 1

4. Discussion

Imidazothiazoles like tetramizole, pyrimidine and phenothiazine affect the depolarization and contraction of the neuromuscular junctions. In order to be effective, an anthelmintic with this mechanism of action must be very selective. Parasitic helminthes are responsible for the majority of animal diseases and mortality which has an impact on human health by decreasing the amount of animal protein available for consumption [12].

The current study results revealed strong effectiveness of the tetramisole in decreasing the egg numbers after 10 days of treatment. This finding agrees with that by Gabriel *et al* [12] who tested the effectiveness of levamisole, an isomer of tetramisole, an anthelmintic drug on dog helminthes. At a therapeutic dosage of 8 mg kg⁻¹, Gabriel *et al* [12] research reported that the effect of levamisole on 15 dogs naturally infected with *Toxocara* was strong in deworming these dogs. The present finding also matches up with that by Chidumayo [13] who reported that canine toxocariasis was widespread in Sub-Saharan Africa, and frequent deworming programs are needed to enhance dog health and reduce the danger to people health. Some researchers used a single 7.5 mg kg⁻¹ dosage of levamisole, and although it was effective in deworming against *Toxocara spp.*, the drug should be given 10 to 30 days in order to achieve optimal therapeutic effectiveness [12]. In the research region regular deworming of dogs using a good anthelmintic is followed for some pet dogs but not for all of them. With the presence of stray dogs it makes the spread of the intestinal worms, especially *Toxocara*, a major health issue for both animals and humans. The frequency of deworming was found to be needed to control intestinal helminths in dogs. However, some high spread of these worms was found even with the presence of regular deworming steps which could be due to different worm loads, management systems, dog breeds and the amount of anthelmintic drug resistance, which are potential factors in the occurrence of this spread [14].

The study revealed some probable corrections to the status of some blood parameters which is in accordance with those by Kumar *et al* [15] who reported that 24 infected dogs were randomly chosen for a haemato-biochemical profile to examine changes in the HGB, erythrocytes and lymphocytes and found that 29% of the population was determined to be affected. When it came to the parasite infestation, puppies were worse than adults in getting the *Toxocara* infection and the sickness was more common in the winter. The authors also revealed that the dogs infected with *T. canis* displayed anemia and leukocytosis [15].

Chai *et al* [16], in users of levamisole-contaminated cocaine, found that the total WBC count, absolute neutrophil count and absolute lymphocyte count faced no changes in the levamisole-treated group. However, only one neutropenic patient was recorded in the levamisole-exposed group. Kassim *et al* [17] revealed that a user of cocaine showed agranulocytosis which was later attributed levamisole-adulterated cocaine. The reason that this study did not show decreases in the granulocytes is due to the short use of levamisole for the treatment of infected dogs in the opposite to that from the cocaine users that they may have been exposed to levamisole for long period of time.

5. Conclusion

The results of the current study may indicate a strong deworming effect of tetramisole against *Toxocara* adult worms that led to decrease the egg counts in the feces of the studied dogs when accompanied with the correction of the hematological picture regarding WBCs, LY, GRA and RBCs.

6. Ethics Statement

Institutional guidelines for the care and use of animals were strictly followed. All procedures carried out in the study and the animals involved were in accordance with the ethical standards of the institution or practice in which the study was conducted (Date 06/15/2021).

7. Financial support

None.

8. Conflict of Interest

There was no conflict of interest among the authors in presenting this article for publication.

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