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# Toxoplasma gondii antibodies in the white stork Ciconia ciconia

## *Antikörper gegen Toxoplasma gondii beim Weißen Storch (Ciconia ciconia)*

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**Summary**

The prevalence of *Toxoplasma gondii* in chicks of wild birds and captive individuals was studied in the Poznań environs and in the Poznań Zoological Garden in the years 2002–2003. Bird blood was tested for *T. gondii* antibodies by an indirect fluorescent antibody test. *T. gondii* antibodies were detected from 5.8 % of 205 analysed white stork chicks and 13.6 % of 44 analysed adult storks in the zoo. Because toxoplasmosis is one of the more common parasitic zoonoses worldwide, we briefly discuss the potential epidemiological importance of stork toxoplasmosis to humans.

**Keywords:** *Toxoplasma gondii*, Toxoplasmosis, birds, prevalence, Ciconia ciconia

**Zusammenfassung**

Die Prävalenz von *Toxoplasma gondii* wurde in Jungstörchen von Wildvögeln und in gefangenen Individuen in der Umgebung von Posen bzw. im Zoologischen Garten von Posen in den Jahren 2002–2003 getestet. Hierzu wurden die Vögel serologisch mittels indirektem Fluoreszenz-Antikörper-Test auf *T. gondii* geprüft. *T. gondii*-Antikörper wurden in 5,8 % von 205 getesteten Jungvögeln des Weißen Storchs sowie bei 13,6 % der 44 getesteten Störche im Zoo nachgewiesen. Da die Toxoplasmose eine wichtige weltweit verbreitete parasitäre Zoonose ist, wird die potentielle Bedeutung dieser Befunde für den Menschen diskutiert.



**Keywords:** *Toxoplasma gondii*, Toxoplasmosis, Vögel, Prävalenz, Ciconia ciconia

## Introduction

*Toxoplasma gondii* infects many species of mammals and birds and is distributed world-wide (for a review see Dubey, 2002). In an agricultural landscape occurrence of this protozoan parasite can be important, both for people as well as for animals. *Toxoplasma gondii* affects bird behaviour and can even influence population dynamics (Dubey, 2002; Tenter et al., 2000).

The aim of present study was to determine the prevalence of *T. gondii* in two groups of the white stork Ciconia ciconia; chicks and flying individuals delivered to a rehabilitation centre. Moreover, we tried to find any potential impact of *T. gondii* antibodies present on body condition of chicks.

## Material and methods

**Field procedures and animals.** Field work was conducted during two breeding seasons (2002 and 2003) in two different part of Wielkopolska region, which holds typical breeding densities of white storks in Poland, ca 17 breeding pairs/100 km²: near Ostrów Wlkp. (Dolata, 2003), and ca 5 bp/100 km² near Poznań (Ptaszyk, 1994 and Ptaszyk, unpubl. data).

The age of chicks was estimated using bill length measurements. We measured the upper mandible of the bill (tip to feathers) of all nestlings to the nearest 0.1 mm using slide callipers. The age of each nestling was estimated according to table of bill development (Kania, 1988). Chicks were bled from the branchial vein, and



blood put into plastic tubes and transported to the laboratory. A total of 205 nestlings (143 in 2002 and 62 in 2003) from 75 nests were sampled, on average at 34.5 ± 11.9 days old (range 6–64 days), i.e. a few days prior to fledging. Based on field observations of the nests, we found that all sampled chicks lived to fledging, suggesting that the blood sampling procedure was not a strong invasive method. In addition, 44 adult white storks were sampled outside of the breeding season when they arrived at a wildlife rehabilitation centre in Poznań Zoological Garden. These animals were in a poor state of health, and were mainly fledged immatures or adults with broken wings after electrical wire collisions.

**Serological examinations.** The blood samples were examined for antibodies (IgG) to **T. gondii** by an indirect fluorescent antibody test (Lin and Su, 1997). The basic serum dilution used was 1 : 32, and titres ≥ 32 were considered positive. We used for the examination material by *'Wytwórnia surowic i szczepionek w Krakowie'*[6] and *Toxodiagnostika*[6].

**Statistics.** We estimated a body condition index as residuals from body mass of each chick regressed on age established from bill length. In flying individuals, a body condition index was defined as the residual of body mass regressed on bill length. Data are presented as means ± SD. Data from two years were pooled for analyses because of the small sample sizes and because there was no evidence for significant between year prevalence in the antibodies. To test data they were separated into two groups: chicks with and without detected *T. gondii* antibodies and analysed by logistic regression with chick age as the independent variable. Analyses were conducted using the statistical package SPSS.

## Results

Antibodies of *T. gondii* were detected from 12 (5.8 %) of the 205 white stork chicks and from 6 (13.6 %) of the 44 analysed storks delivered to the zoo. These two groups of birds differed slightly in *T. gondii* antibodies present (chi-square = 3.27, df = 1, p = 0.07).

The probability of antibodies being present did not increase with chick age (logistic regression, $\chi^2_{Wald} = 55.92$, df = 1, p = 0.62) and was not related to chick condition index ($\chi^2_{Wald}$d = 0.93, df = 1, p = 0.33). Also, in the zoo specimens presence of *T. gondii* antibodies was not influenced by condition index ($\chi^2_{Wald}$ = 0.05, df = 1, p = 0.82).

## Discussion

To our knowledge, this is the first report of *T. gondii* occurrence in the white stork (for reviews see: Dubey, 2002 for toxoplasmosis studies and Valkiūnas et al., 2002 for other parasitological studies in the white stork). Infection is assumed to occur in local foraging areas through food sources, and transported to chicks by parents during feeding or, in the case of individuals in the zoo delivered with food. As main potential *T. gondii* sources in these cases of white stork are probably small mammals, as the common vole *Microtus arvalis* (Hejlíček et al., 1997; Sedlák et al. 2000), comprised the main food of storks in the study area (Antczak et al. 2002; Tryjanowski and Kuźniak, 2002).

We did not find any negative effects of *T. gondii* on the condition of chicks either on the flying white storks.

Rzedzicki & Boś (1999) suggested that wild birds are a valid vector in the distribution of *T. gondii* and the source of toxoplasmosis for humans may be edible poultry products and wild game-birds. The white stork is not hunted for food in Europe but the opposite is the case in Africa (Schulz 1998).

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