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Seroprevalence of Antibody to Procine Reproductive and Respiratory Syndrome Virus in Diagnostic Submissions

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Abstract

During the period from January to December of 2001, a total of 3,391 swine sera were submitted to our laboratory from 256 farms for the diagnosis of porcine reproductive and respiratory syndrome (PRRS). The antibody to porcine reproductive and respiratory syndrome virus (PRRSV) was tested by the indirect immunofluorescent antibody (IFA) test. Of the 256 farms tested, 230 farms (89.8%) were positive for the PRRSV antibody. The overall seroprevalence of the PRRSV antibody was 52.1% (1765/3391). Most of the pigs seemed to be infected with PRRSV at around 50 to 60 days old. The seroprevalence of the antibody became higher with age, and peaked at around 100 days old. More than one-third of the adult pigs, including boars, gilts, and sows, was positive for the PRRSV antibody. The infection of PRRSV was chronic and confined to growers and/or finishers in most farms. However, the antibody was detected in all production phases at some farms.

Key words : PRRS virus antibody, Seroprevalence, Indirect immunofluorescent antibody (IFA) test

Introduction

Porcine reproductive and respiratory syndrome(PRRS) had emerged in the late 1980's in the United States of America. The etiologic agent of PRRS is porcine reproductive and respiratory syndrome virus(PRRSV) and was first isolated by Wensvoort at the Central Veterinary Institute in the Netherlands[1]. Soon afterwards, the PRRSV was isolated in Germany and United States[2,3]. The PRRV is a member of the family *Ateriviridae*, in the order *Nidovirales*[1,4]. The PRRSV affects pigs of all ages and causes poor conception rates in sow. The first sign in affected herds was inappetence or anorexia in adult pigs with pyrexia (39~41℃). Reproductive failure characterized by late-term abortion (premature farrowings), increased the number of stillborn and mummified fetuses, and to a lesser extent, decreased farrowing rates[1,2,3]. High preweaning mortality due to the birth of low viability pigs and respiratory disease was observed. In the growing and finishing pigs, respiratory disease of varying degrees due to a secondary bacterial infection was noted. After acute outbreak, PRRSV infection has been known to be endemic infection and defined to a certain production phase such as nursery, grower, and/or finisher[5]. The primary mode of the PRRSV transmission between herds was due to introduction of infected pigs. Chronic or persistent carrier status has been demonstrated in the swine following PRRSV infection, and the carrier pigs are believed to be the major source of the virus transmission[6]. Airborne transmission has been implicated in some cases in European countries. Artificial insemination with contaminated semen may play an important role in virus transmission[7,8]. Some prevention and eradication measures such as depopulation/repopulation, test and removal, modified medicated early weaning or partial depopulation have been introduced[9,10,11]. A spontaneous elimination of the PRRS virus infection was observed in farrow-to-finish herd[10,11]. The partial depopulation of infected swine herds seems to be an effective method in eradication of PRRS when the PRRSV infection is defined to a certain production phase. Vaccination strategies for the PRRSV prevention may be successful to the herd where the PRRS virus infection is stabilized. There is no effective treatment for the PRRSV infection. Most treatments are intended to provide supportive therapy until the acute signs have subsided. Diagnosis of PRRS has been mainly done by the IFA test, ELISA test,

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and virus isolation[12,13,14].

In this study, we examined PRRSV antibody from a total of 3,391 swine serum samples which were submitted to our laboratory for the diagnosis of PRRS during the period of January to December, 2001.

Materials and Methods

Cell culture

The MARC-145 cells, which are permissive to PRRSV, were maintained in Eagle's minimum essential medium supplemented with 3% fetal bovine serum, 0.15% sodium bicarbonate, and antibiotics[12,15].

Serum samples

A total of 3391 samples were submitted for the diagnosis of PRRS from nationwide during the period of January to December, 2001. The serum samples were heat-inactivated at 56℃ for 30 min.

IFA plates and IFA test

The indirect immunofluorescent antibody test was used for the detection of PRRSV antibody from the swine serum[12,13,15]. The MARC-145 cells were cultured in 96-well cell culture plates. The PRRSV was inoculated at multiplicity of infection of 0.01 onto each cell monolayer. The infected plates were incubated at 37℃ in an atmosphere of 5% CO_2 until the cell monolayers exhibited cytopathic effects. The medium was removed and the infected cell monolayers were then fixed with cold ethanol. After ethanol fixation, the plates were washed twice with phosphate-buffered saline (PBS, pH 7.2). 30$\mu\ell$ of diluted rabbit anti-swine IgG FITC conjugate was added. The plate was then incubated again at 37℃ for 30 minutes and then washed 3 times with PBS. The plate was observed under a fluorescent microscope.

Results

Of 3,391 serum samples tested, 1,765 sera (52.1%) had PRRSV antibody. Of 256 farms tested, 230 (90.4%) farms were seropositive for PRRSV antibody. The antibody positive rates in 1- to <30-day old pigs, 30- to <40-day old pigs, 40- to <50-day old pigs, 50- to <60-day old pigs, 60- to <70-day old pigs, 70- to <100-day old pigs, ≥100-day old pigs were 24.2 %, 19.0%, 25.4%, 53.7% , 54.8%, 77.0%, and 79.7%, respectively (Table 1). In the adult pigs, gilt had the highest antibody positive rate (61.0%), followed by boar (37.5%) and sow (30.0%). More than 50% of pigs became seropositive against PRRSV at around 50 to 60-day old. The seroprevalence of antibody varied with age. The highest seroprevalence of PRRSV antibody was observed in the growing pigs at around 80-day old. In many farms, the infection of PRRSV was confined to grower and/or finisher. However, antibody was detected from all production phase in some farms.

Table 1. Seroprevalence of PRRSV antibody in swine sera collected from 256 farms for the diagnosis of PRRS during the period of January to December, 2001

Age	No. of pigs tested	No. of antibody positive pigs(%)
1-<30 d*	385	93(24.2)
30-<40 d	373	71(19.0)
40-<50 d	59	15(25.4)
50-<60 d	121	65(53.7)
60-<70 d	447	245(54.8)
70-<100 d	596	459(77.0)
≥100 d	681	543(79.7)
Gilt	177	108(61.0)
Sow	544	163(30)
Boar	8	3(37.5)
Total	3,391	1,765(52.1)

* day old

Discussion

In this study, serum samples were not collected randomly. However, general trends of PRRSV infection in the pig farms could be evaluated.

The test results showed that the PRRSV infection spread widely in swine herds throughout the country. Low seroprevalence of PRRSV antibody in pigs at around 30 to 40 days old was thought to be a decrease of maternal antibodies. The majority of PRRSV infection was known to be defined to the grower/finisher herds. This kind of infection pattern suggests that partial depopulation of the infected swine herds may be one of the measures to eradicate the PRRSV infection. High seroprevalecne of PRRSV antibody in boar, gilt and sow indicates that these pigs in the breeding farms are the major source of PRRSV infection, and also play an important role in spreading the PRRSV between fan mates or herds. To avoid introduction of the PRRSV into susceptible swine herds, isolation and acclimatization of incoming boars and gilts for a certain period of time before introducing into breeding herd was recommended.

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