

Serological Diagnosis of Toxoplasmosis in Household Cats in Egypt

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AIM: the aim of this study is to use serological diagnosis for rapid detection of *Toxoplasma gondii* infection among household cats. **Material and Methods:** 212 serum samples collected from household cats of different sex, breeds and age groups in urban and rural area of Giza Province. Samples were checked by rapid chromatographic immune assay (IC) for detection of IgM and IgG antibodies against *Toxoplasma gondii*. Statistical analysis of the obtained results were carried out using Chi-square test to study the effect of sex, breed and age on the results. **Results:** the IgM antibodies against *Toxoplasma gondii* were detected in 19 cats (8.96%), and IgG antibodies were detected in 63 cats (29.71%), the overall positive were 82 cats (38.67), the sero prevalence against *Toxoplasma gondii* was high in Egyptian Mau breed and in cats of over one year age. Statistical evaluation of the results proved that there were significant differences between different sex, different cat breeds and different age groups. **Conclusion:** This study concluded that the serological diagnosis by IC for detecting IgM and IgG against *Toxoplasma gondii*, is a rapid, accurate method for diagnosis of *Toxoplasmosis*

Keywords: Serological diagnosis, Toxoplasmosis, Cats, rapid chromatographic immune assay (IC), Egypt.

Introduction

Toxoplasmosis is an infectious diseases caused by protozoal parasite called *Toxoplasma gondii*, which is an intracellular coccidian of apicomplexan phylum. This disease is a major zoonosis [1], with worldwide distribution [2]. The role of domestic cats in spread of Toxoplasmosis is very critical because they are definitive host of this protozoal parasite where oocyte are shedded. All other mammalian hosts including human and birds considered as intermediate host [3].

After cats had infected, they shedded million of oocytes [4], consumption of food and water with shedded oocytes affect humans and livestock, leading to abortion, neonatal mortalities and other congenital complications in human and animals [5].

In spite of the infection can occurred congenitally or by consumption of meat of infected animals with *T. gondii*, several studies concluded that *T. gondii* infection cannot maintained in the surrounding environment without presence of cats [6].

In human populations where pet cats were in close contact, seroprevalence of IgM and IgG antibodies against *T. gondii* should delivered [7].

Serosurvey of *T. gondii* specific antibodies in cats is much needed as it assess level of oocytes contamination of impacted environments [8].

This study was planned to study serological prevalence of *T. gondii* in house hold cats.

Material and Methods

Examined Animals

The 212 cats of different sex, breed and age as shown in Table 1. Were collected from many urban and rural districts in Giza province. These cats live in houses, cats visited Veterinary Clinic at 6th October City, Giza Province for clinical check up and testing against Toxoplasmosis.

Epidemiological data

Epidemiological data regarding the age, area, hunting habit, access to outside, nature of pet cats food including uncooked meat like luncheon or no, were supplied by questionnaire and interview with the owners of pet cats according to Ahmed et al. [9], Sedlak and Bártoová [10].

TABLE 1: Distribution of examined cats among different breeds, sex and age groups

Breed	Sex		Age (month)			
	Male	Female	3-6	6-9	9-12	>12
Persian	51	47	8	18	22	50
Main coon	7	5	3	2	3	8
Siam	8	12	3	5	3	9
Egyptian Mau	20	22	5	4	8	25
Mix breed	18	20	3	11	4	20
Total	104	108	20	40	40	112

Sampling

Blood samples were collected from Sephanous or juglar vien of examined pet cats with minimal doses of sedation according to Animal Welfare protocols (Ahmed et al. [9]).

Collected blood samples centrifuged at 3000 rpm for is minutes for serum separation according to Ahmed et al. [9] and Sedlak and Bártová, [10].

Serological diagnosis

Rapid chromatographic immune assay (IC) was carried out for qualitative detection of Feline Toxoplasma IgM and IgG antibodies in Feline serum [11]. One step Feline Toxoplasma IgM and IgG test kit supplied by Bionote, Korea.

Statistical analysis

Statistical analysis was done using Chi-square test to study effect of sex, age and breed according to Smith [12].

Results

The results of rapid chromatographic immune assay (IC) are shown in Table 2 which includes distribution of IgM and IgG antibodies presence in different 4 serological groups. The percentages of each group to the total number of examined cats were 3.77%, 25.94%, 5.18% and 61.32% for first group [IgM (+ve) IgG (+ve)], second group [IgM (-ve) IgG (+ve)], third group [IgM (+ev) IgG (-ev)] and fourth group [IgM (-ev) IgG (-ve)], respectively.

TABLE 2. Number of IgM and IgG positive pet cats

Sero-groups	Cats	
	Number	Percentage (%)
IgM (+ve) IgG (+ve)	8	3.77
IgM (-ve) IgG (+ve)	55	25.94
IgM (+ve) IgG (-ve)	11	5.18
IgM (-ve) IgG (-ve)	130	61.32
Tota IgM (+ve)	19	8.96
Total IgG (+ve)	63	29.71
Overall (+ve)	82	38.67
Total	212	--

Table 3 indicates distribution of positive reactors (overall positive) among male and female cats: 39 positive reactors were recorded in males, while 43 positive reactors were recorded among female cats.

Table 4 illustrates distribution of positive reactors among different breeds. It showed 33, 5, 6, 24 and 14 positive, while 65, 9, 14, 18 and 24 were negative in Persian, Main coon, Siam, Egyptian Mau and mix breed, respectively.

TABLE 3. Positive cats (overall positive) among different sex

Sex	Cats	
	Positive	Negative
Male	39	65
Female	43	65
Total	82	130

TABLE 4. Distribution of overall positive reactor cats among different breeds

Breed	Cats		Total
	Positive	Negative	
Persian	33	65	98
Main coon	5	9	14
Siam	6	14	20
Egyptian Mau	24	18	42
Mix breed	14	24	38
Total	82	130	212

Table 5 illustrates distribution of positive reactors among different age groups. It showed 48, 18, 12 and 4 positive, while 64, 22, 28 and 16 were negative in over 12 months, 9-12 months, 6-9 months and 3-6 months, respectively.

Statistical analysis

Statistical analysis using Chi-square test to study the effect of sex proved that there was significant difference between male and female cats ($P \leq 0.05$).

TABLE 5. Distribution of overall positive reactor cats among different age group

Results	Age group (months)			
	3-6	6-9	9-12	Over 12
Overall positive	4	12	18	48
Overall negative	16	28	22	64
Total	20	40	40	112

Chi-square test was also used to study the effect of breed and age on the results of the examined cats. We found that both breed and age had effects on the results by another mean there were significant differences between different cat breeds or different age group ($P < 0.05$).

Discussion

In this study serological diagnosis used by applying rapid IC for detection of both IgM and IgG antibodies against *Toxoplasma gondii* in sera of examined cats was rapid and accurate method for diagnosis, as recommended by Ahmad et al., Luo et al. [9, 11].

Toxoplasmosis in cats present in acute or

chronic form as stated by Gaskell et al., Shaw and Ihle [13, 14]. Rapid IC assay succeeded in detection of IgM antibodies against *Toxoplasma gondii* in 19 cats (8.96%). Theses 19 IgM sero positive cats represented the acute form of *T. gondii* infection [15], while 63 cats (29.71%) were positive for IgG antibodies against *T. gondii* represented the chronic form [16, 17].

The 82 sero positive cats considered as overall positive as with a percentage (38.67%) among population of this study, similar results recorded by several authors [9, 18-26] in different geographical parts all over the world.

The results recorded that there was significance difference between different age

groups, by another mean age has significance effect on the on the prevalence of Toxoplasmosis, but higher percentage was detected in cats over 1 year in age and this may be attributed to multiple exposures of these old cats for infection [27, 28]. While number of overall positive cats decrease with decrease in age significantly due to less exposure times [27].

The overall positive reactors were high in certain breed like Egyptian Mau and Mix breed. These findings attributed to hunting habits and getting outdoor to houses gardens as mentioned by Gyroke et al. [29] and Opsteeg et al. [30].

Statistical analysis were carried out to study the effect of sex, age and breed using Chi-Square Test . Smith [12].

There are significant differences detected between different sex, breed and age group, respectively as stated by Awad et al. [31].

Conclusion: Toxoplasmosis is well known as major zoonosis, causes fatal health problems for human. Cats considered major source for human infection and environment contamination. Toxoplasmosis cannot be diagnosed clinically in cats, so serological diagnosis is the only rapid and accurate method for detection of *Toxoplasma gondii* infection in household cats.

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Conflict of Interest Statement

The author whose name is listed immediately below certify that he has no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria, educational grants, participation in speakers' bureaus, membership, employment, consultancies, stock ownership, or other equity interest, and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

Author contribution

The authors performed the study plan and design. Romane Adieb Awad and Ashraf Barakat collected the samples from the clinic, and had carried out the clinical examination and IC laboratory work. Romane Adieb Awad had done all issues of writing, revising, and improvement of the article for publication.

Ethical consideration

The owners of cats were informed and permission was received from them. The cats included in this study for taking samples used in this work. Samples were collected as per standard sample collection procedure without any harm to animals. The proposal of this study had approval from National Research Center committee no: 10/03/2017.

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التشخيص السيرولوجي لمرض التوكسوبلازما في القطط المنزلية في مصر

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هذه الدراسة تهدف الى استخدام التشخيص السيرولوجي للاكتشاف السريع لطفييل التوكسوبلازما جوندى فى القطط المنزلية. تم تجميع ٢١٢ عينة سيرم من قطط منزلية من اجناس مختلفة من سلالات مختلفة و من مجموعات سنوية مختلفة تعيش فى مناطق الحضر والبدو فى محافظة الجيزة. هذه العينات تم فحصهم بواسطة اختبار امينوكروماتوجرافى لاكتشاف الاجسام المناعية من فصيلة أى جى أم – أى جى جى ضد طفييل التوكسوبلازما جوندى. تم عمل التحليل الاحصائى باستخدام مربع كاي تربيع لدراسة تأثير الجنس ، السلالة والعمر على النتائج. اوضحت النتائج وجود الاجسام المناعية من فصيلة أى جى أم ضد طفييل التوكسوبلازما جوندى فى ١٩ قطة بنسبة ٨,٩٦٪ ووجود الاجسام المناعية من فصيلة أى جى حى فى ٦٣ قطة بنسبة مئوية ٢٩,٧١٪. اوضحت النتائج ان كل العينات الايجابية وجود الاجسام المناعية فى عدد ٨٢ قطة بنسبة ٣٨,٦٧٪. تلاحظ ان مستوى الاجسام المناعية فى السيرم عالى فى الققط من فصيلة القط المصرى و فى الققط التى متوسط اعمارها اكثر من عام. واطهر التحليل الاحصائى للنتائج وجود فروق معنوية بين الاجناس المختلفة والسلالات المختلفة والمجموعات العمرية المختلفة. الخلاصة: توصلت هذه الدراسة الى ضرورة استخدام التشخيص السيرولوجى عن طريق عمل اختبار امينوكروماتوجرافى لاكتشاف الاجسام المناعية من فصيلة أى جى أم – أى جى جى ضد طفييل التوكسوبلازما . هذا الاختبار يعتبر اختبار سريع ودقيق لتشخيص مرض الاصابة التوكسوبلازما.