RESEARCH ABSTRACT

SWINE HEALTH

Title: A modified-live prototype vaccine for PCV-2 in swine - **NPB** #10-047

Investigator: Steven Krakowka, DVM, PhD, Professor

Institution: The Ohio State University

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Industry Summary:

Scientific Abstract: Porcine circovirus type 2 (PCV2) was present in swine populations as an asymptomatic infection at least 25 years prior to the first reported case of PCV2-associated postweaning multisystemic wasting syndrome (PMWS). Viral sequences were amplified from frozen archived (1970-1) porcine tissues and the complete genome of archival PCV2 was deduced from these fragments. While the ORF1 gene product (viral DNA replicase) was homologous to contemporary PCV2 ORF1 sequences, a consistent linear nine-base sequence difference was found in positions 1331 through 1339 of the ORF2 nucleocapsid gene. The deduced amino acid sequence from these base changes alters the nucleocapsid conformation in the second immunogenic epitope from a hydrophobic (contemporary PCV2) to a hydrophilic (archival PCV2) configuration. Since archival PCV2 was, *de facto*, avirulent, these molecular sequence data suggest that the critical viral molecular component of PCV2 virulence is associated with this novel archival base sequence and subsequent amino acid difference.

To test this hypothesis, cloned engineered archival and cloned contemporary PCV2 genomes were constructed wherein the ORF1 gene (viral DNA replicase) was identical in each clone and the ORF2 gene (nucleocapsid protein) was sequence-identical in both clones except for the nine-base difference in positions 1331-1339, corresponding to archival and contemporary PCV2 viruses respectively. Clones were transfected into porcine kidney (PK) 15 cells and, after sequence confirmation, further passed in PK15s and also 3D4/2 porcine alveolar macrophages. Virulence trials in gnotobiotic piglets were conducted with these cloned PCV2s. The resultant data support the hypothesis that the conversion of avirulent archival PCV2(s) into virulent contemporary PCV2 virus(es) was accompanied by mutational event(s) within ORF2 sometime after 1971 and that this mutation in part, accounts for the sudden emergence of PMWS in global swine populations in 1998-2000.