

Review: Epidemiological data regarding animals toxoplasmosis in Romania

Review: Date epidemiologice privind toxoplasmoza la animale în România

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ABSTRACT

In Romania, bibliographic data on toxoplasmosis in animals are parsimonious, with few research teams interested in this protozooosis. In this study, we aimed to review bibliographic data on prevalence of *Toxoplasma gondii* infection in animals from our country.

In Romania seroprevalence of *T. gondii* infection was studied mostly in farm species of (sheep, goats, pigs), rather than definitive hosts (cats). Sheep, seroprevalence values are mentioned between 27.85 and 70.4% in ewes and 25.2 - 50% in lambs. In the goats data are more limited, the quoted values being 64.15% in adults and 3.33% in youngs. The epidemiological situation is similar to pigs, the reported seroprevalence being of 15 – 62.26% in sows, respectively 0.4% in fattening pigs. In dogs, it was registered a seroprevalence of 24.56%. For cats is cited a seroprevalence of 45 - 81% in adults and of 29.4 - 50% in the youth, while at coproparasitologic examination oocysts of *T. gondii*/*H. hammondi* were observed only in 0.33% of cases.

The importance of knowing of the epidemiological situation of *T. gondii* infection in animals, comes from the role of food (milk, meat) obtained from animals (intermediate hosts) in public health and the role of cat (definitive host) in contaminating the environment.

Key words: *Toxoplasma gondii*, epidemiology, Romania

Introduction

T. gondii infections are prevalent in humans and animals worldwide (Dubey and Beattie, 1988). Felids are the main animal species in the life cycle of this parasite because they are the hosts that can excrete the environmentally-resistant stage, the oocyst. Intermediate hosts (animals, humans) become infected by ingesting contaminated food or water with oocysts, by ingesting undercooked meat with tissue cysts and by transplacental infection with tachyzoites (Dubey and Jones, 2008). Cysts of *T. gondii* were found in tissues from pigs, sheep, goats and other animals (Dubey, 1996).

The resistance of oocysts to environmental conditions and inactivation

techniques is very high. This is due to the rigidity and repellent walls of the oocysts. Thus, in moist soil, oocysts resists between 56 and 357 days at a temperature of 20-27°C, in feces 56 days at a temperature of 15-30°C and in the water with a temperature of 60-70°C, oocysts resist less than 1 minute (Dumetre, 2005).

The prevalence of *T. gondii* infection in cats.

In Romania, the prevalence of *T. gondii* infection in cats, revealed by coproparasitologic examination (flotation with salt) is low, probably due to the relatively low number of samples taken in the study. Thus, Titilincu et al. (2008) have found no evidence of *T. gondii*/*H. hammondi* oocysts, of 57 samples examined. In another

study (zinc lotation), there was found a prevalence of 0.33% (1/253) (Mircean et al., 2008). This low prevalence is due to low sensitivity of the method used, compared to other methods (ex. PCR – polymerase chain reaction), and can be explained by the short period of oocysts' shedding, approximately 2-3 weeks, or by the fact that reinfection is not always followed by coproelimination (Dubey, 1994).

By coproparasitologic exam, the diagnosis is of *T. gondii/H. hammondi*, because in terms of morphology, these two types of protozoa oocysts can not be differentiated (12.4-10.7µm), so it necessary for further examination the use of more advanced techniques, such as PCR.

In the center and north-west part of Transylvania, it was recorded an average seroprevalence of 57.7% (97/168) by ImmunoComb ELISA test (enzyme-linked immunosorbent assay). It was noted that the seropositivity in cats increases with age. In kittens seroprevalence is 29.4%, in cats aged 6 months-2 years is 50%, in those aged 2-10 years the seroprevalence is 69.1% and in cats more than 10 years is of 66, 6% (Mircean et al., 2008).

Seroprevalence of infection with *T. gondii*, cited in cats from southern Romania, was 45% (42/94) using the ImmunoComb test (Petriceanu et al., 2007). Also in the south, Antoniu et al. (2008) reported a seroprevalence of 47.6% (20/42) by indirect fluorescence antibody test (IFAT) and 54.8% (23/42) by ImmunoComb. Popa et al. (2003), described a seroprevalence of 20% (4/20) by ImmunoComb test.

In a comparative study on the seroprevalence of *T. gondii* infection in cats and their owners, was highlighted a correlation between seropositivity in humans and cats,

53.33% of cases being detected in both (owner-cat) (Antoniu and Gonciarov, 2004).

However seroprevalence varies according to the diagnostic method used. Titilincu et al. (2008), obtained a seroprevalence of 81.1% in adult cats by ELISA ImmunoComb method and 54.1% by the latex agglutination.

Values obtained in Romania on the prevalence of *T. gondii* infection in cats are similar to values obtained in other countries of the world. In the coproparasitologic examination, oocysts of *T. gondii/H. hammondi* were found with a prevalence of 0.31% in Germany (Schaes et al., 2008), 1.3% in Brasil (Pena et al., 2006).

Regarding seroprevalence in cats in different countries of the world, values are much higher than those obtained with coproparasitologic exam, as follows: 36.7% in Portugal (Lopes et al., 2008), 35.4% in Brazil (Pena et al., 2005), 45.2% in Colombia (Dubey et al., 2006), 79.4% in China (Dubey et al., 2007) and 16.8% in Israel (Salant et al., 2004).

Seroprevalence of infection with *T. gondii* in small ruminants

T. gondii is an important cause of economic losses in small ruminants, by abortion, birth of dead or less viable lambs, or by infertility which can reach rates of 11-29.2% (Borde et al., 2006; Dubey, 1996). In Romania, it was reported a seroprevalence of *T. gondii* infection in sheep from 27.85 to 70.4% in ewes and 25.2-50% in lambs. In 2008, *T. gondii* DNA from aborted tissues in sheep, was identified for the first time in our country (Iovu et al., 2008).

Some quotations on seroprevalence in sheep are represented in Table 1.

Table 1. *T. gondii* seroprevalence in sheep in Romania

Area	Age of animals	No. tested	Prevalence%	Method	Reference
S	ewes	502	37.8	IFAT	Sharma, 1980
			31.07	HI	
S	ewes	183	57	-	Moldoveanu et al., 2006
S	ewes	148	73.6	ELISA	Petriceanu et al., 2007
			71	ImmunoComb	
S	ewes	140	27.85	ELISA	Militaru et al., 2008
N-E	ewes	288	67.7	ELISA	Bondoc et al., 2007
		284	70.4	ELISA	
V	ewes	600	36.33	ELISA	Hotea et al., 2008

C, N-V	ewes with abortion	34	67.6	ImmunoComb	Popa et al., 2003
C, N-V	ewes	1453	64.3	ELISA	Titilincu et al., 2008b
	lambs 6mounth-1year	107	25.2		
	lambs 1mounth	10	50		
C, N-V	ewes	105	45.7	ELISA	Iovu et al., 2008b
C, N-V	abortion	16	50	PCR	Iovu et al., 2008a

Legend: HI – indirect hemagglutination; S – south; N-E – north-est; V – west; C, N-V – centre and north west.

Studies on the seroprevalence of infection with *T. gondii* in small ruminants in the world, are indicating high values: 22% in lambs and 65.6% in ewes in France (Dumetre, 2006), 49.9% in sheep in Italy (Vesco, 2007), 35% in sheep and 30% in goats in Iran (Sharif, 2007), 20.7% in sheep and 28.7% in goats in Brazil (Soares et al., 2009; Figliuolo et al., 2004).

In Romania, there are few data on seroprevalence of *T. gondii* infection in domestic goats, the only systematic study was conducted by Titilincu et al. in 2008. Seroprevalence in goats was evaluated in three regions in central and northwestern Romania, namely Transylvania, Crişana and Maramureş. 401 goat sera have been processed, of which 371 adult goats and 30 kids, by ELISA, giving a seroprevalence of 64.15% (238/371) in adults and 3.33% (1/30) in kids. The highest seroprevalence was recorded in Maramureş and Crişana, 83.33% (70/84) respectively 81.48% (110/135). The lowest seroprevalence was recorded in Transylvania, being 37.5% (57/152).

In international studies there are publications related to goats with different seroprevalence values depending on the test used or the existing epidemiological situation in the studied farms. In goats slaughtered for human consumption in Brazil, Iran and Saudi Arabia, seropositivity ranged between 24% and 51.7%, using IFAT (Faria et al., 2007, Sharif et al., 2007; Sanada and Ghabban, 2007). Seroprevalence is significantly higher in herds of goats, in which abortions were reported, reaching 64.3% (Borde et al., 2006). In seroepidemiological studies, there were mentioned prevalences between 12.3% by IFAT test and 74.8% by modified agglutination test (MAT) (Masala et al., 2003; Ghazaei, 2006; Teshale et al., 2007). Number of positive cases of *T. gondii* infection in goats increases with age, with a positive correlation (Figueiredo et al., 2001; Figliuolo et al., 2004; Jittapalapong et al.,

2005). Also, there was a higher frequency of toxoplasma infection in milk goats compared with those for meat (Jittapalapong et al., 2005). There were cited cases of toxoplasmosis in humans following consumption of goat milk (Skinner et al., 1990).

Seroprevalence of *T. gondii* infection in pigs

Seroprevalence of *T. gondii* varies dramatically among the categories of pigs surveyed (fattening pigs versus reproductive ones, indoor pigs with a biosecurity system versus backyard pigs). Also, raising pigs in paddocks with poor sanitation conditions and in contact with rodents or cats, or keeping improper feeding, may increase their chances of infection (Dubey, 1986). *T. gondii* infection in pigs can cause abortions in pregnant sows, but in case of modern intensive farms, the infections should be middle to even insignificant.

In our country serological studies were performed on samples collected from slaughtered pigs from intensive farming systems and the pigs from household system, resulting in a seroprevalence of 15-62.26% in reproductive pigs, and 0.4-76.6% in fattening pig (Table 2).

Given the culinary tradition of our country in terms of meat consumption, mainly based on pork, it is important to study and know the epidemiological situation of toxoplasma infection in this specie.

In studies on pigs population in the U.S.A., between 1983-1984, it has been reported a seroprevalence of 23% in fattening pigs and 42% in sows (Dubey et al., 1991). Retesting the same herd or flock, in 1992, it was obtained a seroprevalence of 20,8% in sows and 3.1% in fattening ones (Dubey et al., 1995). In Europe, there was recorded a seroprevalence of 7% in fattening pigs category and 19% in adult pigs (Villar and col., 2009; Damriyasa et al., 2004), but in 2007 the prevalence cited in Europe and

the U.S.A., in the pigs reared in intensive system, became of 0.38% (Joke van der Giessen et al. 2007).

Table 2. *T. gondii* seroprevalence in pigs from Romania

Area	Age of animals	No. tested	Prevalence %	Method	Reference
S	slaughter pigs	210	(20%)	-	Moldoveanu et al., 2006
S	fattening pigs	94	(76.6%)	ELISA	Petriceanu et al., 2007
N-E	backyard pigs	190	(33.2%)	ELISA(SafePath)	Bondoc et al., 2007
		190	(87.9%)	ELISA(SafePath)	
S	slaughter pigs	265	(62.26%)	ELISA	Militaru et al., 2008
C, N-V	sows	86	(39.5%)	ELISA	Iovu et al., 2008c
		94	(32,98%)	ELISA	
C, N-V	sows	285	(15.1%)	ELISA	Article in press.
	fattening pigs	282	(0.4%)	ELISA	

Legend: S – south; N-E – north-east; V – west; C, N-V – centre and north west

Seroprevalence of *T. gondii* infection in dogs

In Romania, in stray dogs from Cluj county, there was observed a seroprevalence of 24.56% (14/57) by IFI's, which increased with age (14.28% in dogs up to 6 months, 21.42% in dogs between 6 months -1year, and 64.3% in dogs older than 2 years) (Cozma et al., 2007).

Similar results were noticed in other European countries: 25.9% in the Czech Republic, 23% in Sweden, 26% in Austria, 29% in Germany and 12.2% in Spain (Sedlak and Bartova, 2006; Uggla et al., 1990; Wanhua et al., 2005; Klein and Muller, 2001; Ortuño et al., 2002). In other countries such as Brazil, there have been described different aspects, depending on the applied test, such as the indirect hemagglutination (HI) identified 22.5% positive cases, by IFI and ELISA immunoassay tests there were 35% - 45.1% positive cases (Azevedo et al., 2005, Silva et al., 1997). Higher values were observed in Turkey using the Sabin-Feldman test, 62.06% of dogs examined being diagnosed positive for *T. gondii* infection (Aslantaş et al., 2005).

T. gondii in dogs is considered an opportunistic pathogen, the infection is manifested clinically by neuromuscular, respiratory and gastrointestinal disorders, or as a generalized infection, characterized by nervous disorders such as ataxia, behavioral changes, walking in circle, paralysis, paraplegia, tremors (Silva et al., 2005). Also, dogs can act as mechanical vectors in dissemination of

contaminating forms of *T. gondii*, point proven by experimental infection (Lindsay et al., 1997). In

Germany, an examination of 24,089 fecal samples from dogs, in two of them there were identified oocysts of *T. gondii* (Schaes et al., 2005).

REZUMAT

În România datele bibliografice privind toxoplasmoza la animale sunt parcimonioase, existând puține colective cu interes pentru studierea acestei protozooze. În cadrul acestui studiu ne-am propus să revizuiem datele bibliografice privind prevalența infecției cu *Toxoplasma gondii* la animale în țara noastră.

În România seroprevalența infecției cu *T. gondii* a fost studiată în special la speciile de interes zootehnic (ovine, caprine, suine) și mai puțin la gazdele definitive (pisici). La ovine se citează valori ale seroprevalenței cuprinse între 27,85 și 70,4% la adulte și 25,2-50% la tineretul ovin. La capre rezultatele sunt însă mai puține, fiind citate valori de 64,15% la adulte și de 3,33% la tineret. La suine situația epidemiologică este asemănătoare, seroprevalența semnalată fiind de 15-62,26% la reproducători, respectiv 0,4% la grăsuți. La câini a fost înregistrată o seroprevalență de 24,56%. La pisică este citată o seroprevalență de 45-81% la adulte, iar la tineret de 29,4-50%, în timp ce la examenul coproparazitologic oochisturi de

T.gondii/H.hammondi au fost observate doar la 0,33% din cazuri.

Importanța cunoașterii situației epidemiologice a infecției cu *T. gondii* la animale, rezidă din rolul pe care produsele alimentare (lapte, carne), obținute de la animale (gazde intermediare), îl au în

sănătatea publică și a rolului pe care pisica (gazdă definitivă), îl are în poluarea parazitară a mediului.

Cuvinte cheie: *Toxoplasma gondii*, epidemiologie, România

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