



**HAL**  
open science

## Serologic survey for toxoplasmosis in domestic poultry from the Czech Republic

Eva Bártová, Kamil Sedlák, Ivan Literák

► **To cite this version:**

Eva Bártová, Kamil Sedlák, Ivan Literák. Serologic survey for toxoplasmosis in domestic poultry from the Czech Republic. *Avian Pathology*, 2009, 38 (04), pp.317-320. 10.1080/03079450903055405 . hal-00540157

**HAL Id: hal-00540157**

**<https://hal.science/hal-00540157>**

Submitted on 26 Nov 2010

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



**Serologic survey for toxoplasmosis in domestic poultry from the Czech Republic**

Journal:	<i>Avian Pathology</i>
Manuscript ID:	CAVP-2009-0001.R1
Manuscript Type:	Original Research Paper
Date Submitted by the Author:	24-Feb-2009
Complete List of Authors:	Bártová, Eva; University of Veterinary and Pharmaceutical Sciences, Department of Biology and Wildlife Diseases Sedlák, Kamil; State Veterinary Institute Prague, Department of Virology and Serology Literák, Ivan; University of Veterinary and Pharmaceutical Sciences, Department of Biology and Wildlife Diseases
Keywords:	toxoplasma gondii, IFAT, water fowls, gallinaceous birds

SCHOLARONE™  
Manuscripts

Formatted

Formatted: Right

Cavp-2009-001

Serologic survey for toxoplasmosis in domestic birds from the Czech Republic

**Eva Bártová<sup>1\*</sup>, Kamil Sedlák<sup>2</sup> & Ivan Literák<sup>1</sup>**

<sup>1</sup>*University of Veterinary and Pharmaceutical Sciences, Faculty of Veterinary Hygiene and Ecology, Department of Biology and Wildlife Diseases, Palackého 1-3, 612 42 Brno, Czech Republic,*

<sup>2</sup>*State Veterinary Institute Prague, Department of Virology and Serology, Sídlištní, 24, 165 03 Prague 6, Czech Republic*

Short title: Domestic birds and *T. gondii* antibodies

\*To whom correspondence should be addressed.

E-mail: [bartovae@vfu.cz](mailto:bartovae@vfu.cz) Tel: +420 541562633. Fax: +420-5-41562631

Deleted: ¶

¶  
¶

Received: 2 January 2009

## Summary

This study was carried out on domestic fowls in the Czech Republic in the years 2003 and 2004. A total of 1,108 samples obtained from 538 water birds (geese and ducks) and 570 gallinaceous birds (chickens and turkeys) were tested for specific antibodies against *T. gondii* using the Indirect fluorescence antibody test (IFAT). In geese, 43% prevalence (77 positive out of 178 examined) was found with titres of 40, 320 and 2,560 in 40, 29 and 8 geese, respectively. In ducks, 14% prevalence (52 out of 360) was found with titres of 40 and 320 in 46 and 6 ducks, respectively. In gallinaceous birds, only one of 293 broiler chickens was positive with a titre of 40; sera of 217 hens and 60 turkeys were negative. We found extremely higher antibody prevalence in geese and ducks compared to gallinaceous birds. In Europe, it is the first seroprevalence study in domestic birds by IFAT.

**Deleted:** Serologic survey for toxoplasmosis in domestic birds from the Czech Republic

**Deleted:** Eva Bártová, Kamil Sedlák & Ivan Literák<sup>1</sup>

**Deleted:** ,

**Deleted:** eight

**Deleted:** six

**Deleted:** broiler

## Introduction

The parasite *Toxoplasma gondii* causes infections that are widely prevalent in human and warm-blooded animals worldwide (Dubey and Beattie, 1988). Humans can be infected mainly by ingesting *T. gondii* tissue cysts from undercooked meat or *T. gondii* oocysts from the environment contaminated with cat feces. Domestic birds are a good indicator of environmental contamination with parasite oocysts because of their feeding behaviours. Moreover, birds can serve as a potential source of infection for humans. In chickens, *T. gondii* were found in skeletal muscles, heart, brain, ovary, oviduct, kidney, spleen, liver, lung, pancreas, gizzard, proventriculus, intestine, and retina and even in eggs (Jacobs and Melton, 1966; Kaneto et al., 1997). Tissue cysts of *T. gondii* were found in breast and leg muscles, heart, brain, liver and stomach of experimentally infected domestic ducks (Bártová et al., 2004).

For testing of *T. gondii* antibodies in domestic birds, different methods were used in several countries. Indirect fluorescence antibody test (IFAT) was used to test chickens from India (Sreekumar et al., 2001) and Costa Rica (Abrahams-Sandi and Vargas-Brenes, 2005). Modified agglutination test (MAT) was used to test chickens from several countries, e.g. India (Sreekumar et al., 2003), Israel (Dubey et al. 2004b), Mexico (Dubey et al. 2004a) and Chile (Dubey et al., 2006) and to test chickens and ducks from Egypt (Dubey et al., 2003).

In the Czech Republic, the last serologic study in domestic birds was made by the Sabin-Feldman reaction during the years 1981-1990 (Literák and Hejlíček, 1993). This work is aiming to estimate recent seroprevalence in domestic birds by the IFAT. This method was used in the present prevalence study in several groups of domestic and wildlife animals in the Czech Republic, in order to compare results obtained with the same method.

Formatted: Indent: First line: 35.4 pt

Deleted: ed

Deleted: at

Deleted: ing

Deleted: ies

Deleted: so the obtained results can be

Deleted: compared because

Deleted: of

Deleted: used

## Materials and Methods

**Blood samples.** During the years 2003 and 2004, blood samples of 1,108 domestic birds from the Czech Republic were examined for the presence of *T. gondii* antibodies. The birds were slaughtered at 14 slaughterhouses and blood was taken by veterinary inspectors during the time of avian influenza surveillance. Birds came from 57 different large-scale farms and one slaughter house of 13 districts (Figure 1) to obtain representative sampling from the whole Czech Republic, taking into account the size and the importance of farms. The blood samples were sent to the State Veterinary Institute in Prague. The blood was centrifuged and sera were stored at  $-18^{\circ}\text{C}$  until assayed. Sera of 178 geese, 360 ducks and 570 gallinaceous birds (293 broilers, 217 hens and 60 turkeys) were tested by the IFAT.

Deleted: Blood samples ¶

Deleted: ,

**Indirect fluorescence antibody test.** Antibodies to *T. gondii* were detected in the sera by the IFAT using a commercially available antigen Sevatest Toxoplasma Antigen IFR (Sevac, Prague, the Czech Republic), anti-chicken IgG conjugate (Sigma Aldrich) and anti-duck IgG conjugate (KPL, USA). The sera were diluted in a two-fold series starting at 1:40 as a basic dilution; a titre  $\geq 40$  was considered positive. The other dilutions used were 1:320 and 1:2560. Sera of naturally infected domestic geese, Coscoroba swan (*Coscoroba coscoroba*) and Paradise shelduck (*Tadorna variegata*) and sera from experimentally infected chickens, turkeys and ducks, positive in both the Latex agglutination test (LAT) and the IFAT, served as the positive control (Table 1). Sera negative in both the LAT and the IFAT served as the negative controls.

Deleted: Indirect fluorescence antibody test ¶

Deleted: The list of controls is presented in the Table 1.

## Results

In water birds (geese and ducks) a prevalence of 24 % (129 positive of 538) was found.

Deleted: ,

Deleted: prevalence

Antibodies to *T. gondii* were detected in 43 % (77/178) of geese with titres 40, 320 and 2560

in 40, 29 and eight geese, respectively. Geese came from four different farms with

seroprevalences ranging from 19 % to 64 %. In ducks, 14 % (52/360) prevalence was found

with titres of 40 and 320 in 46 and 6 ducks, respectively. Ducks came from nine different

Deleted: six

farms with seroprevalences ranging from 3 % to 29 % (Table 2). In gallinaceous birds, only

one of 293 broiler chickens originating from 29 farms was positive with a basic titre of 40;

Deleted: broilers

Deleted: coming

Deleted: the

Deleted: coming

Deleted: from

Deleted: six

sera of 217 hens coming from 11 farms and 60 turkeys located on 6 farms, were negative

(Table 3). Data did not allow statistical evaluation because of the differences between districts

(different number of bird sampled, different number and size of farms examined).

## Discussion

The seroprevalence of *T. gondii* in domestic birds varies within countries due to the methods

used for testing, the number of examined animals, type and hygiene of animal breeding, etc.

Deleted: of

Deleted: used

In our study, the gallinaceous birds came from large-scale farms with restriction of cat access.

This can explain the very low seroprevalence found in this group of birds compared to data

obtained in other countries. Antibodies against *T. gondii* were detected by the MAT in 40 %

of chickens from Egypt (Dubey et al., 2003) and in 47 % of free-range chickens from Israel

(Dubey et al., 2004b). In Costa Rica (Abrahams-Sandi and Vargas-Brenes, 2005) and India

(Sreekumar et al., 2001), a prevalence of 41 % and 22 % were found applying IFAT for

Deleted: prevalences

Deleted: by the

Deleted: in

Deleted: chickens, respectively

chicken sera. There are no data available from the European countries, so this is the first

seroprevalence study in domestic birds by the IFAT in Europe. In contrast to 40 % prevalence

in chickens and 16 % in ducks from Egypt (Dubey et al., 2003), we found higher prevalence in ducks compared to chickens.

Our results are similar to those obtained in the Czech Republic in the past, even though a different method was used. Literák and Hejlíček (1993) made a long-term serological study (1981-1990) in domestic birds coming from South Bohemian district by the SFR. They found a higher prevalence in geese (16 %) compared to ducks (2 %). In chickens a prevalence of 5 % was noticed in birds from a small backyard, whereas only one positive chicken was obtained from large-scale commercial farms.

The higher prevalence of antibodies in water birds (geese and ducks) is a good indicator of environmental contamination with oocysts in the sampled areas. Different prevalence was found in geese and ducks. For example, prevalence in geese was 55% (22/40) and 0% (0/39) in ducks coming from the same farm (D) from the OL district. Different prevalence in geese and ducks can be explained by differences in age of the tested animals, the type of breeding and their feeding habits. In the case of ducks, broilers (young birds) produced in large halls were slaughtered and tested. Since geese are not frequently slaughtered, the blood for the surveillance was obtained from breeding stock. These geese were adult with free access to natural water sources (ponds, lakes) and thus with a greater chance to be infected.

Based on the obtained data ducks and geese can represent a higher risk of infection for consumers, because of a higher prevalence found in this group of birds.

## Acknowledgements

This study was funded by the grant no. MSM6215712402 from the Ministry of Education, Youth and Sports of

Formatted: Indent: First line: 35.4 pt

Deleted: , 5 % prevalence in

Deleted: coming

Deleted: and

Deleted: coming

Deleted: animals

Deleted: animals

Deleted: used for breeding

Deleted: (old animals)

Deleted: D

Deleted: from our country



the Czech Republic. We would like to thank MVDr. J. Machová and J. Horníčková from the Czech National Reference Laboratory for Avian Influenza and Newcastle Disease for providing animal samples and to thank Mgr. Zuzana Satková and Bc. Martina Šíbllová for their help with examination of samples.

## References

Abrahams-Sandi, E., and Vargas-Brenes, O. (2005). Serological prevalence of *Toxoplasma gondii* in free-range chickens from Costa Rica. *Tropical animal health and production*, *37*, 369-372.

Formatted: Indent: Left: 0 pt, Hanging: 28.35 pt

Formatted: Font: Italic

Bártová, E., Dvořáková, H., Bárta, J., Sedlák, K., Literák, I. (2004). Susceptibility of the domestic duck (*Anas platyrhynchos*) to experimental infection with *Toxoplasma gondii* oocysts. *Avian Pathology*, *33*, 153-157.

Formatted: Font: Italic

Dubey, J.P. and Beattie, C.P. (1988). *Toxoplasmosis of animals and man*. CRC Press, Boca Raton, FL, 220 pp.

Dubey, J.P., Graham, D.H., Dahl, E., Hilali, M., El-Ghaysh A., Sreekumar, C., Kwok, O.C.H., Shen, S.K., Lehmann, T. (2003). Isolation and molecular characterization of *Toxoplasma gondii* from chickens and ducks from Egypt. *Veterinary Parasitology*, *114*, 89-95.

Formatted: Font: Italic

Dubey, J.P., Morales, E.S., Lehmann, T. (2004a). Isolation and genotyping of *Toxoplasma gondii* from free-ranging chickens from Mexico. *Journal of Parasitology*, *90*, 411-413.

Formatted: Font: Italic

Dubey, J.P., Patitucci, A.N., Su, C., Sundar, N., Kwok, O.C.H., Shen, S.K. (2006). Characterization of *Toxoplasma gondii* isolates in free-range chickens from Chile, South America. *Veterinary Parasitology*, *140*, 76-82.

Formatted: Font: Italic

Dubey, J.P., Salant, H., Sreekumar, C., Dahl, E., Vianna, M.C.B., Shen, S.K., Kwok, O.C.H., Spira, D., Hamburger, J., Lehmann, T. V. (2004b). High prevalence of *Toxoplasma*

*gondii* in a commercial flock of chickens in Israel, and public health implications of free-range farming. *Veterinary Parasitology*, *121*, 317-322.

Formatted: Font: Italic

Jacobs, L., and Melton, M.L. (1966). Toxoplasmosis in chickens. *Journal of Parasitology*, *52*, 1158-1162

Formatted: Font: Italic

Kaneto, C.N., Costa, A.J., Paulillo, A.C., Moraes, F.R., Murakami, T.O., Meireles, M.V. (1997). Experimental toxoplasmosis in broiler chicks. *Veterinary Parasitology*, *69*, 203-210.

Formatted: Font: Italic

Literák, I. and Hejlíček K. (1993). Incidence of *Toxoplasma gondii* in populations of domestic birds in the Czech Republic. *Avian Pathology*, *22*, 275-281.

Formatted: Font: Italic

Sedlák, K., Literák, I., Vitula, F., Benak, J. (2000). High susceptibility of partridges (*Perdix perdix*) to toxoplasmosis compared with other gallinaceous birds. *Avian Pathology*, *29*, 563-569.

Formatted: Font: Italic

Sreekumar, C., Graham, D.H., Dahl, E., Lehmann, T., Raman, M., Bhalerao, D.P., Vianna, M.C.B., Dubey, J.P. (2003). Genotyping of *Toxoplasma gondii* isolates from chickens from India. *Veterinary Parasitology*, *118*, 187-194.

Formatted: Font: Italic

Sreekumar, C., Rao, J.R., Mishra, A.K., Ray, D., Singh, R.K., Joshi, P. (2001). First isolation of *Toxoplasma gondii* from chickens in India. *Journal of Veterinary Parasitology*, *15*, 103-106.

Formatted: Font: Italic

**Table 1.** Characteristic of positive and negative controls included in IFAT.

Controls	Characteristic of controls	n	LAT results	IFAT results
Chicken (negative)	Chicken serum, SPF breed, 2 weeks old	2	-	-
	Chicken serum before <i>T. gondii</i> experimental infection (Sedlak et al 2000)	5	-	-
Chicken (positive)	Chicken serum 28 d.p.i. with <i>T. gondii</i> oocysts (Sedlak et al., 2000)	5	+	+
Turkey (negative)	Turkey serum before <i>T. gondii</i> experimental infection (Sedlak et al., 2000)	4	-	-
Turkey (positive)	Turkey serum 21 d.p.i. with <i>T. gondii</i> oocysts (Sedlak et al., 2000)	4	+	+
Duck (negative)	Duck serum before <i>T. gondii</i> experimental infection (Bartova et al., 2004)	4	-	-
Duck (positive)	Duck serum 28 d.p.i. with <i>T. gondii</i> oocysts (Bartova et al., 2004)	4	+	+
Geese (negative)	Geese serum	4	-	-
Geese (positive)	Sera of naturally infected domestic geese, Coscoroba swan ( <i>Coscoroba coscoroba</i> ) and Paradise shelduck ( <i>Tadorna variegata</i> )	4, 1, 1	+	+

Formatted Table

Formatted: Centered

Formatted: Centered

Formatted: Centered

Formatted: Centered

Formatted: Centered

Formatted: Centered

Formatted: Centered

Formatted: Centered

Formatted: Centered

**Table 2.** Results of *T. gondii* seroprevalence study in ducks and geese

Species	District	Farm	No. of serum samples	No. of positive samples (%)	Titres		
					40	320	2560
Goose	South Bohemian	A	73	14 (19%)	14	2	–
		B	39	25 (64%)	25	23	5
		C	26	16 (62%)	16	2	1
	Olomouc	D	40	22 (55%)	22	10	2
<i>Total</i>			178	77 (43%)	77	37	8
Duck	South Bohemian	E	40	3 (8%)	3	–	–
		F	39	8 (21%)	8	–	–
		G	40	1 (3%)	1	–	–
		H	40	0	0	–	–
		I	33	5 (15%)	5	2	–
		J*	39	8 (21%)	8	–	–
	Hradec Králové	K	48	15 (31%)	15	2	–
	Pardubice	L	42	12 (29%)	12	2	–
	Olomouc	D	39	0	0	–	–
<i>Total</i>			360	52 (14%)	52	6	–

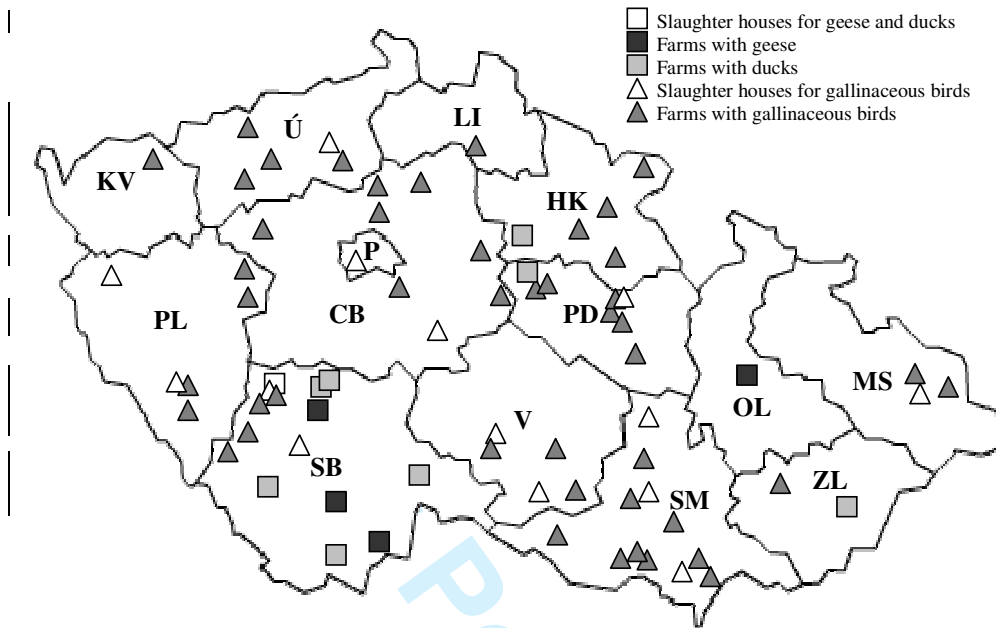
\* J = slaughter house

**Table 3.** Results of *T. gondii* seroprevalence study in gallinaceous birds

Species	District	No. of farms	No. of serum samples	No. of positive samples (%)
<b>Broiler</b>	South Bohemian	3	30	–
	Plzeň	2	20	–
	Ústí nad Labem	3	30	1*
	Hradec Králové	3	30	–
	Central Bohemian	5	50	–
	Pardubice	2	21	–
	Vysočina	2	21	–
	South Moravian	7	71	–
	Moravian-Silesian	1	10	–
	Zlín	1	10	–
<i>Total</i>		29	263	1 (0.4%)
<b>Hen</b>	South Bohemian	1	11	–
	Ústí nad Labem	1	30	–
	Hradec Králové	1	50	–
	Central Bohemian	2	50	–
	Pardubice	4	56	–
	South Moravian	2	20	–
<i>Total</i>		11	217	–
<b>Turkey</b>	Plzeň	2	20	–
	Karlovy Vary	1	10	–
	Liberec	1	10	–
	Vysočina	1	10	–
	Moravian-Silesian	1	10	–
<i>Total</i>		6	60	–

\* positive sample with titre 40

**Figure 1.** Map of the Czech Republic showing the sampled areas.



Districts: SB – South Bohemian; PL – Plzeň; KV – Karlovy Vary; Ú – Ústí nad Labem; LI – Liberec; CB – Central Bohemian; P – Prague; HK – Hradec Králové; PD – Pardubice; V – Vysočina; SM – South Moravian; OL – Olomouc; MS – Moravian-Silesian; ZL – Zlín.