PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS: STRAINS NEWLY INTRODUCED IN SWINE BREEDING SITES IN QUEBEC (2021-2025)

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INTRODUCTION

Worldwide, porcine reproductive and respiratory syndrome (PRRS) is one of the costliest endemic diseases of the swine industry.

PRRS clinical signs

- **Sows:** mortality and reproductive disorders (abortions, mummified, stillborn and weak piglets).
- **Suckling piglets and growing pigs:** dyspnea and cough, mortality, susceptibility to bacterial secondary infections.

PRRS virus (PRRSv)

- RNA virus, Betaarterivirus suid 1 (PRRSv-1) and 2 (PRRSv-2)
- High diversity among strains. Partial cross-protection following heterologous challenge complicates disease control.

OBJECTIVE

- Describe the incidence and characteristics of new-PRRSv-strain introductions in Quebec breeding sites between 2021 and 2025.



MATERIALS AND METHODS

Study design and source population

- Retrospective descriptive study conducted on Quebec swine breeding sites between July 1st 2021 and June 30th 2025.

Data

PRRSv ORF5 sequences

- Sequences from field samples submitted by veterinarians in three Quebec diagnostic laboratories

Site characteristics from the Veille Sanitaire Provinciale (VSP)

- Production type
- Administrative region
- PRRS health status and PRRSv vaccination

PRRSv introductions in breeding sites

- Declared based on multiple criteria including the herd PRRS history, vaccinal status, similarity of the strain with commercial vaccinal strains, and similarity of the strain with previous strains detected in the herd.
- Yearly incidence of introductions with 95% CI intervals estimated using the mean number of breeding sites at-risk registered in the VSP for each year.

Genetic clusters involved in PRRSv introductions

- Alignment of sequences in Clustal Omega.
- Inference of a maximum likelihood tree in RAxML (GTRGAMMA evolutionary model).
- Identification of genetic clusters with ≥ 70% rapid bootstrap (n=1000) branch support value and ≥ 15 sequences.
- Classification of clusters as vaccine-like or wild-type.
- Assignment of PRRSv introduction to each cluster.
- Determination of the number of PRRSv introductions per year and per region by cluster.

RESULTS

662 PRRSv sequences

193 PRRSv introductions

153 Breeding sites

Incidence of PRRSv introductions in breeding sites

- Each site had either one (77%), two (20%) or three (3%) introductions over the 4-year period.
- Yearly incidence decreased from 15.8 to 7.9 introductions per 100 breeding sites from 2021-2022 to 2024-2025 (Fig. 1).

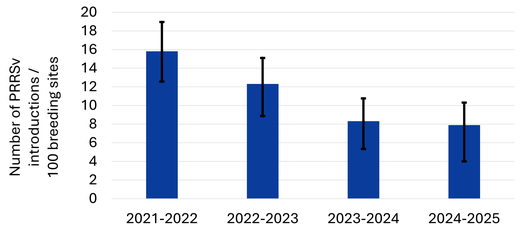


Figure 1. Yearly incidence of PRRSv introductions in Quebec breeding sites with 95% confidence interval per year.

Genetic clusters involved in PRRSV introductions

- PRRSv-2: four wild-type and 1 vaccine-like clusters (Fig. 2).

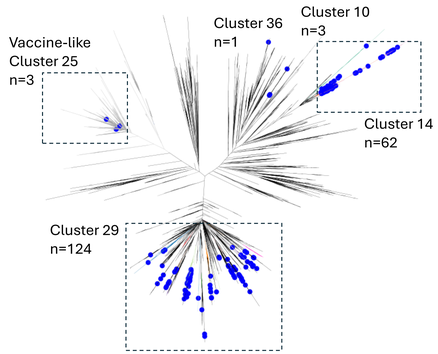


Figure 2. Maximum likelihood tree of Quebec ORF5 PRRSv sequences (n=8500,1998-2025). The 193 PRRSv introductions in breeding sites are highlighted in blue.

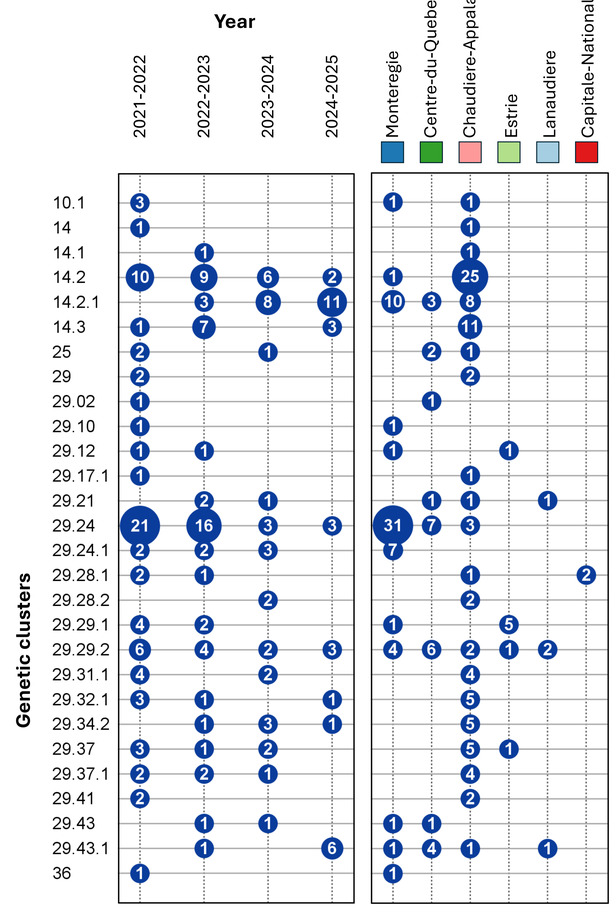


Figure 3. Number of PRRSv introductions in breeding sites involving each genetic cluster according to year and administrative region (2021-2025).

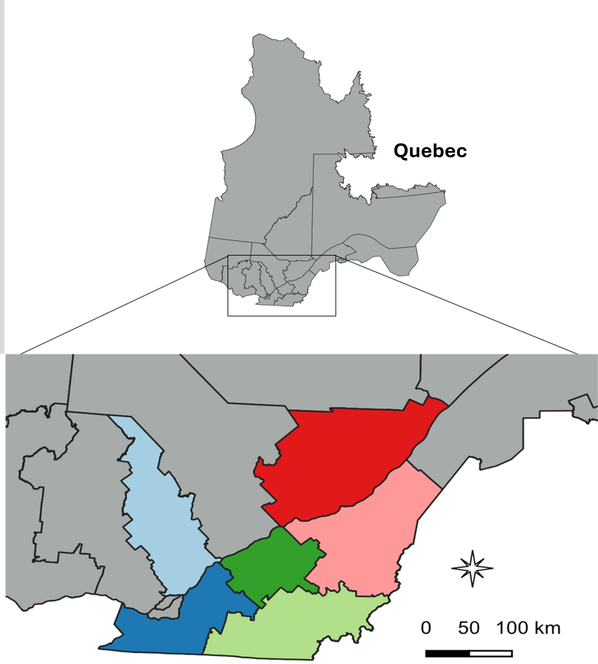


Figure 4. Administrative regions of the province of Quebec. Regions having ≥ 5 breeding sites and ≥1 PRRSv introductions in breeding sites between 2021-2025 were highlighted.

DISCUSSION AND CONCLUSION

- PRRSv incidence in breeding sites and number of clusters involved in introductions decreased over time which is encouraging.
- Predominant genetic clusters varied throughout the years supporting the need of an ongoing surveillance system.
- Detection of PRRSv introductions was based on sequencing data only; the clinical or economic implications may vary.
- The number of clusters observed represented an underestimation of the PRRSv cluster diversity in Quebec considering that only breeding sites with newly introduced strains were included.
- The regions with the highest diversity of PRRSv clusters (Monteregie, Chaudiere-Appalaches and Centre-du-Quebec) have the highest density of pig sites. They had the highest numbers of PRRSv introductions, which highlight the challenges in the disease control.
- The two regions located on the north shore of the St. Laurent river (Lanaudiere and Capitale-Nationale) had less PRRSv cluster diversity and PRRSv introductions, thus, might be more amenable to PRRSv regional elimination.

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