Short Communication

Need of Alertness on Porcine Circovirus 2 in North East India

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Introduction

The domestic pig originated from the Eurasian wild boar (Sus scrofa) and its domestication started approximately 9,000 years ago [1]. Asian pig domestication appeared to have occurred mainly in North-eastern India, the Mekong region, and the middle and downstream regions of the Yangtze River [2]. The pig population in India is 8.8 million, which is 1.09% of the world’s pig population of 967.38 million [3]. India shares only 5.23% of total pork meat production in the world. North Eastern (NE) region of India contributes 28% of India’s total pig population. Among the total pork production in the country, 50% is used in the NE region that includes own production and imported pigs [4]. Pig population contributed by the North Eastern Indian states are Assam (15.89%), Manipur (2.69%), Mizoram (2.38%), Meghalaya (5.27%), Nagaland (4.89%), Tripura (3.52%) and Sikkim (0.29%) [5]. The system of pig production in NE Region of India is unique and traditional where rearing pigs and eating pork are part of their culture. Backyard system of pig rearing is seen here as pigs are highly prolific, fast growing with proven demand and available ready market, resulting in quick generation of income.

Porcine circovirus 2 infection in pigs

Pigs are susceptible to many viral infections which lead to huge morbidity and mortality resulting in considerable economic losses to pig reayers. The important viral diseases among pigs in India are Classical Swine Fever, Rotavirus infection, Foot and Mouth Disease and Porcine Reproductive and Respiratory syndrome. Along with these established maladies, other emerging diseases pose threat to economic pig farming. One such emerging disease is Porcine Circovirus 2 (PCV2) infection which was reported for the first time from Canada in 1991 [6]. There are four types of porcine circovirus, namely PCV1, PCV2, PCV3 and PCV4, of which PCV2, PCV3 [7] and PCV4 [8], are considered to be pathogenic. PCV2 sub-clinical infection is the most common form of PCV2 [8]. Postweaning Multisystemic Wasting Syndrome (PMWS) is a form of PCV2 infection that can increase mortality as well as reduction in the daily weight gain in weaner pigs [9]. PMWS can be transmitted by pig-to-pig direct contact whereas some studies point towards the possible role of airborne transmission. Porcine circovirus 2 (PCV2) causes different forms of disease viz. Porcine Respiratory Disease Complex (PRDC), enteritis, Proliferative and Necrotizing Pneumonia (PNP) and Porcine Dermatitis and Nephropathy Syndrome (PDNS) [10]. The main symptoms are emaciation, icterus, dyspnoea and pallor in pigs of weaning and post-weaning age groups. Lymphadenomegaly is reported in PCV2 infection [11].

Wasting, unthriftiness, skin paleness, jaundice, enlarged lymph nodes and diarrhea are the important clinicopathological manifestations of PCV2 infection. The predilection site for PCV2 is the immune system where it preferentially targets lymphoid tissue depletion and histiocytic replacement, leading to observable typical histological lesions. The macroscopic findings in necropsy are wasting, non-collapsed lungs, pulmonary consolidation and enlargement of lymph nodes. Lymphoid depletion, syncytia formation (giant cells), histiocytess infiltration and histiocytic cells show botryoid inclusions [12].
Several studies have reported reproductive problems associated with PCV infection [13]. Reproductive failures associated with PCV2 have been reported in Canada, Italy, Germany [14] and India [15]. In an investigation to ascertain reproductive failures and neonatal mortality caused by PCV2 by detecting viral antigen and nucleic acids in tissues of stillborn and dead neonatal pigs in Tamil Nadu Kumar, et al. [16], confirmed the presence of porcine circovirus 2 in pooled organ samples. Virus isolation together with PCR assay helped to establish the PCV2 etiology in pneumonia and wasting of pigs encountered in their study.

**Consequences of PCV2 infection**

Heavy economic loss in affected herds was reported due to significant increase in post-weaning mortality [17]. PCV2 infection is reported to be present in every major swine-producing country in the world and the number of cases of Porcine circovirus associated disease (PCVAD) is rapidly increasing. It is considered as the most devastating disease in Korean livestock history, since its first outbreak in 1999 [18]. An estimate in United States shows that PCV2 infection leads to an average loss of 3–4 dollars per pig to 20 dollars per pig in severe outbreak [19]. Grau-Roma, et al. [20], proposed that the diagnosis should be based on a significant increase in post-weaning mortality and ‘wasting’, and positive findings in at least 1/5 pigs post mortem.

**Porcine Circovirus 2 infection in north east India**

Bhattacharjee, et al. [21], reported the complete genome sequence of PCV2a and PCV2b from NE states of India. A prevalence rate of 11.56% for PCV2 was reported by Pugu, et al. [22], in 1064 serum samples of pigs collected from North Eastern states of India. In another study by Mukherjee, et al. [23], in Meghalaya a mean positivity of 18.94% was reported for PCV2. In another study, Mukherjee, et al. [24] reported highest antibody prevalence of PCV2 as 80.8% in 2014, 79.1% in 2015 and 96.2% in 2016 in Meghalaya. A comprehensive study of PCV2 and its incidences in the North East India from 2011 to 2017 indicated 31.27% mean positivity of PCV2 antibodies in the area [25]. In a comprehensive prevalence study, Rajesh, et al. [26,27], reported 49.35% prevalence of PCV2 in samples collected from all the NEH states.

In India, only scanty studies are being conducted to track the epidemiological pattern of PCV2. In comparison with other diagnostic assays, LAMP is less time consuming with ease of performance and high specificity to detect specific nucleic acid sequence in clinical samples as well as can be performed in field level with minimum requirements. It is to mention that every study conducted about PCV2 in NEH region give the alarming situation about the PCV2 prevalence among pigs. It is high time to think about the preventive measures and control measures so that the disease prevalence can be curtailed.

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