

RESEARCH ARTICLE

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Variation in time and magnitude of immune response and viremia in experimental challenges with Porcine circovirus 2b

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Abstract

Background: Porcine circovirus 2 is the primary agent responsible for inducing a group of associated diseases known as Porcine Circovirus Associated Diseases (PCVAD), which can have detrimental effects on production efficiency as well as causing significant mortality. The objective of this study was to evaluate variation in viral replication, immune response and growth across pigs ($n = 974$) from different crossbred lines. The approach used in this study was experimental infection with a PCV2b strain of pigs at an average of 43 days of age.

Results: The sequence of the PCV2b isolate used in the challenge was similar with a cluster of PCV2b isolates known to induce PCVAD and increased mortality rates. The swine leukocyte antigen class II (*SLAI*) profile of the population was diverse, with nine *DQB1* haplotypes being present. Individual viremia and antibody profiles during challenge demonstrate variation in magnitude and time of viral surge and immune response. The correlations between PCV2 specific antibodies and average daily gain (ADG) were relatively low and varied between - 0.14 to 0.08 for IgM and -0.02 and 0.11 for IgG. In contrast, PCV2 viremia was an important driver of ADG decline following infection; a moderate negative correlation was observed between viral load and overall ADG ($r = -0.35$, $P < 0.001$). The pigs with the lowest 10% level of viral load maintained a steady increase in weekly ADG ($P < 0.0001$) compared to the pigs that had the 10% greatest viral load ($P < 0.55$). In addition, the highly viremic group expressed higher IgM and IgG starting with d 14 and d 21 respectively, and higher tumor necrosis factor - alpha (TNF- α) at d 21 ($P < 0.005$), compared to low viremic group.

Conclusions: Molecular sources of the observed differences in viremia and immune response could provide a better understanding of the host factors that influence the development of PCVAD and lead to improved knowledge of swine immunity.

Keywords: Disease susceptibility, PCV2b, Swine

Background

PCV2 vaccination was proven successful in controlling PCVAD. However, in a standard commercial operation, while the majority of pigs are infected with PCV2b, only a fraction will display PCVAD symptoms [1,2]. Currently, no diagnostic tool is available to identify pigs that have potential susceptibility to PCVAD. As a result, the

entire population must be vaccinated in order to protect a fraction of the pigs leading to an increase in production cost. In addition, a research by Cino-Ozuna et al. [3] discovered that acute pulmonary edema, a novel PCVAD syndrome, was associated only with pigs vaccinated for PCV2.

Several studies observed differences in PCVAD susceptibility in several breeds of pigs, with Landrace pigs reported to have increased vulnerability to PCV2 infections compared to Large White, Yorkshire, Duroc and Pietrain pigs [4-6]. Recent research has also shown that

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