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Identifying pig herds at risk for *Toxoplasma gondii*: prevalence and seasonality

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Introduction

Toxoplasma gondii is considerd as one of the most important zoonoses with a high disease burden. Transmission of *T. gondii* to humans can take place through the consumption of tissue cysts in meat from infected pigs. EFSA defined *T. gondii* as a medium risk in pork but sofar no control measures are being taken. To control *T. gondii* in the pork chain,we aimed to evaluate the use of serological monitoring at slaughter and intervention at seropositive farms.

Frequency distribution

Blood samples of pigs which were routinely collected in five slaughterhouses in the Netherlands for the serological monitoring of *Mycobacterium avium* infections in pigs (Hiller et al., 2013) were also tested for anti *T. gondii* antibodies. At every delivery of pigs, one, two or six blood samples were collected randomly from clinically healthy pigs during bleeding. Sera were tested using the PrioCHECK Toxoplasma Ab porcine ELISA (Thermo Fisher Scientific, Prionics Lelystad B.V.). In the period 1 January 2012 until 31 December 2014, in total 135,585 blood samples from 3,114 pig farms were collected and tested. Most samples had a test result between 0 and 12 PP, but a very long "tail" with results up to PPs of almost 400 was present (Figures 1A and 1B).

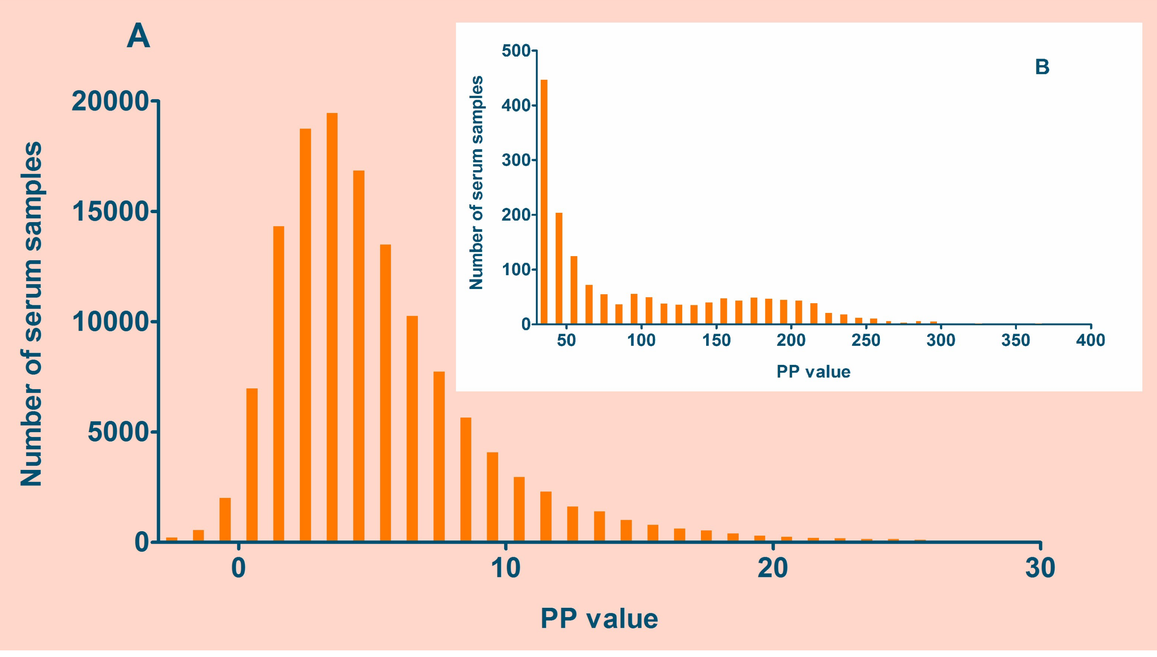

Figure 1. Distribution of PP values ≤ 30 (A) and PP > 30 (B) obtained in the *Toxoplasma gondii* ELISA on 135,585 blood samples from healthy pigs, collected between1 January 2012 and 31 December 2014.

Seroprevalence

Seroprevalence in pigs and on farm level was determined using the manufacturer's recommended cut-off of 20 PP (Table 1). Prevalences in blood samples ranged from 2.0% in blood samples from farms with controlled housing conditions to 4.0% in blood samples from organic farms. In total the seroprevalence was 2.2%. Prevalence of *T. gondii* positive farms with at least one positive test result during the study period was 38.0% on farms with controlled housing conditions and 92.3% on organic farms. In total the prevalence of positive farms was 39.2%.

Table 1. Prevalences of *Toxoplasma gondii* positive blood samples and farms in the period 1 January 2012 to 31 December 2014.

Farming system	Blood samples		Farms	
	Number	Prevalence (%)	Number	Prevalence (%)
Organic	16,407	4.0	65	92.3
Controlled housing conditions	129,177	2.0	3,049	38.0
Total	135,584	2.2	3,114	39.2

Seasonality

Based on a cut-off value of 20 PP the seroprevalence per month was determined from 1 January 2012 to 31 December 2014 (Figure 2). The results show that seroprevalence varied over months and years with a minimum in October 2012 of 1.1% and a maximum in November 2014 of 5.2%. In the thirst quarter of 2012 the seroprevalence appeared to be higher as in the third quarter of that year. Also in 2013 and 2014 the seroprevalence appeared to be higher compared to the third quarters in these years.

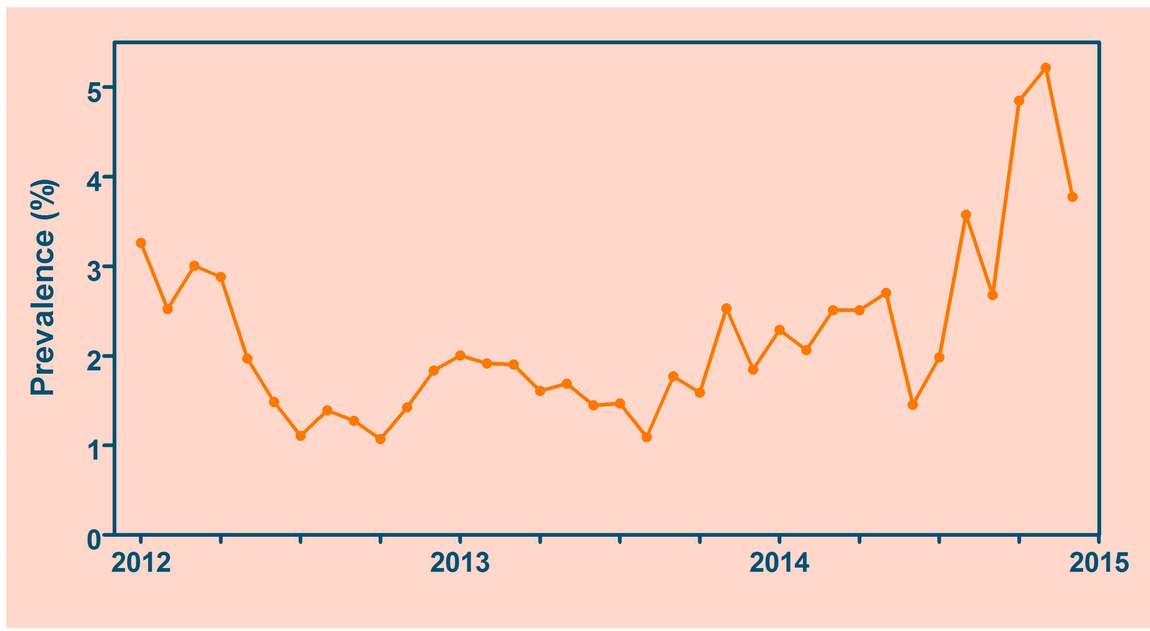

Figure 2. Prevalence of *Toxoplasma gondii* positive blood samples per month from 1 January 2012 to 31 December 2014.

Discussion and conclusions

- A small percentage (2.2%) of pigs and a high percentage (39.2%) of pig farms in The Netherlands was serologically positive for *T. gondii*.
- The highest seroprevalence of *T. gondii* infections was observed on organic farms.
- The seroprevalence of *T. gondii* infections in pigs varied over months and over years.
- A seasonality of *T. gondii* infections in pigs was observed with the highest prevalence in the first quarter of the year and the lowest prevalence in the third quarter.
- The results of this serological monitoring will be used to develop and implement intervention measures in the pork chain.

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