SAR Journal of Pathology and Microbiology

Abbreviated Key Title: *SAR J Pathol Microbiol*
Home page: https://sarpublication.com/journal/sarjpm/home
DOI: https://doi.org/10.36346/sarjpm.2025.v06i03.006

OPEN ACCESS

ISSN 2707-7756 (P)
ISSN 2709-6890 (O)

Original Research Article

Evaluating the In Vitro Efficacy of Potassium Dichromate Extract on Developing *Toxocara spp*. Eggs in the Babylon Province, Iraq

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Article History: | Received: 11.04.2025 | Accepted: 17.05.2025 | Published: 20.05.2025 |

Abstract: *Toxocariasis* is a parasitic zoonosis with worldwide distribution that affects both cats and dogs. Caused by *Toxocara spp*. Is a globally prevalent parasitic roundworm. It is a member of the *Ascarididae* family, which includes one of the most common intestinal parasites. The aim of this study was to investigate the prevalence of *Toxocara spp*. in a total of 150 cats fecal sample and eggs of *T. spp* in different stages development were incubated with Potassium Dichromate K2Cr2O7 extract in different concentrations 2.5% and 5% in vitro from two major breeds from Babylon (75 pets cats and 75 stray cats breeds). Therefore, this is the first parasite investigation as well as molecular characteristic analysis to be conducted in Babylon on pets and stray cats. After conducting a comprehensive examination, the clinical indicators exhibited by these animals were reported. In order to examine parasite eggs under a microscope, we collected feces from each animal. A small sample of faeces was also subjected to molecular analysis. Our investigation found that infestation rates, according to the microscopic method, were 24.6% (21% in stray and 16 % in pets cats). Microscopic investigations of the eggs incubated with Potassium dichromate extract demonstrated restricted larval growth at doses of 2.5% for 14 days but in concentaration 5% eggs developed faster to larvae L3 s, Subsequently, stray cats residing in hilla exhibit an elevated prevalence of *Toxocara.spp*. Therefore, it is crucial to develop effective methods or identifying and eliminating *T.spp* parasites in pet and straycats, while simultaneously prioritising public education on animal and human health. The findings highlight the imperative of preventive measures against toxocariasis due to its widespread occurrence. Recognising the inter connectedness of animal, environmental, and human health underscores the importance of deworming cats, promoting hygiene, and educating the public to mitigate the risks of this zoonotic condition. Protecting feline health benefits cats and reduces the likelihood of human transmission, creating a positive outcome for both.

Keywords: *Toxocara Spp* ,Potassium Dichromate K2Cr2O7, Toxocariasis, *Cats*, Zoonotic Nematodes.

INTRODUCTION

Toxocara species are common ascaridoid nematodes of cats and dogs throughout the world. They are causative agents of toxocariasis, a zoonotic parasitic disease in human with worldwide distribution. The most widespread species of *Toxocara* in dogs and cats are *Toxocara canis* and *Toxocara cati*, respectively [1]. Numerous paratenic hosts such as with humans can be infected with *Toxocara spp* eggs, this pathogen has a life cycle that begins with the ingestion of infective eggs (L3), which are present in contaminated soil or feces of infected cats. These eggs can hatch and develop into adult worms and grow up to 10 cm in length in small intestine of dogs and cats, with females capable of producing hundreds of thousands of eggs daily. Moreover, human infections are more commonly reported in children, especially those of low age [2, 3]. Infectious larvae can be generated by two capacities to release proteins (MUC-120) that support it to pass through the intestinal wall and then enter the journey and expand many tissues, including the lungs and liver [4]. Infected water and food may be transferred by zoonotic agents, with extensive minor linkages to animal secretions [5]. Due to the close association and proximity of man with his domestic animals (in particular, cats), there exist possibilities of human infection with

helminthes parasites of these animals. Although the larvae of non-human acaroids, such as *T. cati larvae*, are capable of limited development in human hosts, this may, in some circumstances, lead to serious public health problems, visceral larva migrants (VLM) or ocular larvae migrants (OLM) [6]. Keeping cats as pets, touching and playing with these animals, by children, free entry of dogs and cats into farmland and public parks, and non-compliance with sanitation in eating nonwashed vegetables are among the most important risk factors associated with toxocariasis [7]. Furthermore, their infection can be detected in cats using clinical elements, and microscopy. Clinical signs of *Toxocara spp.* infection may include vomiting, diarrhoea, abdominal pain, weight loss, and poor body condition [8]. A microscopic study could provide information about the morphological characteristics of *T. spp.* in feline breeds (pets and stray). This can involve examining faecal samples from infected cats for the presence of *T. spp.* eggs [8]. As previously reported, *T. spp.* infection is common in some Iraqi cats [9], found a 40% prevalence in Mosul [16], reported a 12.9% incidence in Baghdad. Reported a 31% in Al-Anbar (15 in Shirazi and 16 in Himalayan) [10], there is no molecular data about this disease in babylon, generally, as well as no epidemiological study of it among household cats in Babylon province; therefore, this research was conducted based on clinical, and microscopic characterizations.

MATERIALS AND METHODS

1. Collection of Samples:

The procedure outlined below was used to collect 150 fecal samples were taken freshly from pet and stray cats from several private veterinary clinics and the streets in Babylon between October of 2024 to March of 2025(75 fecal samples from the pet cats and 75 fecal samples from stray cats). There were three age group (from 1 month to 6 months, from 7 to 12 month and more than one years old) for both stray and domestic cats in the 75 samples of stray cats (30 males and 45 females) and 75 samples of pets cats (39 males and 36 females) from streets in different area in Babylon. About five grams of fecal samples are placed in sterile plastic container with the date, age, and sex written on it. The samples are then sent to the parasitology lab at the Al-Qasim Green University College of Veterinary Medicine Department of Parasitology molecular and microscopically analysis.

2. Laboratory Examination:

2. 1. Direct Wet Smear Method:

put a slight quantity of feces in plastic container with some tap water and mixing it fully by sticks, The mixture was then combined, filtering with guza take one to two drops of liquid on glass slide and a cover slid before it exanimated under a light microscope at (10X and 40X). The stained smears with lugols iodine were prepared by mixing with drop of lugols iodine stain on the glass slid to identify *Toxocara. sp* eggs [25].

2.2. Sedimentation Technique

Fecal samples that have been properly homogenized range from 3 to 4 grams of feces were put in a beaker along with some tap water. The mixture was then combined, sieved, and the liquid was poured into 10 ml test tubes that had been cleaned. The mixture was centrifuged for three minutes at 1000 for time, removing the supernatant. A drop of the solution was removed from the bottom using a pipette, placed on a slide, covered with a cover slip, and inspected under 40X and 100X magnifications [26].

2.3. Potassium Dichromate 2.5% and 5%

3 to 4 grams of feces were put in a beaker along with some tap water. The mixture was then combined, sieved, and the liquid was poured into fifteen ml test tubes that had been cleaned. The mixture was centrifuged for three minutes at 1000 for time 5 minuet, removing the supernatant. 2-3 ml of the solution was removed from the bottom using a pipette, placed on a petri dish preserving in potassium dichromate (K2CR2O7) at 2.5% and 5%. In incubator at temperature (37-37.5 c) for (7-14 day) according to [11]. Potassium Dichromate 2.5% was prepared by dissolved 25 gram of potassium dichromate in 1 liter of distilled water [12].

2.4. Statistical Analysis

Statistical analysis was performed using the Statistical Package for Social Science (SPSS) version 27 for window software and Microsoft Excel 2010. Differences between groups were assessed using the chisquare test. All of these statistical analyzes considered the *P*-value below 0.05 level [26].

RESULTS

Detection of *Toxocara Spp*. Using a Microscopic Technique

150 fecal sample were randomly collected freshly from domestic and stray cats from several private veterinary clinics and the streets in Babylon / Iraq and subjected to microscope examination. The microscopic examination of faecal samples revealed that 37 (24.6%) were positive for *Toxocara spp* Eggs detection in faeces table (1) and Figure (1).

Efficacy of Breed (Pet and Stray Cats) On Infection Rate of *Toxocara Spp*

Prevalence of *Toxocaras spp.* According to breed of cats (pets and stray cats) our data revealed that stray cats have highest infection rate at 28%(21/75) while the lowest was 21.3%(16/75) in pets cats. Shown in (Table2) and Figure (2).

Efficacy of Sex (Pet and Stray Cats) On Infection Rate of *Toxocara Spp*

Stray Cats:

Prevalence of *Toxocaras spp.* Infection According to sex of stray cats our data revealed that male cats have highest infection rate at 30%(9/30) while the lowest was26%(12/45) in female cats.shown in (Table3).

Pet Cats:

Prevalence of *Toxocaras spp*. Infection According to sex of pet cats our data revealed that male cats have highest infection rate at 25.6%(10/39) while the lowest was16.6%(6/36) in female cats. Shown in (Table 4).

Efficacy of Age Group (Pet and Stray Cats) On Infection Rate of *Toxocara Spp*

Stray Cats:

Prevalence of *Toxocaras spp*. Infection According to age of stray cats our data revealed that age(1-6 month) have highest infection rate at 39.2%(11/28) while moderate31.3%(6/31) in age (7-12 month) and the lowest was 19.3%(5/16) in age more than year shown in (Table 5).

Pet Cats:

Prevalence of *Toxocaras spp*. Infection According to age of pet cats our data revealed that age (1-6 month) have highest infection rate at 36.8%(7/19) while moderate23 .3%(7/30) in age more than year and the lowest7.6% (2/26) was in age (7-12 month) shown in (Table 6).

Efficacy of Potassium Dichromate 2.5% and 5% on Development Egg of Toxocara Spp in *Vitro*

Potassium dichromate (K2Cr2O7) in 2.5%: Eggs that incubated in potassium dichromate 2.5% have no effect on day (1-10) but larva developed in larva 3 in 14 days (Figure 3).

Potassium dichromate (K2Cr2O7)in 5%: Eggs that incubated in potassium dichromate 5% have little effect on day (1-3) but larva developed in larva 3 in 7 days (Figure 4).

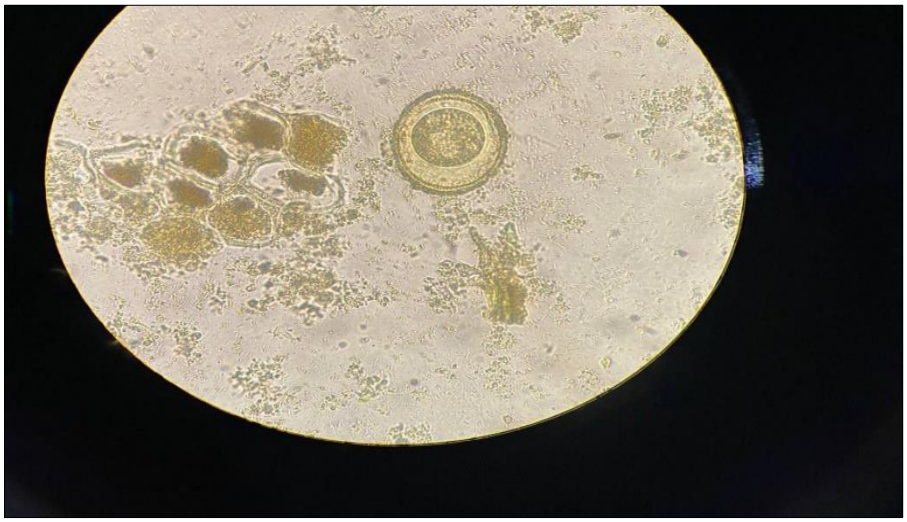

Figure 1: Eggs of *Toxocara Spp*, ("golf ball" appearance) isolated from infected cats by sedimentation method under a microscope at a magnification of 40X

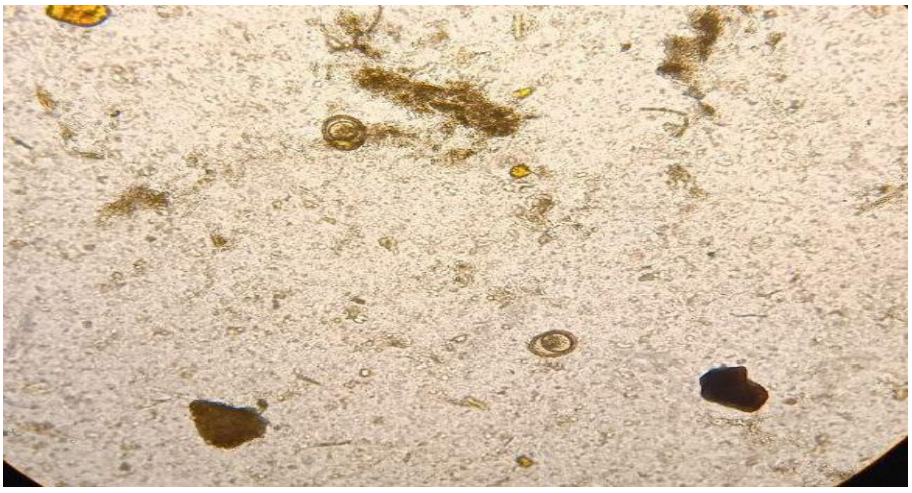

Figure 2: Eggs of *Toxocara Spp* isolated by direct smearstained smears with lugols iodine under a microscope at a magnification of 10X

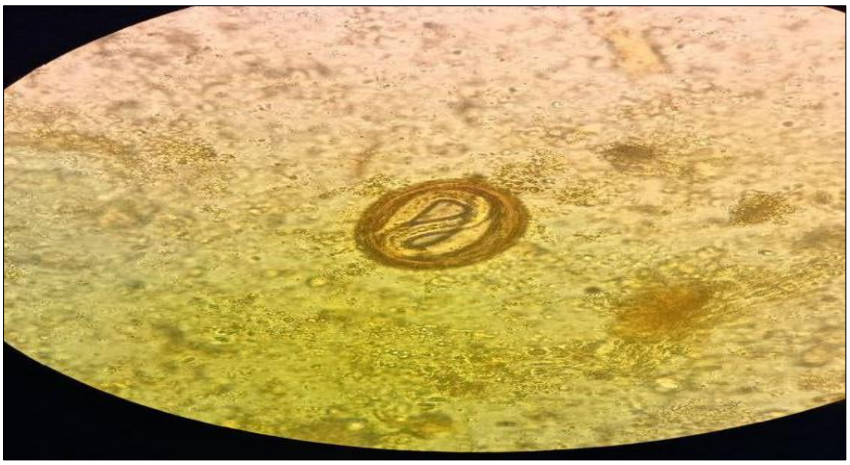

Figure 3: Larva 3 after incubating the eggs in potassium dichromate 2.5% for 14 days, under a microscope at a magnification of 40X

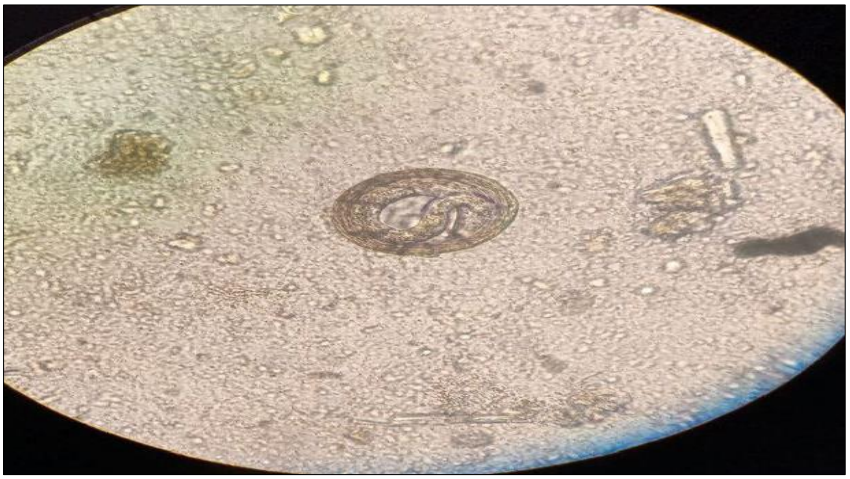

Figure 4: Larva 3 after incubating the eggs in potassium dichromate 5% for 7days, under a microscope at a magnification of 40X

Table 1: Total Prevalence of *Toxocara spp.* infection in cats in Babylon province

Examined samples	Infected samples	Infection rate
150 fecal sample	37	24.6%

Table 2: infection rate of *Toxocaras spp*.in cats according to breed of cats

Host	No. of examined samples	Positive samples	Percentage %	X2	P-value
Stray cats	75	21	28%	0.54	0.5
Pet cats	75	16	21.3%		
Total	**150**	**37**	**24.6%**		

Table 3: Prevalence of *Toxocaras spp*. Infection According to sex of stray cats

Sex	No. of examined samples	Positive samples	Percentage %	X2	P-value
Male	30	9	30%	0.05	0.8
Female	45	12	26%		
Total	**75**	**21**	**28%**		

Table 4: Prevalence of *Toxocaras spp*. Infection According to sex of pet cats

Sex	No. of examined samples	Positive samples	Percentage%	X2	P-value
Male	39	10	25.6%	0.58	0.4
Female	36	6	16.6%		
Total	**75**	**16**	**21.3%**		

Table 5: Prevalence of *Toxocaras spp.* Infection According to age of stray cats

Age	No. of examined samples	Positive samples	Percentage %	X2	P-value
(1-6 month)	28	11	39.2%	1.65	0.4
(7-12month)	31	6	19.3%		
More than year	16	5	31.2%		
Total	**75**	**21**	**28%**		

Table 6: Prevalence of *Toxocaras spp.* Infection According to age of pet cats

Age	No. of examined samples	Positive samples	Percentage %	X^2	P-value
(1-6 month)	19	7	36.8%	3.7	0.2
(7-12month)	26	2	7.6%		
More than year	30	7	23.3%		
Total	**75**	**16**			

DISCUSSION

The incidence of intestinal helminths in cats, both stray and domestic, by microscopic examination was 24.6% (37/150). The present study's results agreed with a recent study investigated the coprological detection of *Toxocara cati* in household Cats Breeds in the Al-Anbar region of Iraq. The findings revealed that the prevalence of infestation rates, according to the microscopy results, were 31% (15 in Shirazi and 16 in Himalayan) [10]. The results of this study's also agreed with total infection rate of *Toxocara cati* in baghdad region of Iraq. The total rat in domestic and stray cats was 23%(19% in domestic and 27% in stray cats), with a non-significant difference between domestic and stray cats [13]. The present study's results disagreed with a recent study investigated the coprological detection of *Toxocariasis* in the residential areas of the Kurdistan region of Iraq. The findings revealed that the prevalence of this parasite among stray cats was 47.62%, which is about four times higher than the infection rate observed in indoor cats, standing at 5.5% [14]. In addition, a recent comparative investigation was conducted to examine the prevalence of intestinal parasites in fecal samples obtained from both domestic and stray cats residing in Baghdad city. The study revealed a relatively low infection rate with 1.65% [15].

It likely that geographical variables and differences in detection methods may be account for the observed variations in *T. cati* prevalence among these studies. Based on the findings of [16], it has been observed that the occurrence of *Toxocara spp.* infection in feline is higher among stray cats that do not receive veterinary attention in comparison to cats that are owned by individuals. Furthermore, the previous data demonstrated a wide spectrum of prevalence rates, ranging from 5.45% to 67.5% in feral and free-ranging feline, as well as from 1.6% to 30.4% in domesticated cats [17].

The results are consistent with another study, which recorded an infection rate of 25% with *T. cati* in Brazil [18]. The current study's total infection rate was higher than what was previously documented in Mexico, which recorded 42.5% by flotation technique, and it was reported that 62.5% of Turkish have *T. cati* [19, 20]. In Estonia, 48.2% of cats were infected with *T. cati*; this rate was higher than the studies conducted in the neighboring country, Iran, where 42.6% were infected [21, 22]. In Russia, 16.7% of cats were infected with *T. cati*, whereas other studies found that 52% of cats were infected [23, 24].

The current study finding showed the eggs that were incubed in potassium dichromate (K2Cr2O7)in 2.5% and 5% developed faster due to K2Cr2O7 that has effect within cell cycle in the most chromate-sensitive part S phase perhaps on DNA/RNA synthesis and also interferes with processes necessary for progression through the G2 phase.This finding agreed with [27], while (28) documented an $K_2Cr_2O_7$ induces oxidative stress, cell proliferation, and cell survival of *Osteochilus vittatus* testis.

CONCLUSION

Cats are significant clinical reservoirs and carrier for zoonotic parasites. In Iraq, Babylon has a high incidence of *Toxocara spp*. detections. Compared to conventional methods, PCR is thought to be a more sensitive, accurate diagnostic procedure that confirms species identity.

Acknowledgments

The authors would like to thank the Al- Qasim Green University, College of Veterinary Medicine, Department of Parasitology, as well as the field technicians who have helped with the study.

REFERENCES

1. Despommier D. Toxocariasis: Clinical Aspects, Epidemiology, Medical Ecology, and Molecular Aspects. Clin Microbiol Rev. 2003; 16:265- 272.
2. Peter, D., Frans van, K., Alexander, S. and Paul, A.M. Role of pet dogs and cats in the transmission of helminthic zoonoses in Europe, with a focus on echinococcosis and toxocarosis, Veterinary Parasitology, 182, 41-53(2011).
3. Monteiro, M. F. M., Ramos, R. A. N., Calado, A. M. C., Lima, V. F. S., Ramos, I. C. do N., Tenório, R. F. L. and Alves, L. C. Gastrointestinal parasites of

cats in Brazil: frequency and zoonotic risk. Revista Brasileira de Parasitologia Veterinária, 25(2), 254–257 (2016).
4. Strube, C., L. Heuer and E. Janecek. 2013. Toxocara spp infections in paratenic hosts. Veterinary parasitology 193:375-389.
5. Hadi, A.M. and A.A. Faraj. 2014. Role of domestic cats Feliscatus as reservoir hosts of internal parasites and protozoa in Baghdad. Bull. Iraq Nat. Hist. Mus 13:89-94.
6. Woodruff, A.W., S.Y. Salih, D. Savigny, E.I. Baya and Shah, A. I. 1981. Toxocariasis in the Sudan. Annals. Trop. Med.J. Parasitol. 75, 559-561.Yamaguchi, N., D.W. Macdonald.
7. Lucio-Forster, A., Mizhquiri Barbecho, J. S., Mohammed, H. O., Kornreich, B. G. and Bowman, D. D Comparison of the prevalence of Toxocara egg shedding by pet cats and dogs in the U.S.A. Veterinary Parasitology, 5(2), 1–13 (2016)
8. Remesar, S., García-Dios, D., Calabuig, N., Prieto, A., Díaz-Cao, J. M., López-Lorenzo, G., López, C., Fernández, G., Morrondo, P., Panadero, R. and Díaz, P. Cardiorespiratory nematodes and co-infections with gastrointestinal parasites in new arrivals at dog and cat shelters in north-western Spain. Transboundary and Emerging Diseases, 69(5), 3141-3153 (2022).
9. Al-Obaidi, Q.T. Prevalence of internal Helminthes in stray cats (Felis catus) in Mosul city, MosulIraqi. Journal of Animal and Veterinary Advances, 11(15), 2732–2736 (2012).
10. Akil Alshawi and Omar Alhayani . Molecular Detection and Prevalence of the *Toxocara Cati* Parasite in Household Cats Breeds in the Al-Anbar Province-Iraq., Egypt. J. Vet. Sci. Vol. 55, No. 6, pp. 1627-1636 (2024).
11. Conway, D.P. and Mckenzie, M.E. (2007). Poultry Coccidiosis: diagnostic and testing procedures. 3rd ed. Blackwell Publishing, Ames, Iowa: 164.
12. Mai, K., Sharman, P.A., Walker, R.A,. Katrib, M., Souza, D. and McConville, M.J .(2009). Oocyst wall formation and composition in coccidian parasites. Mem Inst Oswaldo Cruz; 104(2): 281-289
13. Alani ZK, Kawan MH. Prevalence and molecular analysis of *Toxocara cati* in Baghdad Province. J Adv Vet Anim Res. 2024 Jun 9;11(2):392-397. doi: 10.5455/javar.2024.k788. PMID: 39101072; PMCID: PMC11296162.
14. . Rashid, Z. M., Aziz, S. A., Ali, O. J., Kakarash, N. K. and Marif, H. F. Coprological detection of toxocariosis in domicile and stray dogs and cats in Sulaimani Province, Iraq.
15. Al-Taie, D., Ahmed, A. and Al-khayat, Fadia. A Comparative Study of Some Intestinal Parasitesin Faecal Samples of Domestic and Stray Cats in Baghdad, Iraq. *Comparative Parasitology*, 89(1), 31-35 (2022).
16. De Santis, A.C., Raghavan, M., Caldanaro, R.J., Glickman, N.W., Moore, G.E., Lewis, H.B., Schantz, P.M. and Glickman L.T. Estimated prevalence of nematode parasitism among pet cats in the United States. *Journal of the American Veterinary Medical Association*, 228(6), 885–892 (2006).
17. Lucio-Forster, A., Barbecho, J.S.M., Mohammed, H.O., Kornreich, B.G. and Bowman, D.D. Comparison of the prevalence of Toxocara egg shedding by pet cats and dogs in the U.S.A. *Veterinary Parasitology: Regional Studies and Reports*, 1,5,1–13(2016)
18. Labarthe N, Serrão ML, Ferreira AMR, Almeida NK, Guerrero J. A survey of gastrointestinal helminths in cats of the metropolitan region of Rio de Janeiro. Brazil Vet Parasitol. 2004;123(1–2):133–9.
19. Martínez-Barbabosa I, Tsuji OV, Cabello RR, Cárdenas EMG, Chasin OA. The prevalence of Toxocara cati in domestic cats in Mexico city. Vet Parasitol. 2003;114(1):43–9.
20. Yaman M, Ayaz E, Gül A, Muz MN. Investigation of helminth infections of cats and dogs in the Hatay province. Turk Parazitol Derg. 2006;30(3):200–4.
21. Talvik H, Moks E, Mägi E, Järvis T, Miller I. Distribution of Toxocara infection in the environment and in definitive and paratenic hosts in Estonia. Acta Vet Hung. 2006;54(3):399–406.
22. Zibaei M, Sadjjadi SM. Trend of toxocariasis in Iran: a review on human and animal dimensions. Iran J Vet Res. 2017;18(4):233.
23. Dantas-Torres F. Toxocara prevalence in dogs and cats in Brazil. Adv Parasitol. 2002;109:715–41.
24. Lukashev AN, Ruzina MN, Akhmadishina LV. Toxocara prevalence in dogs, cats and the environment in Russia. Adv Parasitol. 2020;109:801–17.
25. Rashid, Z. M., Aziz, S. A., Ali, O. J., Kakarash, N. K., & Marif, H. F. F. (2022). Coprological detection of Toxocariasis in domicile and stray dogs and cats in Sulaimani province, Iraq. Iraqi Journal of Veterinary Sciences, 36(4), 1047-1051.
26. Zhao, Z.-Y.; Li, M.-H.; Lyu, C.; Meng, X.-Z.; Qin, Y.-F.; Yang, X.-B.; Ma, N.; Zhao, Q.; Zhang, Y. and Jiang, J. (2022). Prevalence of *Giardia duodenalis* Among Dogs in China from 2001 to 2021: A Systematic Review and Meta-Analysis. Foodborne Pathogens and Disease, 19, 179-191
27. Bakke,O.,Jakobsen, K., & Eik-Nes, K. B. (1984). Concentration-dependent effects of potassium dichromate on the cell cycle. *Cytometry: The Journal of the International Society for Analytical Cytology*, *5*(5), 482-486.
28. Wijayanti, G. E., Mentari, D., & Habibah, A. N. (2025). Acute in Vitro Exposure of Potassium Dichromate on Oxidative Stress, Cell Density, and Cell Viability of Osteochilus Vittatus. In *E3S Web of Conferences* (Vol. 609, p. 02006). EDP Sciences.