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***Background and aim:*** Porcine reproductive and respiratory syndrome (PRRS), also called 'blue ear' disease caused by PRRS virus, is typically characterized by a high fever and respiratory distress in young pigs and is accompanied by high rates of mortality and reproductive failure in pregnant sows. This syndrome is considered to be one of the most important infectious diseases in pigs and has caused serious economic losses to the pork industry worldwide including Japan. Since 2006, a highly pathogenic form of the PRRS virus (HP-PRRSV) that caused high fever and high mortality in both young and adult animals has been occurred and detected firstly in China and then spread rapidly into other neighbor countries. In March 2007, HP- PRRSV emerged and caused outbreaks in Vietnam. By 2010, this viral disease had spread widely throughout Vietnam and killed many pigs at various life stages. To date, no studies have investigated the pathological characteristics of natural cases of HP-PRRS infection. The aim of this study was to investigate the clinical and pathological features of pigs naturally infected with HP-PRRS.

***Methods:*** Ten 10 pigs infected naturally with HP-PRRSV at different ages in three provinces in northern Vietnam were collected for this study. HP-PRRSV infection was confirmed by RT-PCR and, subsequently, by virus isolation in Marc145 cells and evaluated using immunocytochemistry. NSP2 regions of 3 presentative isolates were sequenced and analyzed. The clinical features, gross features was recorded and compared among pig age groups. Tissue samples of infected was used to conduct histopathological examination using HE staining and Immunohistochemistry with several marker (Iba1, CD163, AE1/AE3 and IHC caspase 3), then microscopical findings of the infected pigs was described deeply.

***Results:*** The clinical signs and gross findings in these pigs included high fever (>40.2_C), red skin, blue ears, anorexia, respiratory distress, diarrhoea, haemorrhagic pleurisy and lymphadenopathy. Reproductive failure was the main clinical feature in sows. PRRSV infection-associated microscopical lung and lymph node lesions were observed frequently, regardless of age of the animals. Lung lesions were characterized by interstitial pneumonia and were occasionally associated with haemorrhage and fluid exudation following alveolar collapse. Lymph nodes exhibited characteristic haemorrhage and apoptosis, lymphocytic depletion and disorganization secondary to

fibrosis and capillary formation. Haematoxylin eosin staining or caspase-3 immunohistochemistry revealed apoptosis induction in various tissues and organs, particularly the lymph nodes and lungs. Apoptosis was easily detected by light microscopy (HE) and caspase-3 immunohistochemistry in natural case of HP-PRRS infection instead of specific assays such as TUNEL technique as other previous studies. Primarily haemorrhagic microscopical lesions were observed commonly in other organs including the spleen, liver, heart and kidney. Immunohistochemical examination revealed HP-PRRS antigen in the lung, lymph node, liver and kidney macrophages, and lung and kidney epithelial cells

***Conclusion:*** This is the first study to describe in detail the pathology of HP-PRRS in naturally infected pigs, which shown as multisystemic disease and characterized by severe haemorrhage, apoptosis and lymphocyte depletion which resulted from apoptosis, leading to immune suppression and cause the HP-PRRS disease. We also demonstrated that the distribution of HP-PRRSV antigens in epithelial cells and macrophages was likely influenced by the virulence of the viral strain and breed genetics.

Keywords: HP-PRRSV; pathological characterization; pig; Vietnam