Seroprevalence of *Neospora caninum* infection in free ranging chickens (*Gallus domesticus*)

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Abstract Recently chickens are considered as an important intermediate hosts for *Neospora caninum*. Free range chickens expose to infection with *N. caninum* oocysts because they feed from the ground therefore they could be a good index of the environmental contamination. We studied *N. caninum* infection in free range chickens by serological. One hundred and fifty chickens purchased from five regions from Fars province and their blood were used for serological testing. Antibodies to *N. caninum* were found in 26 (17.33 %) of 150 serum samples by MAT. This study is the first to describe the presence of antibodies to *N. caninum* in chicken in Iran. These serological results indicate a widespread exposure of free range chickens to *N. caninum* in south of Iran.

Keywords *Neospora caninum* · Seroprevalence · Chicken · Modified agglutination test (MAT)

Introduction

Neospora caninum is cyst-forming coccidian parasite that belong to the subfamily of Toxoplasmatinae (Frenkel and Smith 2003). Up to now dogs and coyotes are confirmed as definitive hosts of the parasite, although other canids are suspected to be definitive hosts of *N. caninum* (McAllister et al. 1998; Gondim et al. 2001). *N. caninum* is an

important infectious agent of abortion in cattle and has a significant cause of reproductive failure and economic losses in the dairy and beef industries (Trees et al. 1999). Currently there is no drug or efficient vaccine to prevent *N. caninum* abortion in cattle (Lundén et al. 1998; Dubey et al. 2002). The risk factors for neosporosis in cattle are largely unknown, however the combined presence of dogs and poultry was identified an increased risk of abortion storms due to *N. caninum* (Bartels et al. 1999; Otranto et al. 2003). *N. caninum* is known to infect several birds including, chickens (Costa et al. 2008), magpies (*Pica pica*) sparrows (*Passer domesticus*) (Gondim et al. 2010), buzzard (*Buteo buteo*) (Darwich et al. 2012), and Psittaciformes (Mineo et al. 2011) but infected birds do not show sign of the disease. Chickens are intermediate hosts of *N. caninum* and because they feed directly from the soil, being more exposed to infection therefore these birds could serve as good index of environmental contamination with oocysts (Costa et al. 2008). Recently experimental infections of chickens and embryonated eggs with *N. caninum* were reported and also transmission of this infection to dogs as definite host was proved (Costa et al. 2008; Furuta et al. 2007; Mansourian et al. 2009; Khodakaram-Tafti et al. 2012). According to these findings isolation of *N. caninum* from chicken looks quite logic although so far the parasite has not been isolated from naturally infected birds. The aim of this study was to determine the serological of *N. caninum* infection in free ranging chickens in Fars province located in south of Iran.

Materials and methods

One hundred and fifty adult chickens were bought from suburb of Shiraz located in south of Iran. The birds were

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Table 1 Seroprevalence of *Neospora caninum* infection from free ranging chickens in different regions of Fars province, Iran

Region of sampling	Numbers of samples	MAT
Kavar	70	12
Marvdasht	20	5
Sarvestan	20	3
Siakh darengon	20	2
Beiza	20	4
Total	150	26

acquired in towns: Kavar (70 Chickens), Marvdasht (20), Siakh Darengoon (20), Sarvestan (20), and Beiza (20). The blood samples of chickens were transferred to Razi institute and chicken sera were tested for *N. caninum* using Modified agglutination tests (MAT) according to methods previously described (Packham et al. 1998). Briefly all chicken sera were added to the 96 well microtiter plate's U bottoms, and diluted two-fold starting from 1:5 to 1:160. Chicken sera with MAT titers of 1:5 or higher were intended positive for *N. caninum* antibodies. Negative and positive controls were remarkable in this test.

Results

Antibodies to *N. caninum* were found in 26 (17.33 %) of 150 serum samples by MAT. The antibody titers of seropositive chickens were 1:5 in two, 1:10 in five, 1:20 in four, 1:40 in six and 1:80 in five, 1:160 in four chickens (Table 1). In clinical examination chicken did not exhibit any disorders or neurological signs associated with infection by the *N. caninum*.

Discussion

In this study we used the N-MAT that previously proved to be highly sensitive and specific for both naturally and experimentally infected animals, highly reproducible between and within readers, easy to use on large sample sizes without requiring special equipment, and useful in testing serum from any species without modification (Packham et al. 2008). This study is the first to describe the presence of antibodies to *N. caninum* in chicken in Iran. In this survey, prevalence of serum antibodies against to *N. caninum* was 17.33 % by MAT. This prevalence rate is comparable to those have been reported from different countries in America where 5.7–83.6 % of free range chickens were seropositive (Martins et al. 2011). So far nothing is known of specificity of any serological test for

the diagnosis of patent *N. caninum* infection in chickens because the parasite has not been isolated from naturally-infected birds, and chickens experimentally infected with *N. caninum* developed only intransient infection and became seronegative by 60 days post infection (Furuta et al. 2007).

The results indicate that exposure to this parasite is common in this region however; the absence of clinical signs show that a significant degree of *Neospora* sp. infection occurs sub-clinically. Previous reports and our results reconfirm a widespread infection of free range chickens to *N. caninum*. These findings emphasis on further studies to understand the importance of chickens in the epidemiology of *N. caninum*.

References

- Bartels CJ, Wouda W, Schukken YH (1999) Risk factors for *Neospora caninum*-associated abortion storms in dairy herds in The Netherlands. *Theriogenology* 52:247–257
- Costa KS, Santos SL, Uzeda RS, Pinheiro AM, Almeida MA, Araujo FR, McAllister MM, Gondim LF (2008) Chickens (*Gallus domesticus*) are natural intermediate hosts of *Neospora caninum*. *Int J Parasitol* 38:157–159
- Darwich L, Cabezon O, Echeverria I, Pabon M, Marco I, Molina-Lopez R, Alarcia-Alejos O, Lopez-Gatius F, Lavin S, Almeria S (2012) Presence of *Toxoplasma gondii* and *Neospora caninum* DNA in the brain of wild birds. *Vet Parasitol* 183:377–381
- Dubey JP, Graham DH, Blackston CR, Lehmann T, Gennari SM, Ragozo AM, Nishi SM, Shen SK, Kwok OC, Hill DE, Thulliez P (2002) Biological and genetic characterisation of *Toxoplasma gondii* isolates from chickens (*Gallus domesticus*) from Sao Paulo, Brazil: unexpected findings. *Int J Parasitol* 32:99–105
- Frenkel JK, Smith DD (2003) Determination of the genera of cyst forming coccidia. *Parasitol Res* 91:384–389
- Furuta PI, Mineo TW, Carrasco AO, Godoy GS, Pinto AA, Machado RZ (2007) *Neospora caninum* infection in birds: experimental infections in chicken and embryonated eggs. *Parasitology* 134:1931–1939
- Gondim LF, Pinheiro AM, Santos PO, Jesus EE, Ribeiro MB, Fernandes HS, Almeida MA, Freire SM, Meyer R, McAllister MM (2001) Isolation of *Neospora caninum* from the brain of a naturally infected dog, and production of encysted bradyzoites in gerbils. *Vet Parasitol* 101:1–7
- Gondim LS, Abe-Sandes K, Uzeda RS, Silva MS, Santos SL, Mota RA, Vilela SM, Gondim LF (2010) *Toxoplasma gondii* and *Neospora caninum* in sparrows (*Passer domesticus*) in the Northeast of Brazil. *Vet Parasitol* 168:121–124
- Khodakaram-Tafti A, Mansourian M, Namavari M, Hosseini A (2012) Immunohistochemical and polymerase chain reaction studies in *Neospora caninum* experimentally infected broiler chicken embryonated eggs. *Vet Parasitol* 188:10–13
- Lundén A, Marks J, Maley SW, Innes EA (1998) Cellular immune responses in cattle experimentally infected with *Neospora caninum*. *Parasite Immunol* 20:519–526
- Mansourian M, Khodakaram-Tafti A, Namavari M (2009) Histopathological and clinical investigations in *Neospora caninum* experimentally infected broiler chicken embryonated eggs. *Vet Parasitol* 166:185–190

- Martins J, Kwok OC, Dubey JP (2011) Seroprevalence of *Neospora caninum* in free-range chickens (*Gallus domesticus*) from the Americas. *Vet Parasitol* 182:349–351
- McAllister MM, Dubey JP, Lindsay DS, Jolley WR, Wills RA, McGuire AM (1998) Dogs are definitive hosts of *Neospora caninum*. *Int J Parasitol* 28:1473–1478
- Mineo TW, Carrasco AO, Raso TF, Werther K, Pinto AA, Machado RZ (2011) Survey for natural *Neospora caninum* infection in wild and captive birds. *Vet Parasitol* 182:352–355
- Otranto D, Ilazari A, Testini G, Traversa D, Frangipane di Regalbono A, Badan M, Capelli G (2003) Seroprevalence and associated risk factors of neosporosis in beef and dairy cattle in Italy. *Vet Parasitol, Amsterdam* 118(1–2):7–18
- Packham AE, Sverlow KW, Conrad PA, Loomis EF, Rowe JD, Anderson ML, Marsh AE, Cray C, Barr BC (1998) A modified agglutination test for *Neospora caninum*: development, optimization, and comparison to the indirect fluorescent-antibody test and enzyme-linked immunosorbent assay. *Clin Diagn Lab Immunol* 5:467–473
- Trees AJ, Davidson HC, Innes E, Wastling JM (1999) Toward evaluating the economic impact of bovine neosporosis. *Int J Parasitol* 29:1195–1200