



PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME (PRRS)

Improvement of therapeutic and prophylactic measures against PRRS virus through the discovery of antiviral drugs and the use of antimycotoxins

Carl Gagnon, University of Montreal

Why is this project important?

Porcine reproductive and respiratory syndrome (PRRS) is a major viral infectious disease affecting pigs, causing significant economic losses of around \$150 million per year for the Canadian swine industry. In sows, PRRS is characterized by reproductive failure, late-term abortions, increased numbers of stillborn fetuses, and/or premature and weak piglets. During PRRS disease, there is an increase in morbidity and mortality in growing and finishing pigs due to severe respiratory disease and poor growth performance.

Currently, the main strategies used to control PRRS include vaccination, surveillance and biosecurity measures. Overall, the efficacy of available commercial vaccines against PRRS is somewhat limited, partially because of the high genomic variability of the PRRS virus.

The main objective of this research program is to improve the general health status of swine by acquiring new knowledge. Researchers hoped to improve the antimicrobial protection of pigs against PRRS using any suitable means, such as antiviral drug development and enhancement of PRRS vaccination efficacy.

What will be the benefit of this research?

The Canadian hog products exportation market is quite significant, with an estimated value of \$3.2 billion per year. However, DON-contaminated feed is a constant threat to pig health due to its effects on the immune system and predisposition to infectious diseases, including PRRS. Deoxynivalenol (DON), commonly referred to as Vomitoxin, is a mycotoxin that may be produced in wheat, corn and barley grain infected by mold (such as *Fusarium spp*).

The control of swine viral diseases, as well as the prevention of negative effects of DON, will have a huge economic impact for swine industry stakeholders. Therefore, new strategies, such as antiviral

¹ (Deoxynivalenol (DON), commonly referred to as Vomitoxin, is a mycotoxin that may be produced in wheat, corn and barley grain infected by mold (such as *Fusarium spp*)

compounds, need to be developed to fight PRRS and control DON as a frequent contaminant of feed.

The study will also enhance efficiencies in the pork value chain. By decreasing the presence of PRRS at the farm level using novel strategies such as antiviral drugs and anti-mycotoxin feed additives, researchers can have a positive impact on all the downstream processes of swine production, from the farm to the table.

What was done?

Researchers identified and characterized PRRS antiviral molecules that are secreted by a porcine bacteria, *Actinobacillus pleuropneumoniae* (*App*).

They also worked to circumvent the negative effect of DON mycotoxins on the efficiency of the PRRS MLV vaccine. To achieve this goal, researchers had to determine if anti-mycotoxin feed additives could prevent the negative effects of DON-contaminated feed on the efficiency of a PRRS vaccine. They also needed to decipher the DON mechanisms involved in stopping the PRRS virus from replicating and suppressing vaccine efficiency.

Following extensive metabolomic analyses, adenosine nucleotides analog molecules (molecules with diverse applications in medicine and biochemistry) have been identified in the *App* cell culture at very high concentration. The PRRS antiviral efficacy of some of these molecules were tested. Interestingly, some of them were able to suppress the replication of the PRRS virus *in vitro*. This finding may lead to the development of novel PRRS antiviral compounds and, ultimately, to the implementation of a new strategy to control PRRS.

Collaborators

Francis Beaudry
Younès Chorfi
Mario Jacques University of Montreal

Project status

Completed in 2023.

Additional resources and information about this project

Farmscape Interviews

- [Scientists Strive to Use Actinobacillus Pleuropneumoniae Secreted Molecules to Fight PRRS](#)
August 25, 2023
- [Actinobacillus Pleuropneumoniae Bacteria Provides Molecules to Fight PRRS](#)
August 18, 2023

Additional resources

- Faud Salmin, A., Gagnon, C., Beaudry, F. (2021, April 26). Virus du syndrome reproducteur et respiratoire porcin : de l'espoir pour le développement d'un traitement. *LaTerre De Chez Nous*.
<https://www.laterre.ca/actualites/page-conseils/virus-du-syndrome-reproducteur-et-respiratoire-porcin-de-lespoir-pour-le-developpement-dun-traitement>

Financial support for this project

This project is part of the Swine Cluster 3 (2018-2023) research program, made possible through financial support from Agriculture and Agri-Food Canada's Canadian Agricultural Partnership, eight provincial pork producer organizations and over 30 industry partners. [Click here to learn more about the financial partners for Swine Cluster 3.](#)