Contacts posing risks of disease introduction in swine breeding herds in Quebec, Canada: is frequency of contacts associated with biosecurity measures?

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Objectives

To describe the frequency of contacts in swine breeding sites over a one-month period, and to evaluate their association with biosecurity measures.

Materials and Methods

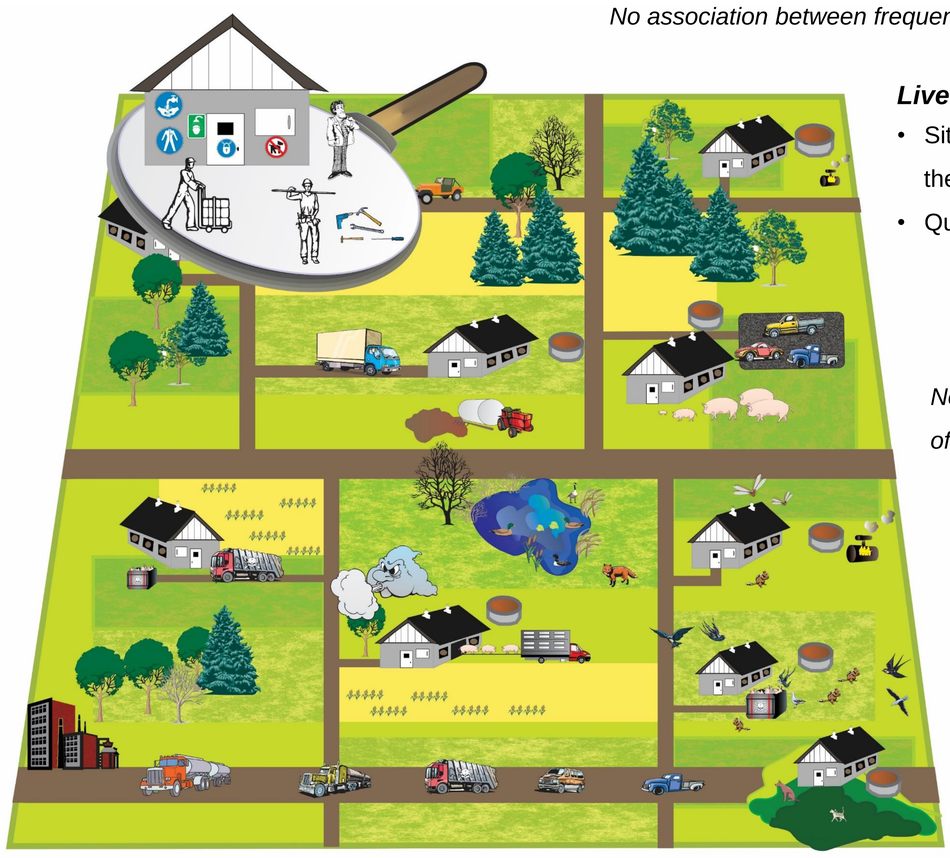
Study design, source population and data collection

A retrospective observational study was conducted on swine breeding sites in Quebec, Canada. As part of a larger project, sites with ≤4 pig units, which had a porcine reproductive and respiratory (PRRS) virus introduction followed by clinical signs between August 1, 2014, and July 31, 2017 were selected.

A questionnaire, logbooks and pig traceability data were used to describe contacts over the 30-day period prior to PRRS virus introduction:

- Number of entries of visitors and deliveries in breeding unit;
- Number of live pig transportations (in and out movements);
- Number of entries of service vehicles on the site;
- Presence of other animal species in unit(s);
- Neighboring pig sites;
- Manure spreading around breeding site.

For each type of contact, biosecurity measures over the 30-day period were investigated using a questionnaire.



Statistics

- Descriptive statistics of the frequency of contacts.
- Associations were tested between frequency of contacts and biosecurity.
  - Biosecurity measures were dichotomized as always versus occasionally/never implemented;
  - Bilateral Wilcoxon Rank Sum Test (continuous variables) or exact Chi-square statistic (categorical variables) was used;
  - Alpha value was set at 0.05.

Results

Owner's participation was obtained for 87% of the detected PRRS virus introduction.

Characteristics of the 84 investigated sites were:

- 675 median sow inventory;
- 74% farrow-to-wean, 26% farrow-to-grow or farrow-to-finish;
- 48% independent, 52% integrated production system;
- 58% with 4-week, 42% with <4 week batch farrowing.

Visitors entering breeding unit

- 87% of the sites had ≥1 visitors (Table 1).
- Number of visitor contacts per site described in Table 2.
- Maintenance and technical services accounted for the highest number of visitor contacts.

Biosecurity (% of sites with reported contacts)

- 66% main door locked
- 38% signature of a logbook
- 70% shower-in or delimited entrance with changing of boots, coveralls and washing hands

Higher number of visitor contacts was associated with higher frequency of each of the above biosecurity measures.

Table 1. Frequency of breeding sites with ≥ 1 reported contact over a one-month period, by type of contact (84 sites, Quebec, Canada).

Type of contacts	Number (%) of sites
Visitors entering the breeding unit	73 (87)
Deliveries entering the breeding unit	
Small material and/or meds[1]	82 (98)
Equipment[2]	51 (61)
Semen	83 (99)
Bag[3]	73 (87)
Live pig transportation	
Gilts (in)	52 (62)
Weaned piglets ≈ 5kg (out)	63 (75)
Growing pigs ≈ 25kg (out)	6 (7)
Finishing pigs (out)	16 (19)
Culled sows (out)	75 (89)
Service vehicles entering the site	
Feed mill truck	78 (93)
Fuel tanker truck	18 (21)
Propane truck	51 (61)
Rendering truck	62 (74)
Manure vacuum truck	30 (36)
Waste collection vehicle	41 (49)
Winter service vehicle	15 (18)
Presence of other animal species in unit(s)	
Dogs or cats	0 (0)
Birds	7 (8)
Presence of ≥ 1 pig site in a X km-radius	
1 km	47 (56)
2 km	65 (77)
3 km	71 (85)
4 km	72 (86)
5 km	74 (88)
Manure spreading at <100m from a unit	8 (10)

[1] Needles, swabs, gloves, acidifiers, disinfectant, letters or camera.
[2] Repair or maintenance equipment, building materials, toolbox or other specialized equipment as hog catchers or stunning pistol.
[3] Starter feed for piglets, minerals, premixes, drying agent for piglets or milk substitute.

Deliveries in breeding unit

- The large majority of sites had deliveries (Table 1), with a median of 8 deliveries over a month (Table 2).
- Sanitization of incoming material (% of sites with reported contacts)
  - 40% small material and meds, 43% equipment, 32% bags

No association between frequent deliveries (≥ 2) and sanitization, for each type of delivery.

Live pig transportation

- Sites with different pig movements are described in Table 1 and the median number of pig movements per site was 5 (Table 2).
- Quarantine for gilts (% of sites with reported contacts)
  - 19% always AIAO pig flow, washed and disinfected between batches
  - 17% not always AIAO pig flow, washed and disinfected between batches
  - 63% no quarantine

No association between the number of pig movements for any types of pig transportation and biosecurity measures.

Services vehicles entering the site

- Sites with entry of different service vehicles are described in Table 1 and the median number of entries of service vehicles per site was 8 (Table 2).
- Biosecurity for manure vacuum truck (% of sites with reported contacts)
  - 10% truck used on the site only
  - 20% truck used on other pig sites, washed before entrance
  - 70% truck used on other pig sites, not always washed

Frequent entries (≥ 2) of manure truck was associated with always washing equipment used on other sites (vs. not always washed).

Table 2. Total number of contacts per site according to different types of contact over a one-month period (84 sites, Quebec, Canada).

Types of contacts	Total number of contacts	
	Median (Q1-Q3)	Maximum
Visitors entering the breeding unit : nb of entries[1]	5 (2-8)	24
Deliveries entering the breeding unit : nb of entries of all types[2]	8 (7-10)	18
Live pig transportation : nb of movements in or out the site[2]	5 (3-8)	16
Service vehicles entering the site : nb of entries[2]	8 (6-10)	15
Number of pig sites in a 5-km radius	14 (7-27)	81

[1] Multiple entries of the same visitor during the same day were counted only once.
[2] The total number of contacts is the sum of entries reported for all categories listed in Table 1.

- Biosecurity for rendering truck (% of sites with reported contacts)
  - 69% carcasses were picked-up at ≥ 100m from a unit of the site
  - 44% truck used a different road from the personnel main entrance

No association between frequent entries (≥ 4) of rendering truck and biosecurity measures.

Other animal species in unit(s)

- Birds were observed in unit(s) on 8% of the sites.
  - 83% of the sites had wire mesh bird screens in air inlets.

Presence of birds in units was associated with absence of wire mesh bird screens.

Discussion and Conclusion

- The high number and diversity of contacts is a matter of great concern in disease introduction, and fomites and vehicles may act as mechanical vectors for various pathogens.
- For few types of contacts, a high frequency of contacts was associated with better biosecurity implementation, but most of the time, the frequency of contacts did not correlate with biosecurity implementation (complete results not shown). Producers maybe aware of the importance of biosecurity notwithstanding the level of contacts on their herd.
- The absence of infrastructures may had precluded some biosecurity measures (e.g. quarantine, shower, different road for rendering).
- The influence of herd characteristics on the level of contacts as well as the influence of particular contacts on the risk of introduction of specific pathogen should be further addressed.

Funding
Swine Innovation Porc within the Swine Cluster 2, funded by Agriculture and Agri-Food Canada through the AgriInnovation Program, provincial producer organizations and industry partners. Financial support was also provided by the Éleveurs de porcs du Québec and Zoetis Canada.

Acknowledgements
We thank Sylvie Vermette for conducting the interviews and the producers who participated in this study.