# Identification and Development of African Swine Fever Virus Vaccine Candidates by Reverse Vaccinology

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## IMPACT STATEMENT

African swine fever (ASF) is an acute, highly contagious and often fatal disease of domestic swine. ASF is endemic in most countries of Sub-Saharan Africa and in the last several years has been reported in the Iberian Peninsula, Sardinia and Eastern Europe. ASF is a severe socio-economic concern for countries with commercial swine, and the recent spread of this disease in Europe and Russia has increased the need to find an effective ASF vaccine, as none currently exist. The estimated net benefit of preventing ASF in the United States is approximately $4.5 billion.

## THE CHALLENGE

While an effective vaccine for ASF is not currently available, several vaccine development studies have demonstrated varying levels of partial protection and/or neutralizing antibody response using African swine fever virus (ASFV)-specific antibodies, recombinant protein transfer and DNA fusion vaccines. The failure to achieve complete protection may be due to the delivery method or the requirement of more or alternative antigens, and it is possible that protection requires a multi-pronged approach that induces both humoral and cellular immune responses.

## THE SOLUTION

Successful vaccine development may require the inclusion of viral proteins capable of inducing humoral and cellular responses and improvements in delivery methods. The objective of this project is to evaluate a novel approach, reverse vaccionology, for the identification and development of ASFV vaccine candidates. This approach will be combined with two different antigen expression methods and a pooled delivery system to provide the best chance of successfully identifying effective vaccine candidate(s).

FAZD CENTER

## TECHNOLOGY TRANSITION

The objective is to identify and develop ASFV recombinant protein vaccine candidates using reverse vaccinology. Two protein/antigen expression and delivery platforms will be evaluated. Both the eukaryotic and poxvirus vaccine expression platforms provide safe marker-enabled, differentiating infected from vaccinated animal (DIVA) capability. The candidates will be evaluated in proof-of-concept swine serological studies to assess safety and immunogenicity. The National Center for Foreign Animal and Zoonotic Disease Defense Center (FAZD) has engaged an animal health industry biopharmaceutical company as a partner in the research and development for this project to leverage their subject matter expertise on candidate down selection and delivery methods as well as use of their commercially licensed adjuvant for vaccine formulation.

## FEATURES AND BENEFITS

- Results in the first application of reverse vaccinology for ASFV vaccine candidate identification.

- Provides a safety and immunogenicity efficacy assessment of seven unique candidates using two delivery platforms, recombinant protein and poxvirus vector approach, combined with a commercial adjuvant.

- Provides ASFV vaccine candidates with DIVA capability by down selection of recombinant proteins with diagnostic potential exclusive of the selected recombinant vaccine.

- Develops much-needed diagnostic reagents (monoclonal and polyclonal antibodies) for ASFV detection for use by the scientific research community.

- Establishes and defines critical ranking parameters for the use of reverse vaccinology in viral vaccine candidate identification.

- Develops Vaxign vaccine predictive features and criteria (swine genome and MHC class predictions) to enable universal swine disease vaccine development by reverse vaccinology.

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