PORCINE PARVOVIRUS INFECTION IN THAILAND

โรคพาร์โวไวรัสในสุกรของประเทศไทย

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Abstract

Mummified and stillborn fetal pig lungs from Thailand were tested for evidence of porcine parvovirus (PPV) infection using agar gel precipitation technique. Positive results were found using this method. In addition, a four-fold increase in PPV hemagglutination inhibition antibody titters was found in sows two weeks following abortion or stillbirths. These sows had negative antibody titers for swine brucellosis. These findings suggest that PPV is a significant cause of mummification and fetal death in swine in Thailand.

Introduction

Porcine parvovirus (PPV) is the major cause of embryonic and fetal death in swine where no clinical signs of illness are otherwise observed in the adult[1]. This virus was first reported in England[2] and later in Japan[3]. Today PPV infection is found in swine throughout the world. There is no evidence that PPV is antigenically related to parvoviruses found in other species of animals or birds[1] or other viruses known to infect swine. The virus in swine can infect many cell types and be found in most secretions and excretions including boar semen[4]. Viral replication is dependent upon cellular enzymes present in cells during mitotic activity. Therefore rapidly dividing embryonal and fetal cells are ideal host cells for PPV replication[4]. Experimental transplacental infection of the fetus with PPV has been demonstrated in gilts at less than 80 days of gestation[5]. In Thailand, stillbirths, mummification, embryonic death, and infertility are problems in swine production. The present paper emphasizes the detection of PPV infection in cases of swine abortion and stillbirths in Thailand.

Materials and Methods

Virus

Inactivated PPV (Salsbury International, Incorporation, Iowa, USA.) for hemagglutination inhibition test was diluted with phosphate buffer saline, pH 7.2, to contain 8 hemagglutinating units, (HAU) /25μl.

Swine sera

Sera of gilts and sows were obtained from commercial swine herds with a history of reproductive failure. These sera were tested for brucellosis. Those with negative results were tested for PPV infection. Swine had not been given any PPV vaccination. PPV positive and negative serum controls were received from Salsbury International, Incorporation, lowa, USA.

Agar gel precipitation (AGP) test

The agar gel precipitation test was used for detection of PPV antigen. PPV antibody was prepared by injecting rabbits intramuscularly with 1.0 ml of inactivated PPV (256 HAU/25 μl); this was followed by 2 additional intravenous injections of 0.5 ml at one week intervals.

Hemagglutination inhibition (HI) test

Porcine parvovirus HI test[6] was used to determine titers of paired sera. HI titers are expressed as the reciprocal of the terminal dilution of serum inhibiting 8 HAU of virus.

Results

In each aborted litter there was often a variation in the size of the mummified fetuses and mummification was not always present in every fetus of a litter (Fig 1). One or more mummified fetuses from each sow was tested for porcine parvovirus infection.

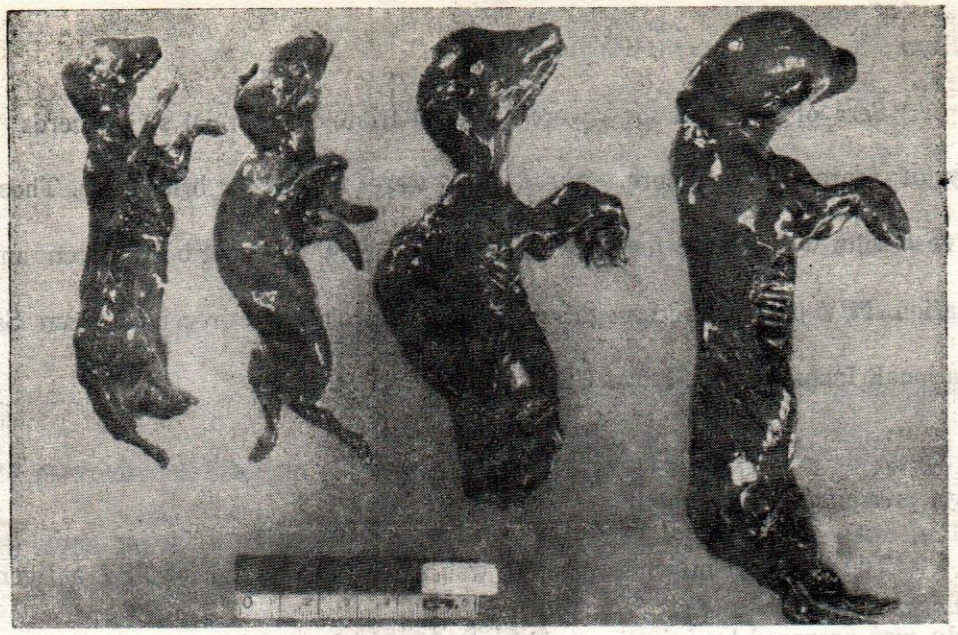

Figure 1. Typical appearance of mummified fetuses tested for parvovirus infection by agar gel precipitation technique.

Lung tissue was positive for parvovirus antigen by the agar gel precipitation test (Fig 2). Precipitation lines were present between the PPV antibody well and the fetal lung tissue supernatant and PPV control wells. Normal swine tissue antigen and serum did not form bands with the PPV antiserum.

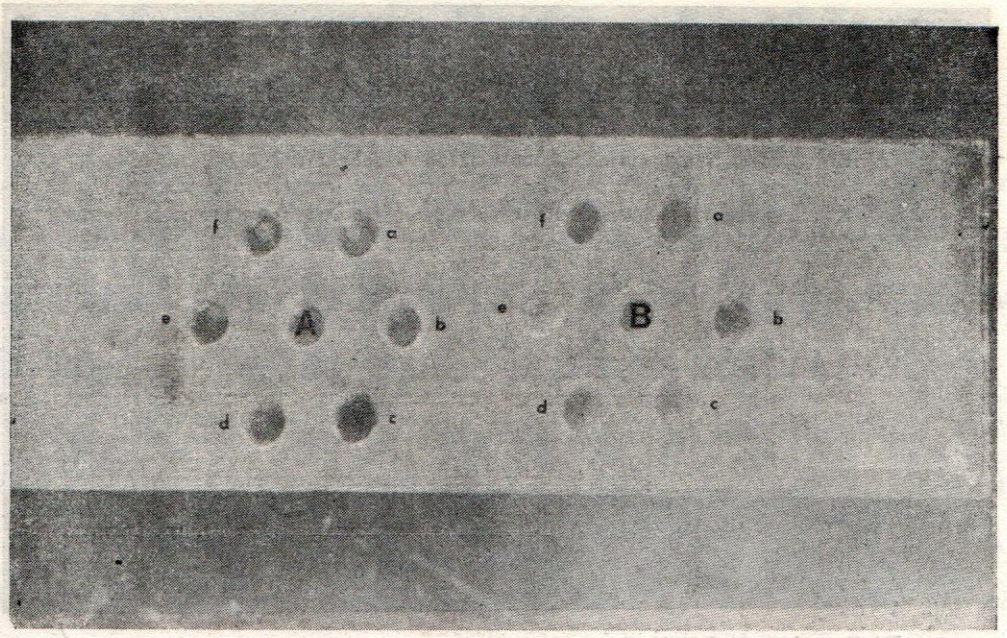

Figure 2. Anti PPV immunodiffusion test. Central wells contain normal rabbit serum (A) and rabbit anti PPV serum (B). Peripheral wells contain normal swine serum (a), normal swine tissue supernatant (b), porcine parvovirus antigen (c, d) and lung supernatant from aborted fetuses (e, f).

Paired sera from sows with stillborn and mummified fetuses were tested for parvovirus HI titers. A typical positive test with a four fold increase in titer after two weeks is shown in figure 3. Usually pigs less than 6 months of age had negative or low HI titers (< 256). A survey of pigs from 10 provinces in Thailand over a period from Dec 1981 through Feb 1983 is shown in Table 1.

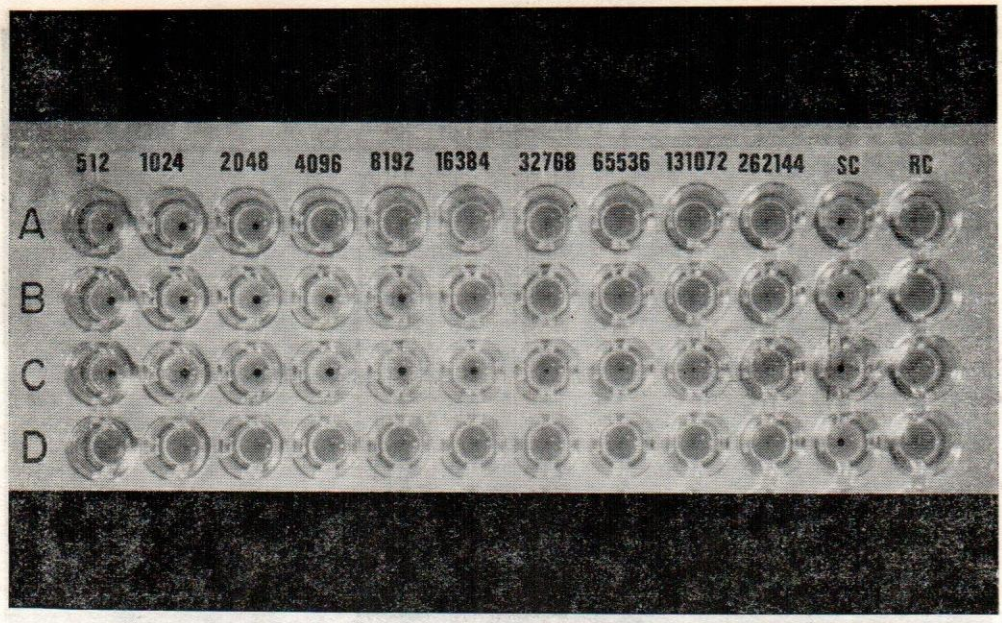

Figure 3. Rising titers of paired sera from sow given four mummified fetuses (figure 1).
Row A : the first serum was collected from sow at time of farrowing showed HI antibody titers of 2,048.
Row B : the second serum was collected 2 weeks later showed HI antibody titers of 8,192.
Row C and D were positive and negative serum controls respectively.
Note : four fold rising HI antibody titers of paired sera in 2 weeks indicated porcine parvovirus infection.

Table 1. Antibody to brucella and parvovirus in swine.

	Antibody	
	Brucella[a]	Parvovirus in brucella negative[a]
All swine tested	40/2,027	404/537

[a]Number positive/number tested (Dec 1981 – February 1983).

Discussion

The diagnosis of porcine parvovirus infection was based upon the history of reproductive failure, detection of parvovirus antigen in the stillborn or mummified fetus by AGP technique, and a rising PPV titer in paired sera from swine with reproductive failure.

The variation in fetal size and extent of mummification within a litter was compatible with observations reported in PPV abortions[1]. When brucellosis was eliminated as a possible cause of abortion or stillbirth in swine, evidence of PPV infection was usually present. Embryonal and fetal lung cells have a high mitotic activity and provide a good environment for PPV replication. AGP method demonstrated the presence of PPV antigen in lung tissue.

Fetal infection after 80 days of gestation may not cause any clinical problems when the pig is born on day 114[4]. If infection occurs prior to day 80, the sow's antibody titer may have reached a maximum level before parturition. Therefore a second serum 2 weeks after stillbirth or abortion may have titer equal or less than the first serum sample. This problem in sample collection may account for the failure to demonstrate on antibody titer increase in some pigs. Viral infectivity is lost soon after fetal death so isolation of the virus from submitted dead fetuses was not attempted.

The loss of piglets due to abortion and stillbirths ranged from 2 to 50% on the farms tested. Because of the potential economic impact on swine production, parvovirus immunization programs should be included on farms where this disease is present. Antibody titers to PPV were usually negative in young pigs 5–6 months of age when maternal antibody had disappeared. PPV immunization should begin in swine at this age.

Acknowledgement

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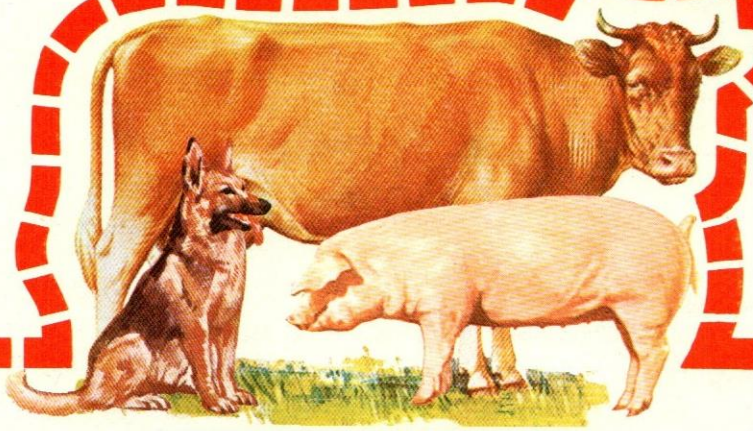

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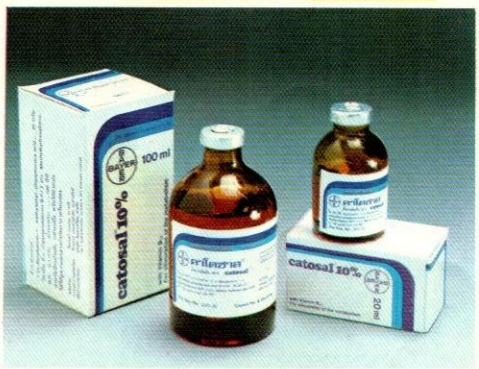

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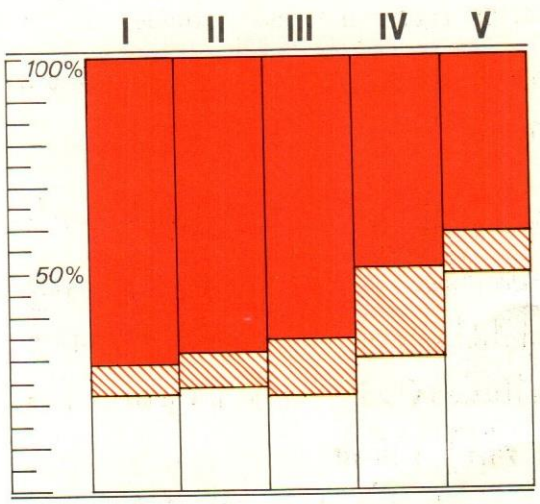

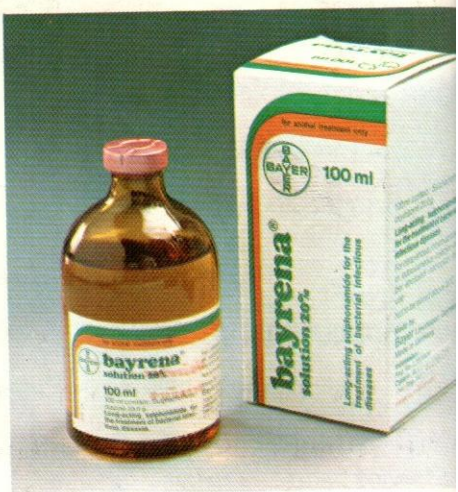

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