Seroprevalence of *Toxoplasma gondii* and *Bartonella henselae* infection in stray cats of the Daejeon City, Korea

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**Abstract:** In this study, the seroprevalence of *Toxoplasma (T.) gondii* and *Bartonella (B.) henselae* infection among stray cats in Daejeon City, Korea was surveyed. A total of seven samples were positive (7/118, 5.93%) for *T. gondii* including three samples from female cats (3/58, 5.2%) and four samples from male cats (4/60, 6.7%). There was no significant difference between the genders. A total 22 samples (22/118, 18.6%) were positive for *B. henselae*; nine were from females and 13 were from males. There was no significant difference between genders. Nineteen samples had a titer of 1 : 50, two samples had a titer of 1 : 100, and one sample had a titer of 1 : 200. The present study is the first to use serological tests to analyze *B. henselae* prevalence among stray cats in Korea.

**Keywords:** *Bartonella henselae*, cat, *Toxoplasma gondii*

**Introduction**

*Toxoplasma (T.) gondii* is a worldwide endemic intracellular parasite that infects most warm-blooded vertebrates including cat, and human [12, 17, 18]. It is generally known that cats are a major spreader of this zoonotic agent by eating or direct contacting with feces, soil, food or water contaminated oocysts or tissue cysts of *T. gondii* over a period of 1–2 weeks [5]. Cat is the only animal that excretes resistant oocysts into the environment and a single cat may excrete 10 million oocysts [15]. Recently, several reports on the prevalence of *T. gondii* infection in feral cats in local areas, including Gyeonggi province [9], Seoul [13] and Daejeon [11] have been published.

A syndrome of fever, malaise, and regional lymphadenopathy in people that was frequently associated with contact with kittens or cats was called cat scratch disease (CDS), which is a zoonosis caused by *Bartonella(B.) henselae* [2, 4, 6]. The natural infection with *B. henselae* is usually asymptomatic, or mild clinical signs such as lymphadenopathy, stomatitis, renal, and neurological disease in cats [7, 8]. Infected cats, even if asymptomatic, may be highly bacteremic for several months, and can be a risk factor for human infection [3, 6]. In Korea, large numbers of stray cats become a controversial issue, due to their uncontrolled overpopulation, public health, animal welfare [11, 19]. Also, they disrupt people’s sleep, traffic accidents, and this has been a serious issue since 2000 [12].

The purpose of this study is re-evaluate the seroprevalence of *T. gondii* and *B. henselae* which are zoonotic pathogen that can be spread by cats in Daejeon by Enzyme-linked immunosorbent assay (ELISA) and indirect immunofluorescence antibody test (IFAT).

**Materials and Methods**

**Animals and sampling**

In total 118 feral cats were captured through the local ward government’s Trap, Neuter, and Return (TNR) program; the feral cats were captured safely, subjected to ovariohysterectomy in females and castration in males, and then returned to the territory from which they were captured. Blood was collected from each cat *via* cephalic or jugular puncture and separated equally into 2 parts; blood in a plain test tube was centrifuged for 5 min at 1,800 × g after clotting at room temperature for 30 min.
ELISA for \textit{T. gondii} infection

An ELISA test was performed according to Roqueplo \textit{et al.} \cite{16} method on serum from cats, using a commercial test kit (Multi-species ID Screen Toxoplasmosis Indirect; ID Vet, France) for the detection of antibodies against the \textit{T. gondii} P30 protein according to the manufacturer’s instruction. All samples were examined in twice basically and the doubtful samples were examined in triple.

IFAT for \textit{B. henselae} infection

The indirect immunofluorescence antibody test (IFAT) was performed on the \textit{B. henselae} IFAT slides (MegaCor Diagnostik, Austria) in MegaScreen BARTONELLA kit. All sera were diluted 1 : 50 (cut off) in phosphate-buffered saline and incubated on wells of the slides in a humid chamber at 37°C for 30 min. The slides were rinsed two times in PBST (PBS + 0.4% Tween 80; Sigma Aldrich, USA), two times in distilled water and air-dried. Each well of the slides was surveyed with FITC-conjugated goat anti-Cat IgG (Santa Cruz Biotechnology, USA), two times in distilled water and air-dried. Each well of the slides was surveyed with FITC-conjugated goat anti-Cat IgG (Santa Cruz Biotechnology, USA), two times in distilled water and air-dried. Each well of the slides was surveyed with FITC-conjugated goat anti-Cat IgG (Santa Cruz Biotechnology, USA), two times in distilled water and air-dried. 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nested polymerase chain reaction (PCR) method [10]. Because of different method, we could not compare the result directly, but, low positive rate may be influenced from different method, surveyed region and researched time. Our positive rate was lower than No significant difference was observed between males and females. Al-Majali [1] did not observe a connection between sex and seropositivity on B. henselae. Al-Majali [1] determined outdoor life and predator behavior as risk factors for B. henselae. In the present study, because all sampling cats are stray cats who living in outdoors and high predator in natural environment, Korea and they are assumed to one of a risk factor for B. henselae. In addition, it is considered that outdoor cats are more chance to be exposed to contact with fleas and other sources of infection [1, 14]. Further study for correlation between the presence of fleas and/or ticks and B. henselae seropositivity should be needed.

We observed a prevalence of IgG antibodies against B. henselae of 18.6% on the territory of the Daejeon city. It is reported that seroprevalence for antibodies against B. henselae varies between 5 and 80% [4]. Although all cats in the current study did not show clinical signs of Bartonella infection, clinically healthy cats can be a reservoir for CSD for human [6]. Seropositive cats with IFAT and ELISA might be from a current bacteraemia phase, or a past infection [1, 16]. For this reasons, IFAT and ELISA can be an useful tool for epidemicologic survay but not for the current disease status or diagnosis [6]. In particular, because a first patient coinfected with T. gondii and B. henselae was reported in Korea [20], the screening investigation of this zoonotic pathogens should be continuously and regularly performed in a view of monitoring a public health threaten.

In conclusion, this is a first report of serological investigation for B. henselae infection among stray cats in small population.

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References