

TOXOPLASMA GONDII IN ANIMALS AND FOOD: RESULTS OF FOUR-YEARS MONITORING BY THE OFFICIAL ITALIAN ZOOSES INFORMATIVE SYSTEM

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Introduction

When considering human toxoplasmosis, food remains the main source of infection. Whether is meat from susceptible animals that naturally harbour *Toxoplasma gondii* tissue cysts or food like fresh vegetables or fishery products (mussels, fish) contaminated by environmentally derived oocysts, information about animal toxoplasmosis prevalence should continue to be under the spotlight.

Directive 2003/99/EC of the European Parliament and the Council classifies toxoplasmosis and its causative agent as a class B zoonosis/agent for which monitoring depends on the epidemiological situation. In 2015, the World Health Organization reported that food-borne toxoplasmosis, spread through undercooked or raw meat and fresh produce, may cause up to 20% of the total food-borne disease burden in the EU and affects more than 1 million people in the European Region each year (WHO, 2015). Overall, *T. gondii* has been lately ranked the fourth (global) and second (Europe) most important foodborne parasite by experts (Opsteegh et al., 2019). Although outbreaks of toxoplasmosis are rarely reported, individual cases can lead to severe life's impairment.

Materials and methods

Surveillance systems on animal toxoplasmosis are different across Europe and regulated by national legislation.

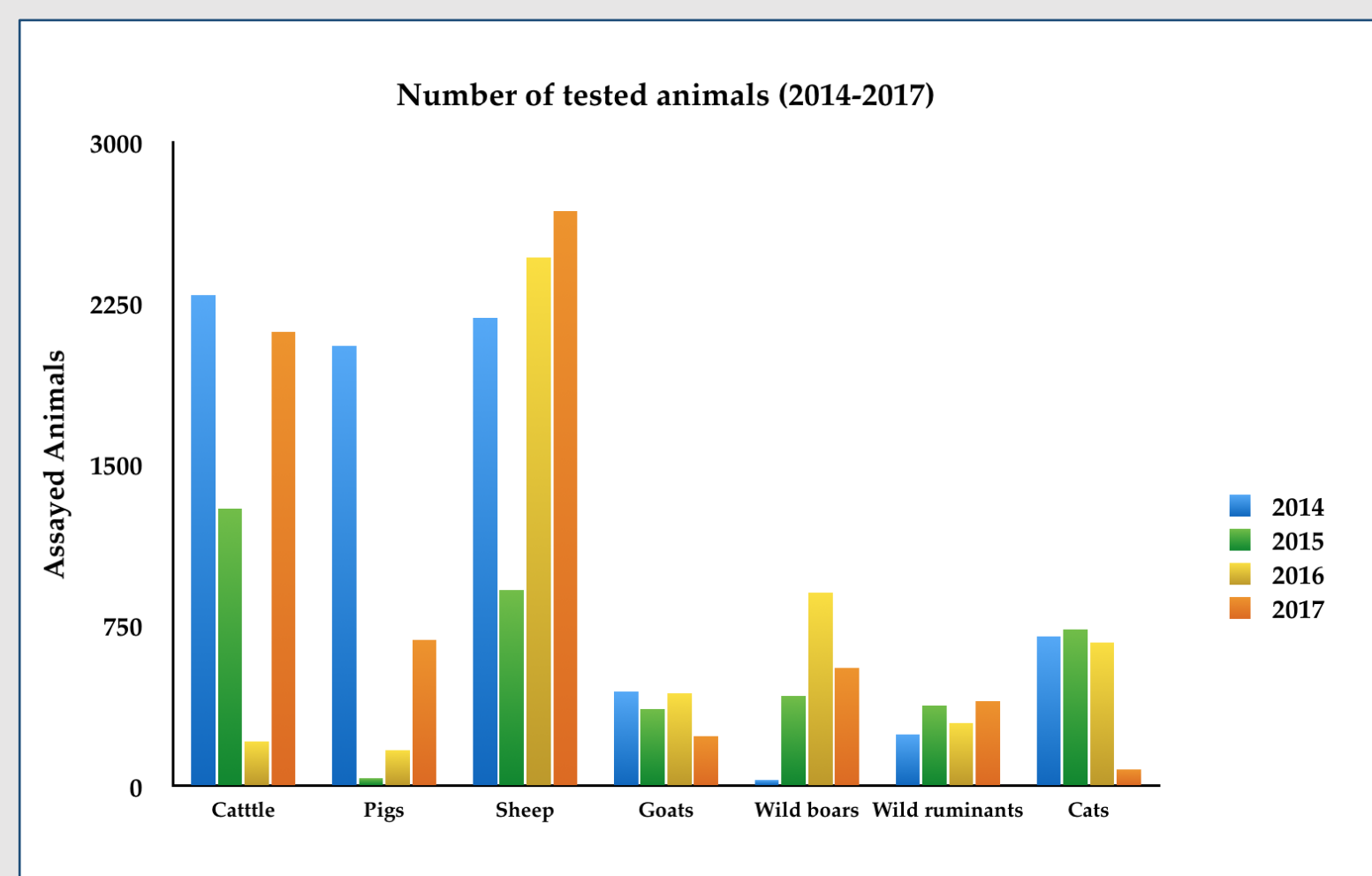
In Italy, administrative regions are called annually to submit data on animal toxoplasmosis to SINZOO (Zoonoses Informative System) data collection framework that is part of the Veterinary Informative System managed by the Italian Ministry of Health. Foodborne zoonoses data collected at national level are then processed and summarized by EFSA to become part of the annual EFSA/ECDC joint European Union summary reports on trends and sources of zoonoses, zoonotic agents and foodborne outbreaks.

Results

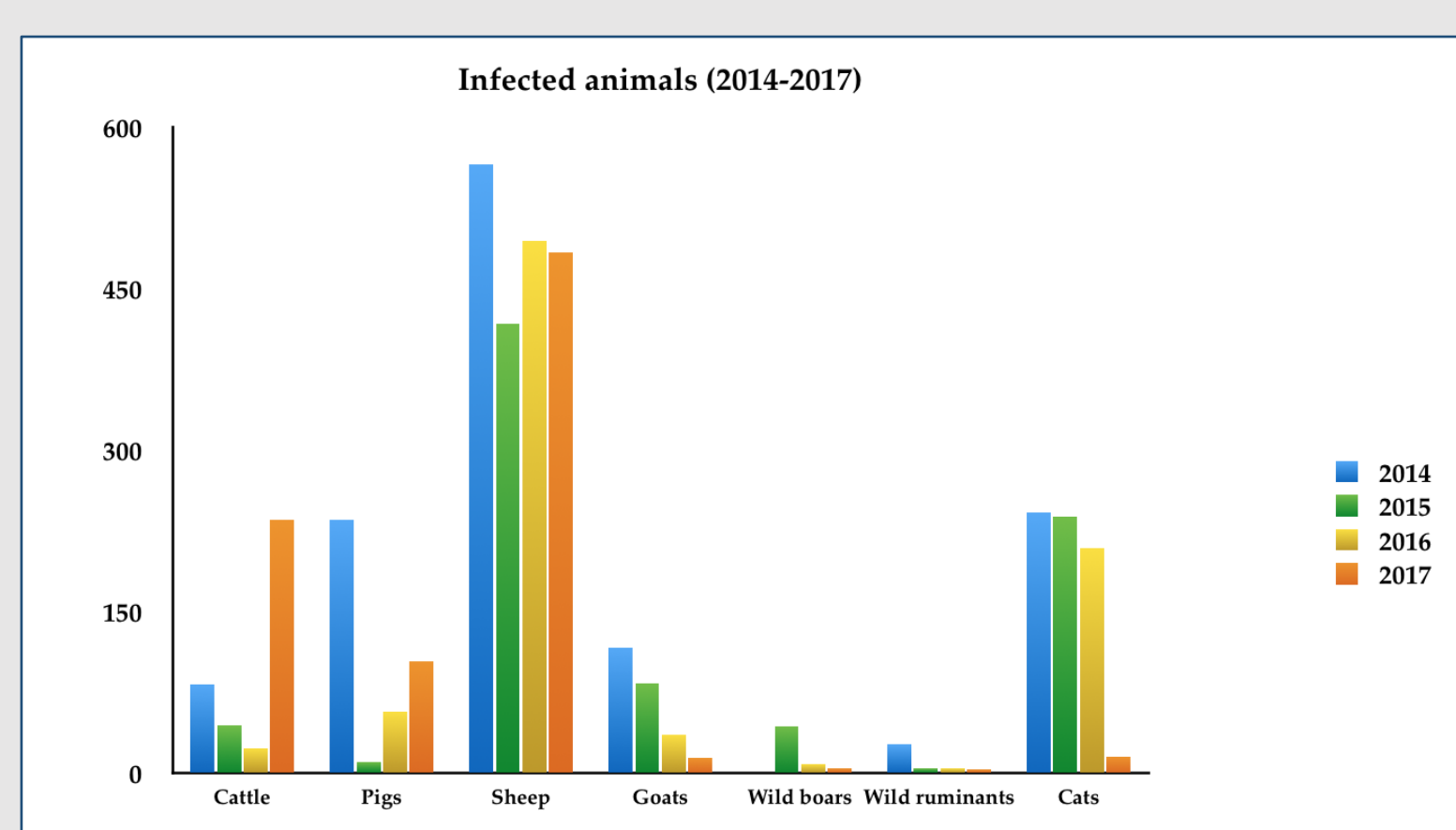
No foodborne outbreaks of toxoplasmosis have been reported in Italy during 2017, the most recent year for which a report is available.

Over the past four years (2014-2017), in Italy, sheep, cattle, pig, goats, wild boars and wild ruminants were the main species tested besides pet animals. Prevalence of the infection ranged: 3.49-11.10% in cattle (209 to 2289 animals tested); 11.46-34.55% in pigs (37 to 2051 animals tested); 18.01-45.72% in sheep (912 to 2682 animals tested); 5.98-23.25% in goats (234 to 432 animals tested). Positive among wildlife ranged from 0 to 10.24% for wild boars (26 to 901 animals tested) and from 0.76 to 11.25% for wild ruminants (240 to 394 animals tested).

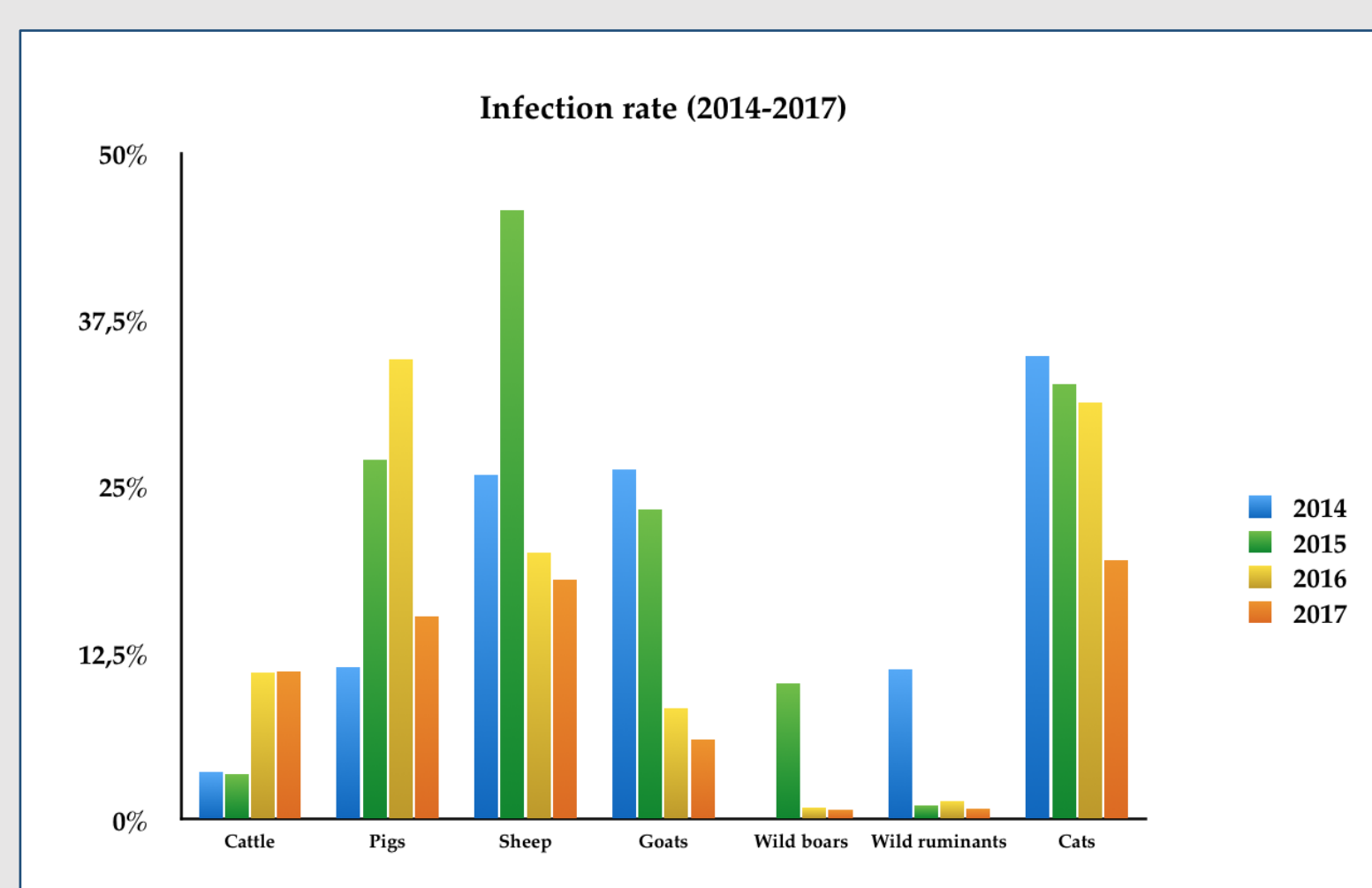
For cats, that are solely responsible for contamination with environmentally-resistant oocysts, the prevalence ranged from 19.48 to 34.77% (77 to 696 animals tested). Data are summarized in table 1 and displayed in graphics 1-3.



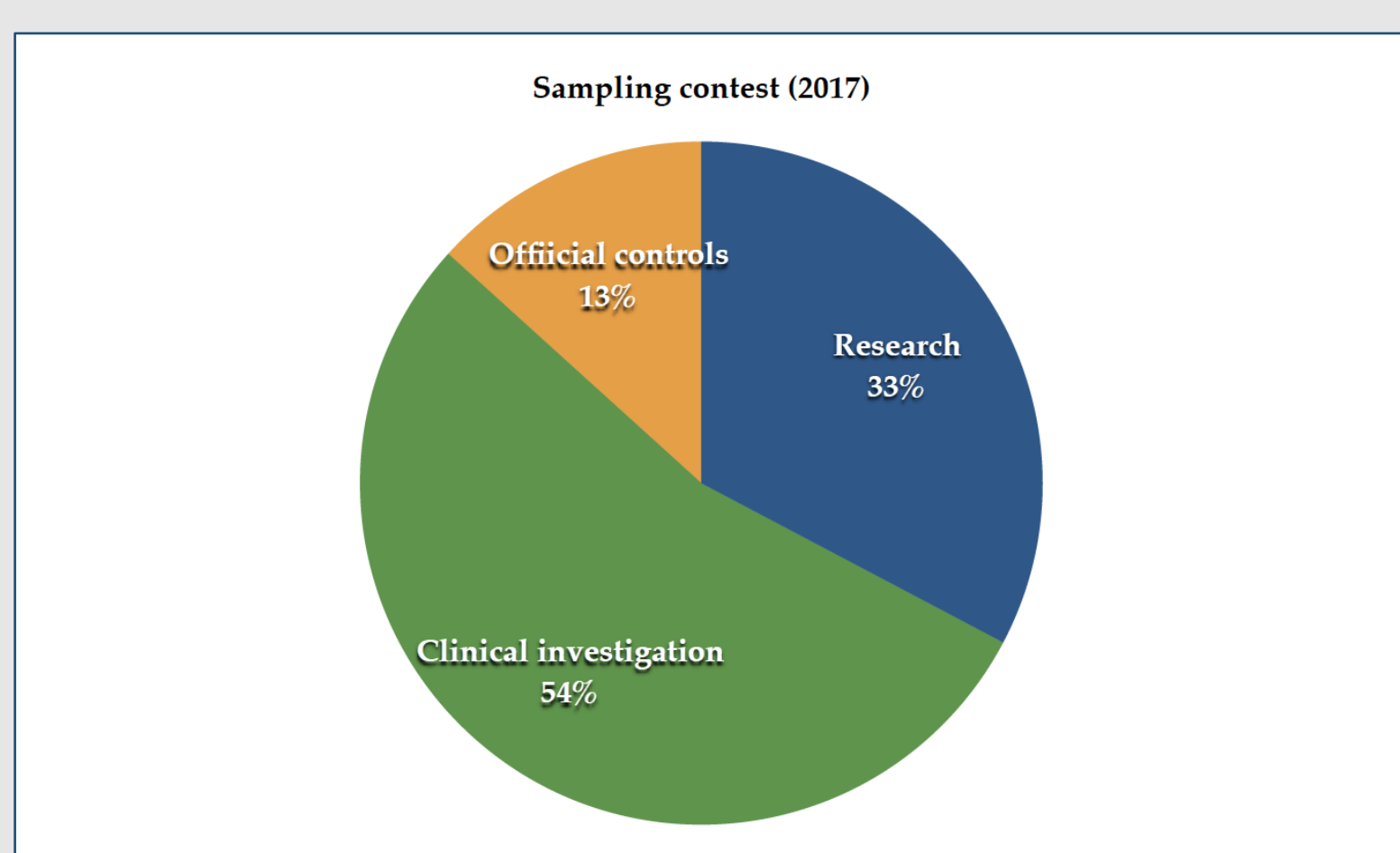
Graph 1. Overall numbers of animals assayed for *T. gondii* infection over 2014-2017



Graph 2. Overall numbers of animals infected with *T. gondii* over 2014-2017



Graph 3. Overall *T. gondii* infection rates over 2014-2017



Graph 4. Sampling contest for *T. gondii* detection in 2017

	Tested animals (2014-2017)		Infection rate (2014-2017)	
	Lowest	Highest	Lowest	Highest
Cattle	209	2289	3.49%	11.10%
Pigs	37	2051	11.46%	34.55%
Sheep	912	2682	18.01%	45.72%
Goats	234	432	5.98%	23.25%
Wild boars	26	901	0%	10.24%
Wild ruminants	240	394	0.76%	11.25%
Cats	77	696	19.48%	34.77%

Table 1. Lowest and highest values of animals tested and infection rates recorded in SINZOO

References

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Discussion

Unfortunately, the data reported in the SINZOO framework are not representative of the real prevalence of toxoplasma infection among animals since data transmission by the Regions lack homogeneity with regards to number of samples and the animal species surveyed. Also, these data are often the results of targeted researches or clinical investigation. In 2017 more than 50% of the overall analyses were performed following clinical suspicions making the results of the report likely biased. Nevertheless, reported data are the only official information available on the diffusion of *T. gondii* among meat-producing animals and provide a foundation to monitor epidemiological trends for driving public health preventive measures when active surveillance is not sustainable.

In this context, in a recent scientific opinion on public health risk associated with foodborne parasites EFSA suggest that the application of on-farm measures that reduce the likelihood of contamination may be a more effective control method than post-harvest interventions. With regards to *T. gondii*, these include the implementation of on-farm stricter biosecurity measures to control unwanted animals like cats and rodents from accessing the farm premises and the areas where animal feed are stored.

As regards post-harvest interventions, the development of standardised, validated analytical methods that can be applied across the range of relevant foods is considered a key factor in the strategy to reduce the burden of foodborne toxoplasmosis. Also, the development and implementation of an assay that could be used to distinguish between meat-borne infection and infection via oocysts would be beneficial in order to effectively trace the source of infection (EFSA, 2018).

Conclusions

Although these data cannot support epidemiological analyses, they suggest that pigs and small ruminants are still the major sources of meat-borne toxoplasmosis and that *T. gondii* must be considered a relevant hazard to be covered by meat inspection in these species as well as in farmed and wild game (boars and ungulates).

Cattle are also under a special watch list since beef consumption has been predicted as the most important source of meat-borne toxoplasmosis at least in Italy (Belluco, 2018) and the Netherlands (Opsteegh, 2011) as resulting from quantitative risk assessment studies. Cattle are often found positive to serological screening although direct detection of *T. gondii* via biological assay or PCR is uncommon with lack of concordance between antibodies and parasite DNA detection.

The informative system also reports very limited information on food such as fresh vegetables or fishery products that can be contaminated by *T. gondii* oocysts dispersed in the environment although 1 sample of mussels and 3 samples of fish resulted positive by PCR in 2017. These findings suggest that surveillance on animal toxoplasmosis and meat and other food contamination with *T. gondii* should be enhanced since it is one of the few effective tools to control the parasite diffusion and prevent the transmission of the zoonosis.