African Swine Fever: Safeguarding Canada's Swine Populations

African swine fever (ASF) is a devastating viral disease of farmed and wild pigs that causes nearly 100% mortality. It is highly contagious and can survive in the environment for long periods. There is no effective vaccine or treatment.

Canada is the third largest pork exporting country. In 2020 1.4 million tonnes of pork, valued at $5 billion, was exported to 93 countries. ASF has not been detected in Canada, but the disease poses a significant threat to Canada's pork industry—for both pig health and for the devastating impact a positive case could have on international market access.

DISEASE TRANSMISSION HISTORY

ASF first appeared in Africa in the early 1900s. It emerged in eastern Europe in 2007 and has since spread to other parts of Europe and Asia. It has also recently been found in the Dominican Republic and Haiti, the first appearance in North America in nearly 40 years. The disease and available control measures (e.g., culling) have caused the deaths of hundreds of millions of pigs in affected countries and led to significant socioeconomic impacts.

The virus can be transmitted by infected animals, ticks, contaminated feeds, farm equipment, and clothing. Even though ASF has caused high mortality in infected pigs for decades, effective vaccines or treatments are not available.

INNOVATION AND PROGRESS

Recent ASF outbreaks have increased global efforts to stop the spread of the virus. As part of this effort we are developing a viral vectored vaccine that incorporates several ASF genes. Since the infectious ASF virus is not used in this vaccine it will be safe to use in our swine populations in Canada.

The Vaccine and Infectious Disease Organization (VIDO) is a world leader in infectious disease research and vaccine development.

Collaborating with national and international partners from government, academia, and industry, we aim to improve animal health, protect Canadian herds and ensure food safety by:

- Understanding how pathogens cause disease;
- Developing novel vaccines and therapeutics;
- Improving vaccine formulations and delivery methods.

Our work has resulted in vaccines for porcine epidemic diarrhea virus and *Actinobacillus pleuropneumoniae*, as well as several others for cattle and poultry.

We have also developed more potent adjuvants that enhance the immune response of vaccines, and novel approaches for needle-free delivery.

VIDO

OUR RESEARCH

VIDO is the first non-government research organization with approval to conduct *in vitro* and *in vivo* work with ASF in Canada. The Canadian Pork Council, Canadian Meat Council, Saskatchewan Pork Development Board and the Canadian Food Inspection Agency facilitated these approvals.

Globally, several live attenuated vaccines are in development, but the potential risk of reversion to the disease-causing form excludes use in countries free from ASF—including Canada, the USA and Mexico. Because of this, we are developing a vaccine using non-pathogenic viral vectors that deliver part of the ASF virus genetic material (non-infectious) to pigs. This vaccine development approach will help induce protective immunity in pigs and will also differentiate infected from vaccinated animals (DIVA vaccine). As a two-pronged approach, the team is also identifying antiviral compounds that could be administered to pigs to prevent viral replication and stop the spread of the virus.

To facilitate research the team is developing a continuous porcine cell line to evaluate virus host interactions and for the commercial production of live attenuated ASF vaccines. A lack of these cell lines has impeded ASF research and the development of potential live attenuated vaccines for international use.

WHAT'S NEXT

We are currently developing a challenge model for ASF to assess the effectiveness of vaccines, antivirals, and other treatments in pigs, and explore diagnostic methods. By helping to develop a vaccine for this devastating disease, we will help prevent the virus from spreading to Canada.

STUDYING AFRICAN SWINE FEVER AT VIDO

The Containment Level 3- Agriculture (CL3-Ag) facility at VIDO was constructed for research on pathogens like ASF virus. To ensure safety and security we have:

- state-of-the-art equipment and building features engineered to protect employees and the surrounding community from exposure to infectious agents,
- stringent standard operating procedures and employee training to ensure safe handling of pathogens, and
- restricted facility access.

Our ASF research will operate with enhanced oversight by the Canadian Food Inspection Agency.

FOR MORE INFORMATION CONTACT:

Suresh Tikoo
Project Leader
suresh.tik@usask.ca

Andrew Van Kessel
Director of Research
andrew.vankessel@usask.ca

VIDO
/ACCINE AND INFECTIOUS DISEASE ORGANIZATION

UNIVERSITY OF SASKATCHEWAN

www.vido.org

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