

Special Edition
"Porcine Epidemic Diarrhea
Virus Infection in Pig: Current
Perspective"

Editorial

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Special Edition 1

Article Ref. #: 1000VMOJSE1e001

Article History

Received: August 21st, 2017

Accepted: August 22nd, 2017

Published: August 22nd, 2017

Citation

Tian D. A re-emerging epizootic swine virus: Porcine epidemic diarrhea virus. *Vet Med Open J*. 2017; SE(1): Se1-Se2. doi: [10.17140/VMOJ-SE-1-e001](https://doi.org/10.17140/VMOJ-SE-1-e001)

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A Re-Emerging Epizootic Swine Virus: Porcine Epidemic Diarrhea Virus

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Porcine epidemic diarrhea virus (PEDV) is an economically relevant viral agent associated with diseases in pigs. In a farm which has experienced PEDV outbreak, the infected pigs show severe alimentary system disorders characterized by symptoms such as vomiting, watery diarrhea, dehydration and growth retardation, and the young piglets usually have a higher mortality rate.^{1,2} As a member of the *Coronaviridae* family and the *Nidovirales* order, PEDV is an enveloped, positive-sense, single stranded RNA virus. The PEDV genome comprises of a 5'- and 3'- terminal untranslated region (UTR) flanking a large replicase gene and a couple of structural protein genes, approximately encompassing 28 kb size in length.³

PEDV is a typical re-emerging epizootic swine virus. The first PEDV epidemic was described in the United Kingdom in 1971, and subsequently spread to the areas of Europe supporting the maximum pig livestock, but without the recognition of a causative agent until 1977.⁴ After the 1980s, the clinical reports of PEDV gradually declined in Europe and finally began to disappear, persisting only in a few pig farms in Europe.⁵ Therefore, the PEDV was not intensively studied at that time. Meanwhile, PEDV spread globally, affecting various other areas such as the Asian countries in 1980s. The first PEDV epidemics in the Asian sub-continent was reported for the first time in 1982 in Japan, and then spread to adjacent countries such as South Korea and China.⁶ Since these countries are known as the main pig producing areas, PEDV epidemic caused a consistent impact on the swine industry from the 1980s until 2000. However, a remarkable increase of PEDV epidemic occurred in China from 2010, and finally it was confirmed that a new mutant PEDV strain belonging to the G1b genotype caused this outbreak.⁷ In 2013, a violent PEDV outbreak characterized by clinical symptoms such as watery diarrhea, vomiting and high morbidity in weaned pigs occurred in the Iowa state of USA, and then spread rapidly to other states across the country causing tremendous financial loss to the swine industry of USA.² Phylogenetic analyses of the outbreak in the US PEDV strain established a close relationship with the Chinese mutant strain which was isolated in 2012 from the Anhui province in China.^{8,9} From the start of 2013 outbreak to the end of 2015, this PEDV outbreak had a disastrous impact on the US swine industry.

Ever since the significant impact on the global swine industry following the most recent outbreak, PEDV is being extensively studied by virologists and veterinary researchers. The application of appropriate diagnostic methods and vaccines are the first few steps that need to be prioritized to facilitate the prevention of PEDV. A couple of different diagnostic methods have been implemented for quick results.¹⁰ Among these methods, the nucleic acid based tests such as conventional RT-PCR, real time RT-PCR are commonly used in the laboratory on account of its high sensitivity. Antibodies-based serological tests including indirect fluorescent antibody assay (IFA), virus neutralization assay, enzyme-linked immunosorbent assay (ELISA), and fluorescent microsphere immunoassay (FMIA) also have been well established.^{11,12}

Inactivated vaccines against PEDV were used in China and in some other Asian countries since the 1990s. But these inactivated vaccines were all based on the classical virus strain CV777, which was isolated in the 1970s in Europe, while the current epidemic strains have very limited similarity compared with the strain CV777. Therefore, the protective efficacy of these inactivated vaccines are poor.¹³ After experiencing the recent PEDV outbreak, to meet the demands of the industry, scientists in these countries have developed attenuated live vac-

cines and recombinant subunit vaccines based on the mutant strains.^{14,15} In North America, three commercial vaccines are available until now. All these vaccines were licensed after the 2013 outbreak, and are inactivated or subunit vaccines based on the epidemic strains.^{13,16} The protective efficacy of these newly developed vaccines are still under observation.

Four years have passed from the start of this latest outbreak in North America. Extensive research is needed to understand the current epidemic status of PEDV, and the efficacy of the current prevention strategies. A prompt communication is needed between the research scientists and veterinary professionals to be able to find answers to these questions.

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