

Toxoplasmosis in livestock in Italy: an epidemiological update

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Abstract. Infection with *Toxoplasma gondii* is one of the most common parasitic infections of human being and other warm-blooded animals. It has been found worldwide from Alaska to Australia. Public health organizations repeatedly encourage the collection of accurate data about *T. gondii* in animals and humans due to its medical importance as a major source of parasitic zoonosis. For these reasons, epidemiological updates on toxoplasmosis in livestock are strongly advised also to plan control strategies. In the present paper, seroprevalence data on *T. gondii* that have been recorded in livestock from different Italian regions over the last 3 decades are reviewed, showing the high level of exposure of livestock to this parasite.

Key words: *Toxoplasma gondii*, livestock, epidemiology, Italy.

Infection by *Toxoplasma gondii* is a cosmopolitan zoonotic disease caused by a coccidian intracellular protozoan capable of infecting all warm-blooded animals, including mammals, birds and humans (Fayer, 1981). The parasite has a worldwide distribution - from Alaska to Australia - and it is mainly transmitted by food/water contaminated with oocysts dispersed by cats and other felines (definitive hosts), raw/undercooked meat containing tissue cysts or un-pasteurized milk containing tachyzoites, and transplacentally (Tenter *et al.*, 2000). *T. gondii* infection has important implications for public health, since it affects one-third of the world's population. In addition, it also has important veterinary implications because it causes disease, miscarriage or congenital malformations in the definitive and intermediate hosts. Cats, sheep, goat and pig are the domestic animal species most seriously affected by the protozoan. Since the 1950s, *T. gondii* has been recognized as a significant and common cause of endemic and epidemic abortions on sheep farms (Dubey, 2004).

Because of the great importance of *T. gondii* as a causative agent of a zoonosis, public health organisations, such as the World Health Organisation, have repeatedly advised the collection of accurate epidemiological data on this parasite. Such data are essential to elucidate the relative importance of the various sources of infection for humans, to control disease, and to prevent reduction in quality of human life caused by this parasite. However, only few countries of the world regularly monitor toxoplasmosis in humans, and even less countries monitor *T. gondii* infection in animals (Tenter *et al.*, 2000). For these reasons, we believed useful to report the seroprevalence data on *T. gondii* that have

been recorded in livestock from different Italian regions over the last 3 decades (from 1980; see table 1).

This is an attempt to summarize the information on *T. gondii* in livestock in Italy based on published data; we apologize if we missed any other data. It should be noted, however, that when comparing seroprevalence data for infections with *T. gondii*, the different serological methods used should be taken into account (Piergili Fioretti, 2004). In addition, prevalence values might vary over time and with the age of animals (Tenter *et al.*, 2000). Besides serological surveys, also molecular studies have been conducted on ovine tissue and milk samples; however, these PCR-based techniques seems to be not so effective in showing the real distribution of the parasite. Indeed, the presence of *T. gondii* DNA was found only in 3.3% of the examined hearts from Sardinian sheep, whereas the other organs resulted negative (Purqueddu *et al.*, 2006). Similarly, *T. gondii* DNA was found only in 3.4% of the ovine bulk milk samples from Campania (Fusco *et al.*, 2007). The high seropositivity rates in livestock from the different Italian regions indicate that the consumption of raw or undercooked meat from livestock is still the main risk factor for human to contract toxoplasmosis as showed by Cook *et al.* (2000). Pigs, goats, sheep, horses and poultry are the major meat sources of human infection (Tenter *et al.*, 2000; Tassi, 2006). Of epidemiological interest is the fact that cattle and presumably water buffaloes are not an important source of human infection although they can become infected by *T. gondii* (Kijlstra *et al.*, 2006). The prevalence of *T. gondii* in free-ranging chickens is a good indicator of the prevalence of the parasite's oocysts in soil because chicken feed from the ground (Dubey *et al.*, 2008).

The prevalence values reported in livestock are noteworthy not only for the transmission of the protozoan from animals to human as food-borne zoonosis, but also because it causes substantial health problems in farm animals. Pigs, sheep and goats are the livestock species most seriously affected by the protozoan whereas cattle, water buffaloes and horses are considered less sensitive species to the pathogenic effects of *T. gondii*

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Table 1. Seroprevalence data on *T. gondii* recorded in livestock from different Italian regions over the last 3 decades

Livestock species	Region	No. examined animals	Seroprevalence (%)	Diagnostic method	References
Cattle	North	255	92.0	DAT	Avezza <i>et al.</i> , 1993
	Sicilia	317	11.3	IFAT	Vesco <i>et al.</i> , 2005
Buffaloes	Campania	187	94.0	MAT	Persechino <i>et al.</i> , 1980
	Lombardia	352	78.0	LAT	Gaffuri <i>et al.</i> , 2006
	Emilia Romagna	374	69.0	IFAT	Baldelli and Pietrobelli, 1985
	Campania	1,170	28.5	IFAT	Fusco <i>et al.</i> , 2007
	Puglia and Basilicata	306	88.6	IFAT	Puccini <i>et al.</i> , 1981
		321	56.1	IFAT	Puccini <i>et al.</i> , 1983
		1,390	0.1	IFAT	Balbo <i>et al.</i> , 1980
Sheep		1,876	49.9	ELISA	Vesco <i>et al.</i> , 2007
	Sardegna	7,149	28.4	IFAT IgG	Masala <i>et al.</i> , 2003
			9.9	IFAT IgM	
		29,886	19.2	IFAT IgG	Tola <i>et al.</i> , 2006
		1,043	5.4	IFAT IgM	
		1,043	51.3	ELISA	Natale <i>et al.</i> , 2006
Goats	Lazio	198	95.0	MAT	De Capraris and Gravino, 1981
	Puglia and Basilicata	244	68.9	IFAT	Puccini <i>et al.</i> , 1983
	Sardinia	2,445	12.3	IFAT IgG	Masala <i>et al.</i> , 2003
		4,562	5.6	IFAT IgM	
		4,562	11.7	IFAT IgG	Tola <i>et al.</i> , 2006
			4.0	IFAT IgM	
Pigs	North	90	64	IFAT	Genchi <i>et al.</i> , 1991
	Emilia Romagna	1,521	9.0	LAT	Soldati <i>et al.</i> , 1986
	Umbria	576	16.7	IFAT	Piergili Fioretti <i>et al.</i> , 2008
	Sicilia	1,035	21.3/20.0	ELISA/IFAT	Vesco <i>et al.</i> , 2006
	Sardegna	408	15.2	ELISA	Scala <i>et al.</i> , 2008
Horses (human consumption)	Various	163	30.7	MAT	Tassi, 2006
Chickens	Various	80	12.5	MAT	Dubey <i>et al.</i> , 2008

Legend: DAT = direct agglutination test; IFAT = indirect fluorescent antibody tests; MAT = microscopic agglutination test; LAT = latex agglutination test; ELISA = enzyme-linked immunosorbent assay.

(Kijlstra *et al.*, 2006). Regarding pigs, the majority of the infections are sub-clinical or latent and few clinical cases of toxoplasmosis have been reported. However, four outbreaks of disease with mortality in different pig herds have been recently reported in the Lombardia and Emilia-Romagna regions of northern Italy (Gelmetti *et al.*, 1999).

Concerning small ruminants, *T. gondii* is recognized as one of major cause of infectious reproductive failure in several countries of the world causing fetal resorption, abortion at any stage of pregnancy, fetal mummification, stillbirth or birth of live but weak offspring. The important role played by *T. gondii* in ovine and caprine abortion as been documented in the Sardinia region (Tola *et al.*, 2002; Masala *et al.*, 2003); out of a total of 366 ovine aborted samples from Sardinia, *T. gondii* DNA was detected in 18.1% of fetuses and 13.1% of placentae (Masala *et al.*, 2007).

In conclusion, the present paper shows that seroprevalence data on toxoplasmosis in livestock are not uni-

formly distributed along the whole Italy. In addition, these data, although revealing a *scenario* at risk from a zootechnical and sanitary point of views, represent a situation highly heterogeneous, probably due to the different sampling and laboratory techniques utilized.

Thus, a coordinated national-scale survey on toxoplasmosis in livestock - based on homogeneous sampling and laboratory techniques - is strongly needed, in order to better assess the actual epidemiological situation of this under-estimated zoonosis in livestock and to clarify factors that influence its presence and distribution.

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