

# PRRS TECHNICAL PAPER

Cambridge Technologies

## KEY POINTS:

- 1** PRRS REMAINS A MAJOR PROBLEM TO SWINE PRODUCERS AND DUE TO RAPID MUTATION AND STRAIN VARIATION, VACCINATION WITH OVER THE COUNTER VACCINES ALONE IS DIFFICULT.
- 2** RECENT RESEARCH HAS SHOWN SUCCESS IN USING A COMBINATION OF MLV AND AUTOGENOUS KILLED VACCINES.
- 3** WITH NEXT GENERATION SEQUENCING, DIAGNOSTICIANS CAN IDENTIFY AND CHARACTERIZE ANY EMERGING VIRUSES OR VIRAL VARIANTS PRESENT IN A HERD.
- 4** MULTIPLE MANUFACTURING OPTIONS CAN OFFER A FLEXIBLE APPROACH TO DEALING WITH AN EVER CHANGING DISEASE.

## INTRODUCTION

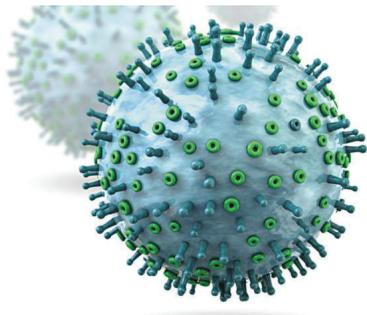
Porcine reproductive and respiratory syndrome virus (PRRSV) has been negatively impacting pork production around the world for nearly 30 years. Since it was first identified in the late 1980s, the virus has cost the industry billions of dollars, with estimated losses of \$664 million just in the United States breeding and growing-pig herds<sup>4</sup>. In recent years, a highly pathogenic variant has emerged in China<sup>6</sup>. These strains cause disease similar to traditional PRRSV as well as neurological signs and erythematous blanching rash. The new variants have spread throughout south-east Asia and can cause clinical disease and death in all ages of swine, including adult pigs and pregnant sows<sup>7</sup>.



Despite the nearly worldwide reach of the disease and its longevity, there is still much to be learned regarding vaccination protocols. The virus evolves and mutates quickly<sup>5</sup>, making effective vaccination difficult. In recent years, a combination of commercial and autogenous vaccines has been found to boost humoral immunity in sows and to reduce viremia in weaned piglets<sup>2</sup>.

## VACCINATION PROTOCOL

Geldhof, et al., demonstrated that a vaccine's ability to stimulate the production of virus-specific neutralizing antibodies does not necessarily correlate with protection against said virus, and vice versa, which suggests that there are additional vaccine-induced immune mechanisms beyond antibodies that contribute to immunity<sup>3</sup>. This, along with research showing how administration of a homologous, farm-specific vaccine can bring a positive response<sup>2,1</sup>, has led to an increased belief that there is not a "one-size-fits-all" approach, and that in fact a unique approach to PRRSV versus other virus may be warranted.



Inactivated vaccines including autogenous products are believed to be most effective when used in combination with a modified live vaccine, as the MLV "primes" the pigs in order to adequately respond to the second product<sup>8</sup>. Based on this information, it would be beneficial for a PRRSV vaccination protocol to include administration of an autogenous vaccine to pigs whose immune system is primed against the PRRS virus. Cambridge Technologies uses Precision Vaccinology™ to insure the autogenous product will expose the animal to farm-specific viral proteins thus stimulating a greater breadth of

antibodies to target various strains

Cambridge Technologies works with veterinarians and producers using Precision Vaccinology™, which includes our next-generation diagnostics and state of the art manufacturing processes, to produce an autogenous vaccine that targets the most imminent PRRS threat in the herd.

## DIAGNOSTIC METHODS

As the initial step in the Precision Vaccinology™ process, Cambridge Technologies uses next-generation sequencing processes such as metagenomics for both detection of the virus and strain identification/selection. This enables diagnosticians to identify and fully sequence any novel or emerging viruses or variants, such as is common with PRRSV. In cases where there is a complex interaction between multiple bacteria and viruses, such as respiratory disease caused by PRRSV interacting with PCV2, metagenomic sequencing can be used to identify all of the viruses potentially associated with the condition while also producing a complete genome sequence of them. If needed, qPCR can be used to quantify the identified viruses.

Metagenomics can help to answer questions about potential virus transmission with the ability to profile animals coming from multiple sources, points of comingling and concentration, and transport vehicles moving in and out. Longitudinal metagenomic profiling can be used to see what viral and bacterial changes take place in a herd over time.

Veterinarians and producers can compare what is present in healthy animals to what is present when there is disease, in order to establish a clearer picture of what challenges the animals are facing, and when.

Evaluation for and of virulence factors is necessary as potential selection criteria for final choice of isolates used in the vaccine. In Precision Vaccinology™, Cambridge Technologies uses a next generation sequencing technique known as Multi Locus Sequence Typing to characterize and compare isolates from a herd to select those that are most relevant for use in a vaccine.

### VACCINE MANUFACTURING

When manufacturing autogenous killed PRRSV vaccine, it is important to maintain the integrity of the viral protein structure, which in theory generates immune response when introduced to the pig's immune system. A key part of the Precision Vaccinology™ process is our proprietary manufacturing process that protects this structure, keeping it as close as possible to the originally isolated virus.



Certain adjuvants can enhance the immune response and/or aid in the administration of the antigen. There are

multiple options to choose from when deciding on a route of administration as well. Our autogenous vaccines can be developed for intranasal, intramuscular, intraperitoneal, or subcutaneous administration. The technical staff at Cambridge Technologies works throughout the Precision Vaccinology™ process with the herd veterinarian to select the most appropriate adjuvant and route of administration.

### CONCLUSION

Forward-thinking manufacturers such as Cambridge Technologies continue to work toward identifying the most effective protocols for PRRSV vaccination. Researchers have found success in using a combination of commercial and autogenous MLV and killed products. Our Precision Vaccinology™ has raised the bar in both PRRSV diagnosis and vaccine formulation, including our use of metagenomic diagnostics and a proprietary vaccine manufacturing process. In the face of continually emerging PRRSV variants, pork producers and veterinarians who partner with Cambridge Technologies can be confident that they are on the leading edge of combatting the disease.

## SOURCES

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