

## THE UNIQUE CHIMERIC FORMULATION OF SUVAXYN® PCV2 ONE DOSE

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### KEY POINTS

- Suvaxyn PCV2 One Dose is a chimeric formulation that combines the infrastructure of nonpathogenic PCV1 with surface components of PCV2.
- A chimeric vaccine is recognized by the pig's immune system as a pathogenic PCV2, but grows, infects and replicates like a nonpathogenic PCV1.

### CHIMERIC FORMULATION OVERVIEW

Suvaxyn PCV2 One Dose is uniquely formulated using 2 types of related porcine circoviruses. Most pigs naturally become infected with both porcine circovirus type 1 (PCV1) and porcine circovirus type 2 (PCV2). PCV1 was isolated more than 20 years ago and is known to be nonpathogenic in swine. PCV2, however, can cause devastating disease in swine when combined with a triggering cofactor (such as a coinfection or certain types of immunostimulation). Disease effects can include wasting, impaired immune system function and death.

Researchers know that nonpathogenic PCV1 and highly pathogenic PCV2 share about 75% of the same genetic (nucleotide sequence) identity and the same genomic structure. Consequently, this similarity makes them ideal candidates for construction of the chimeric virus.

The genome of circoviruses is arranged in sections called open reading frames (ORF). The first open reading frame

(ORF-1) codes for proteins that are involved with allowing the virus to infect and replicate in porcine cells. The second open reading frame (ORF-2) codes for proteins that make the viral capsid that is involved in stimulating an immune response.

A chimera virus is constructed in a laboratory and contains genetic material from two closely related viruses. After many trials, Virginia-Maryland Regional College of Veterinary Medicine researchers Xiang-Jin Meng, M.D., Ph.D., and Martin Fenau, Ph.D., succeeded in removing the ORF-2 from PCV1 and replacing it with ORF-2 from PCV2. The resulting virus is a chimera that is recognized by the pig's immune system as the pathogenic PCV2, but grows, infects and replicates like the nonpathogenic PCV1.

This unique chimeric structure allows the vaccine virus to retain the safety of nonpathogenic PCV1, while stimulating a protective immune response to pathogenic PCV2.

### ADVANTAGES OF A CHIMERIC FORMULATION

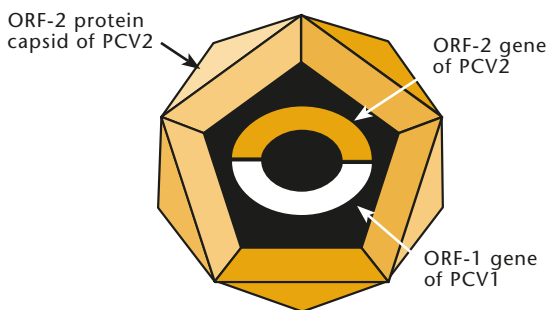
#### Safety

The unique design of a chimeric formulation makes it virtually impossible for the vaccine virus to revert to a virulent one. Because Suvaxyn PCV2 One Dose is a killed-virus vaccine, it will not cause the disease it is meant to prevent.

#### Flexibility

A chimeric formulation offers more flexibility for future vaccine developments, giving the option to pursue either killed or modified-live combinations of the vaccine, depending on market requirements.

### CHIMERIC CIRCOVIRUS VACCINE



While the PCV1 virus is nonpathogenic, the PCV2 virus causes disease in pigs, especially when combined with 1 or more trigger factors. In all circoviruses, the ORF-1 gene (the backbone) controls replication and the ORF-2 gene (the viral capsid or coat) contains the immunogenic proteins the pig's body recognizes, triggering an immune response. In the chimera, the vaccine circovirus looks like PCV2 to the pig's immune system, but acts like PCV1, being nonpathogenic.

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## THE RESEARCHERS BEHIND SUVAXYN® PCV2 ONE DOSE

Developing a new vaccine against a disease that's not well understood takes innovation, cooperation and dedication from a team guided by clear vision. A collaborative set of researchers rose to the challenge posed by porcine circovirus, creating Suvaxyn PCV2 One Dose, plus new diagnostic methods and viral antigen production processes along the way.

### **XIANG-JIN MENG, M.D., Ph.D.**

*Associate Professor, Molecular Virology, Virginia-Maryland  
Regional College of Veterinary Medicine*

Meng "invented" the chimeric PCV1-PCV2 used in Suvaxyn PCV2 One Dose. His research focuses on understanding replication and pathogenesis of viruses, including porcine circovirus, porcine reproductive and respiratory syndrome virus (PRRS) and hepatitis. Recently, Meng discovered the swine and avian hepatitis E viruses.

### **MARTIJN FENAUX, Ph.D.**

*Research Scientist, Gilead Sciences, Inc.*

As a doctoral student under Xiang-Jin Meng, Fenaux constructed the chimeric virus used in Suvaxyn PCV2 One Dose and was responsible for *in vitro* viability testing of the vaccine virus. He also developed assays used to determine PCV2 viral loads of tissue samples. After earning his Ph.D. in molecular virology, Fenaux completed a postdoctoral fellowship at Stanford Medical School in California.

### **PAT HALBUR, D.V.M., Ph.D.**

*Department Chair, Veterinary Diagnostic and Production  
Animal Medicine; Executive Director, Veterinary Diagnostic  
Laboratory; Iowa State University*

Identifying new and emerging viruses, understanding their pathogenesis, and designing control and prevention strategies for viral disease in pigs are at the center of Halbur's research. He has worked extensively with PRRS, PCV2 and hepatitis E. Halbur and Tanja Opriessnig, D.V.M., Ph.D., assessed immunogenicity of the chimeric circovirus vaccine virus. He also developed a model to reproduce postweaning multisystemic wasting syndrome and tested vaccine prototypes.

### **STEVE CHU, D.V.M., Ph.D.**

*Executive Vice President, Global Research and Development,  
Fort Dodge Animal Health*

At Fort Dodge Animal Health, Chu has overseen development and registration of many products, including West Nile virus vaccines for horses, a canine Lyme disease vaccine and a feline immunodeficiency virus vaccine. He has been awarded several key vaccine patents. Before joining Fort Dodge Animal Health 20 years ago, Chu worked for Boehringer Ingelheim Animal Health and at the University of California–Davis School of Veterinary Medicine.

### **MIKE GILL, Ph.D.**

*Senior Director, Viral and Small Animal Research  
and Development, Fort Dodge Animal Health*

Collaborating with Steve Chu and Stephen Wu, Gill designed the studies that allowed Fort Dodge/Wyeth Animal Health to gain licensure for Suvaxyn PCV2 One Dose. He has worked in veterinary vaccine research and development for more than 30 years and helped develop several important swine, canine and feline biological products.

### **STEPHEN WU, Ph.D.**

*Associate Director, Biotechnology Research and Vaccine  
Development, Fort Dodge Animal Health*

The project manager who shepherded Suvaxyn PCV2 One Dose through development, Wu uses his expertise in molecular biology and vaccinology to create vaccines for food and companion animals. Before joining Fort Dodge Animal Health, Wu conducted molecular microbiology research at the Institute of Physical and Chemical Research in Japan, Cornell University and Harvard Medical School's Massachusetts General Hospital.