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# PRRS vaccines

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The biology of the PRRS virus has made the development of safe and effective PRRS vaccines a daunting task. The virus is efficiently transmitted horizontally (from pig to pig) and vertically (pig to fetus) and is shed in all excretions including semen. PRRSV is highly infectious, with only a few virus particles sufficient to establish a productive infection. The resulting infection is often subclinical and can be maintained in some pigs at a low-level for several months. At the level of immunity, genetic variation makes PRRSV a moving target. A vaccine colloquium, organized by Dan Rock at the University of Illinois, described several properties for a broadly effective PRRS vaccine. However, the "ideal" vaccine is still several years away.[1]

The USDA supported PRRS Coordinated Agricultural Project (PRRS CAP) has created a comprehensive road map leading to the control and eventual elimination of the virus (**www.prrs.org**). One objective of the PRRS CAP is to develop new knowledge needed for improvement of current vaccines and for the exploration of novel vaccination strategies.

a. Characterize the structural components of PRRSV that determine protective immunity.

b. Establish a definition of heterologous PRRS virus protection.

c. Characterize viral genes/sequences and virion structure components which determine virulence, replication and host range.

d. Investigate sources of immune dysregulation caused by PRRSV infection.

e. Design and develop companion diagnostic tests that can differentiate infected from vaccinated animals (DIVA).

A community asset being developed under the PRRS CAP is to establish a **standardized vaccine challenge resource** that will allow researchers and veterinarians to make accurate comparisons between vaccines as they become available. The rationale for the resource is outlined in an editorial by Murtaugh et al.[2] The first step will be to develop standardized protocols that describe the appropriate challenge model, including the number and breed of animals, number and types of challenge isolates, and the identification of indicators that accurately measure protection and related end points.

A unique aspect of PRRS is that it is often manifested in the field as a disease complex, which can make it difficult to faithfully recreate an appropriate challenge model in the lab. This limitation has made field studies an essential component for determining the "bottom line" effectiveness of vaccination. One benefit of a properly designed field study is that vaccination can be factored into the cost/benefit economics of a given production system. An example of a field test of a vaccine against porcine circovirus disease is described in Horlen et al.[3] An important limitation is that field studies require access to herds that have a thoroughly documented virus and disease status. Another important consideration is the identification of an appropriate "experimental unit". For subunit vaccines, which are not shed, the experimental unit is as small as a single pig. However, for modified live virus vaccines, which are shed from pig to pig, the smallest experimental unit is the barn. Under this circumstance, the logistics of conducting a trial become considerably more difficult.

One important lesson learned from PRRS, is that the design, development and testing of PRRS vaccines requires an integrated knowledge of the virus; from a thorough analysis of its basic biology to an understanding of its epidemiology and ecology. This is the approach taken by the PRRS CAP.

## References

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3. Horlen, KP, Dritz SS, Nietfeld JC, Henry SC, Hesse RA, Oberst R, Hays M, Anderson J, Rowland RR. 2008. A field evaluation of pig mortality and performance following commercial vaccination against porcine circovirus type 2. J Am. Vet. Med. Assoc. 232:906–912.