Serologic Reports of H3N2 Canine Influenza Virus Infection in Dogs in Northeast China

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ABSTRACT. Reports of dogs with H3N2 canine influenza virus (CIV) have been documented frequently. To better understand the seroprevalence of H3N2 CIV among dogs in northeast China, here we report for the first time a relatively high seroprevalence of H3N2 CIV infection in dogs in northeast China. Forty-five of the 223 canine sera (20.2%) and 166 of the 500 canine sera (33.2%) tested feral dogs and pet dogs were seropositive by NP-ELISA, which is higher than that in southern China. The relative data provided in this report can be useful for small animal practitioners or public health policy makers to carry out relative measures for the prevention of this disease. Meanwhile, similar seroprevalence studies and prospective natural history and incidence studies should also be undertaken in other places.

KEYWORDS: canine, canine influenza virus, H3N2, Northeast China, serologic.


The influenza A virus has a wide host range, from birds to mammals, and it exhibits varying degrees of host adaptation [2, 9]. The emergence of novel influenza virus subtypes, interspecies transmission and prevention of epidemics and pandemics have aroused great worldwide concern. The basic mechanism for interspecies influenza virus transmission is through direct transfer of an essentially unaltered virus from one species to another [4, 8]. A laboratory confirmed case of canine influenza was reported in 2004, and the etiology turned out to be an equine-origin H3N8 influenza A virus [5]. Since the isolation of H3N8 canine influenza virus from racing greyhounds in 2004, the virus has been reported to cause influenza outbreaks among pet dogs in the U.S.A. [2]. The transmission of H3N8 equine influenza viruses to dogs has been reported in Australia and the United Kingdom [6]. In 2007, another canine infection in a pet dog was reported in the Republic of Korea, which was caused by an avian-origin H3N2 CIV. Dogs have been infected via nasal inoculation or contact (respiratory fluid exchange) under experimental conditions. In China, the first CIV strain was isolated from a pet dog in Guangdong Province in 2006, which was also an avian-origin H3N2 subtype influenza virus. Most canine influenza outbreaks are associated with pet dogs from animal clinics in southern China, and all isolates were avian-origin H3N2 [4, 5]. As dogs carrying influenza viruses, it is not only detrimental to the development of the dog-raising industry, but also poses a threat to human health. Great concerns for both veterinary and human health have been aroused for the appearance of H3N2 CIV among dogs, yet little is known about the seroprevalence of H3N2 CIV among dogs in northeast China. We carried out this study to have a better understanding of the seroprevalence of H3N2 CIV among dogs in northeast China.

A total of 723 canine blood samples were collected from 24 different pet hospitals and animal shelters in Heilongjiang and Jilin provinces, northeast China, between February and November 2012. Of these, 223 blood samples were collected from feral dogs in animal shelters, and 500 blood samples were collected from pet dogs in pet hospitals, respectively. About 30 of 723 dogs had presence of influenza-like illness. The dogs showed similar signs of sneezing, copious nasal discharge, coughing and low fever. These sera were separated by centrifugation at 3,000 rpm for 15 min. The serum samples were transferred to new eppendorf tubes and stored at −20°C, until they could be tested for antibodies against the influenza A virus. All serum samples were treated with a receptor-destroying enzyme and absorbed with erythrocytes to remove nonspecific inhibitors before the assays. All samples were tested by Hemagglutination Inhibition (HI) and Neutralization (NT) assays according to the manufacturer’s instructions as previously reported [1, 3, 6, 10]. HI titer≥40 and NT titer≥40 are considered seropositive and indicate previous infection. Influenza viruses used in this study were A/canine/Guangdong/1/2005 (H1N1), A/canine/Guangdong/2/2011 (H3N2). The H3N2 CIV was isolated and named A/canine/Guangdong/2/2011 (H3N2) by the College of Veterinary Medicine, South China Agricultural University [7]. The following antigens were also used for HI tested: H1N1 swine influenza virus (A/swine/Guangdong/L6/2009/H1N1) for H1, H3N2 swine influenza virus (A/ Swine/Guangdong/01/2005) for H3 and H9N2 avian influ-

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Enza virus (A/Chicken/Guangdong/HL/2006) for H9. These viruses were isolated by the College of Veterinary Medicine, South China Agricultural University. The comparison of HI for H3N2 CIV antibodies. Screening 723 canine serum viruses were isolated by the College of Veterinary Medicine, results were confirmed by the NT test. The serological screening revealed that 45 sera (20.2%) and 166 sera (33.2%) were positive by NT in feral dogs and pet dogs (Table 1), respectively (P<0.596). All samples were also tested with other antigens (H1, H3 and H9) for the test, and they were all negative. Based on Table 1, the result revealed that all the city and the type of dog population were not statistically associated with H3N2 CIV infection rate (P>0.05).

Few seroprevalence studies have been attempted in dogs in China. In this study, we conducted serosurveillance of the H3N2 CIV for approximately one year. Here, we report for the first time the currently relatively high seroprevalence of H3N2 CIV infection in dogs in northeast China. Forty-five of the 223 canine sera (20.2%) and 166 of the 500 canine sera (33.2%) tested feral dogs and pet dogs were seropositive by NT, which is higher than that in southern China in 2010. The seroprevalence of H3N2 CIV infections in dogs in southern China was 6.71% (31/462) by ELISA [10]. As a companion animal, the dog is kept in close contact with humans, although the H3N2 CIV is genetically and antigenically different from viruses currently circulating in humans. Whether CIVs have the ability of transmitting to humans remains to be determined, we should nevertheless be aware of the potential for cross-species transmission to occur. Therefore, this has implications for veterinary practice and should be pursued. The relative data provided in this report can be useful for small animal practitioners or public health policy makers to carry out relative measures for the prevention of this disease. In China, similar seroprevalence studies in other regions should be conducted, and prospective natural history and incidence studies should also be conducted.

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REFERENCES


Table 1. Seroprevalence of H3N2 CIV in different dog populations in northeast China

<table>
<thead>
<tr>
<th>City</th>
<th>Feral dogs</th>
<th>Pet dogs</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>No. examined</td>
<td>Seroprevalence (%)</td>
</tr>
<tr>
<td>Heilongjiang</td>
<td>131</td>
<td>14.5% (19/131)</td>
</tr>
<tr>
<td>Jilin</td>
<td>92</td>
<td>28.3% (26/92)</td>
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<tr>
<td>Total</td>
<td>223</td>
<td>20.2% (45/223)</td>
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