

Short communication

Seroprevalence of porcine respiratory coronavirus in selected Korean pigs

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Abstract

A total of 446 serum samples from 88 herds in Korea were examined for antibody to porcine respiratory coronavirus (PRCV) using blocking enzyme-linked immunosorbent assay (ELISA). All serum samples were collected from 24- to 26-week-old finishing pigs between December 1998 and June 1999. By ELISA, 237 out of 446 sera tested (53.1%) and 54 out of 88 sampled herds (61.3%) were positive against PRCV. Of 446 sera from 88 herd tested, 185 (41.5%) serum samples from 22 (25%) herds were seronegative against PRCV and transmissible gastroenteritis virus infection. Our data suggested that seropositive herds for PRCV are distributed diffusely throughout South Korea. © 2000 Elsevier Science B.V. All rights reserved.

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1. Introduction

Porcine respiratory coronavirus (PRCV) was first isolated in Belgium in 1984 and is antigenically related to transmissible gastroenteritis virus (TGEV) (Pensaert et al., 1986). It also has been isolated in North America (Wesley et al., 1990; Jabrane et al., 1994). PRCV and TGEV have several striking differences. In contrast to TGEV, PRCV isolates have a deletion in the region that encodes mRNA 3 (Rasschaert et al., 1990; Vaughn et al., 1994). TGEV replicates in both the intestinal and respiratory tract without causing respiratory disorder. In contrast, PRCV replicates in lung tissue but little or not all in the intestinal tissues (O'Toole et al., 1989; Cox et al., 1990).

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PRCV with no evidence of villus atrophy or gastroenteritis at first was considered to be nonpathogenic (Pensaert et al., 1986), and most studies have concluded that PRCV causes only subclinical respiratory infection (Bernard et al., 1989; Cox et al., 1990; Wesley et al., 1990). However, other investigations have linked PRCV with a field outbreak of respiratory disease and with respiratory disorders including pneumonia following experimental infection (O'Toole et al., 1989; van Nieuwstadt and Pol, 1989; Vannier, 1990; Ahn et al., 1997). Differential serological diagnosis between PRCV and TGEV infection is not possible with the classical sero-neutralization test. Infection with PRCV or TGEV induces antibodies which neutralize both viruses to the same titer. However, the enzyme-linked immunosorbent assay (ELISA) can differentiate between PRCV and TGEV infection (Callebaut et al., 1989; Simkins et al., 1993).

Since PRCV infection was first described in South Korea in 1996 (Ahn et al., 1997), no studies have been performed to determine the prevalence of PRCV infection. Therefore, the purpose of our study was to report the recent seroprevalence of PRCV by a blocking ELISA testing sera collected from swine herds between December 1998 and June 1999.

2. Materials and methods

A total of 446 sera from 24- to 26-week-old finishing pigs in 88 swine farms (an average of 5 serum samples per farm) was selected using a random-numbers table. The list of farms was obtained from the Korean Swine Association, and herds were included from all five of the country states. The sample size was based on financial and logistic restrictions. All farms in this study were farrow-to-finish operations and do not use an all-in-all-out system. No herds were vaccinated against any strain of PRCV. The average size of the 88 herds selected, 220 sows per herd, is considerably larger than the Korean average (currently approximately 135 sows per herd). A herd was considered positive when at least one of the sampled animals was positive. 95% confidence intervals (CI) were calculated. An ELISA kit (Svanova Biotech, Uppsala, Sweden) with a sensitivity of 0.978% and specificity of 0.964% relative to the serum-neutralization test was used to determine the prevalence of PRCV infection (Dr. S. Carman, personal communication, University of Guelph). Blood was collected by jugular puncture and allowed to clot, centrifuged and the serum kept at -20°C until used. One hundred microliters of the 1:2 dilution of test sera added to duplicate wells coated with TGEV antigen, and incubated for 2 h at 37°C . The wells were then washed three times with a phosphate-buffered saline containing Tween (300 μl /well). The plates were reincubated for 30 min at room temperature and after being washed three times, were incubated for 30 min with 100 μl of anti-mouse IgG horse-radish peroxidase conjugate solution. After being washed three times, the plates were incubated for 30 min with 100 μl of substrate solution at room temperature. The reaction was then stopped by addition of 50 μl of a stop solution into each well. The optical density of each well was measured at a wavelength of 450 nm using a ELISA microplate reader.

3. Results

By ELISA, 237 out of 446 sera tested (53.1%; 95% CI: 48.4, 57.8) and 54 out of 88 sampled herds (61.3%; 95% CI: 50.4, 71.6) were positive against PRCV. The prevalence of seropositive sera ranged 36% (28/78) in Kyonggi-Do, 41% (13/32) in Kangwon-Do, 43% (33/77) in Kyoungsang-Do, 53% (63/119) in Cholla-Do to 72% (100/140) in Chungcheung-Do. The prevalence of seropositive herds ranged from 46% (5/11) in Kyoungsang-Do, 57% (4/7) in Kangwon-Do, 57% (8/14) in Kyonggi-Do, 58% (14/24) in Cholla-Do to 72% (23/32) in Chungcheung-Do. Twenty-four out of 446 sera tested (54%) positive against either TGEV infection alone or dual infection with TGEV and PRCV.

4. Discussion

Our sample size was based on financial limitations; some state-specific CIs therefore would be rather imprecise. We found that 61.3% of herds had animals with PRCV antibodies. This confirms the nearly complete spread of PRCV across Korea. Airborne transmission may have facilitated the dissemination of the virus between nearby herds; the infection does not appear to require carrier animals (Martin et al., 1994). The targets of this survey were 24- to 26-week-old finishing pigs. Finishing pigs were chosen because most pregnant sows are vaccinated with TGEV in Korea. Moreover, maternal PRCV- and TGEV-antibodies become seronegative by the age of 18 weeks (Pensaert et al., 1986). The ELISA kit used in this study can discriminate between antibodies developed after a PRCV infection from antibodies developed after a TGEV infection.

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