Cross-Canada Disease Report
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Distribution of *Streptococcus suis, Actinobacillus pleuropneumoniae,* and *Glaesserella parasuis* serotypes isolated from diseased pigs in Quebec between January 2020 and December 2023

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Streptococcus suis, Actinobacillus pleuropneumoniae, and *Glaesserella parasuis* are important bacterial pathogens of swine and serotype determination remains a valuable tool used by veterinary practitioners and diagnosticians to understand the epidemiology of the infections and evaluate the need for serotype-specific vaccines in a herd. *Streptococcus suis* is one of the most important bacterial pathogens, affecting mainly post-weaning piglets (1). It is noteworthy that we have a reference laboratory for serotyping and that > 60% of available data on *S. suis* serotype distribution of isolates recovered from diseased pigs worldwide comes from Canada (2). From January 2020 to December 2023, 386 isolates were received in our laboratory for serotyping. Most originated from the Centre de diagnostic vétérinaire de l'Université de Montréal (CDVUM) at the Université de Montréal or from provincial laboratories; all originated from tissues of diseased pigs with a variety of clinical signs, such as nervous signs, septicemia with sudden death, arthritis, endocarditis, and pneumonia. Serotyping was done using PCR, as described (3). Positive isolates for serotypes 2 or 1/2 and 1 or 14 were further differentiated by mismatch amplification mutation assay (MAMA)-PCR (4). Results are shown in Table 1.

These data are only informative and are not intended to suggest that *S. suis* was the sole causative agent of the pathological conditions. The serotypes most frequently detected were 1/2 and 2, followed by serotypes 7, 9, 3, 1, and 14, which in general (with very few changes) were similar to those previously reported (5). It is interesting to note that the frequency of serotype 9 continued increasing in a trend observed for 10 y (5). Serotypes 20, 22, 26, 32, 33, and 34, reported as belonging to a species different from *S. suis,* were not detected in the current study, along with serotypes 6, 13, 17, 19 and 25. There were < 13.9% untypable strains, indicating no clear justification for characterization of new serotypes. It should be noted that only *Streptococcus suis sensu stricto* untypable isolates were taken into consideration based on the presence of the *recN* gene (5).

Porcine pleuropneumonia caused by *A. pleuropneumoniae* is a contagious disease reported to cause economic losses worldwide (6). Serotyping is still of major interest since various serotypes have different virulence potentials depending on geographic origin (6). During the last 3 y, 78 isolates from the CDVUM and provincial diagnostic laboratories were serotyped using a multiplex PCR (7). The number of isolates markedly decreased with time (8), confirming that this infection is relatively well-controlled in North America (6). The distribution of serotypes is presented in Table 2. Serotype 7 was decidedly the most frequent, with > 60% of isolates. The increase in the frequency of serotype 7, a decrease in that of serotype 5 (with only 12.8% of isolates), and the absence of serotype 1 confirmed a trend observed during the last 10 y (8). Relative to previous years, serotype 8 increased in frequency whereas serotype 12 decreased (8). One of the serotype 15 isolates was untypable by PCR but was confirmed by whole-genome sequencing to belong to that serotype. Interestingly, there was 1 isolate belonging to the recently described serotype 19 (7).

Glaesserella parasuis is the etiological agent of Glässer's disease, an important bacterial pathogen of swine (9). It usually causes polyserositis, but infection may also result in arthritis, meningitis, and septicemia (sudden death) (9). Serotyping is highly important, not only for epidemiological studies and to identify the most prevalent serotypes involved in disease in a region or country, but also for developing vaccination strategies to prevent future outbreaks, since bacterins are usually considered to induce mainly serotype-specific immunity (9). A total of 196 *G. parasuis* isolates were received in our laboratory through the CDVUM and provincial diagnostic laboratories. Serotyping was done using PCR (10). Compared to the previous report (8), the

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Table 1. Distribution of serotypes of 386 isolates of *Streptococcus suis* recovered from diseased pigs over 4 y (2020 to 2023).

Serotype	%	Serotype	%
1	5.3	18	0.3
1/2	14.5	19	0
2	11.4	20	0
3	5.6	21	0.8
4	6.7	22	0
5	3.1	23	0.6
6	0	24	1.4
7	9.5	25	0
8	2.2	26	0
9	7.2	27	0.6
10	0.3	28	1.1
11	0.8	29	1.1
12	1.7	30	1.1
13	0	31	3.3
14	4.5	32	0
15	0.8	33	0
16	2.2	34	0
17	0	UT	13.9

UT — Untypable.

Table 2. Distribution of serotypes of 78 strains of *Actinobacillus pleuropneumoniae* recovered from diseased pigs over 4 y (2020 to 2023).

Serotype	Number of isolates	%
2	6	7.7
5	10	12.8
6	2	2.6
7	48	61.5
8	6	7.7
12	3	3.8
15	2	2.6[a]
19	1	1.3

[a] One isolate was originally untypable but confirmed to belong to serotype 15 by whole-genome sequencing.

6 most frequently detected serotypes were the same, though not all in the same order, indicating a certain stability in the distribution of the most important serotypes (Table 3). Serotype 5/12 (which cannot be differentiated by PCR) was still most commonly detected, as previously reported, followed by serotypes 4, 7, 1 and 2, and 13. Compared to previous data, serotype 4 increased in frequency and became the 2nd-most common serotype. In general, serotypes 5/12, 4, and 7 have been those most commonly detected from ill animals worldwide (11). A recent report from the United States indicated a very high proportion of serotype 7 isolates with a surprising lower frequency of serotype 5/12. The proportion of untypable isolates (confirmed to be *G. parasuis* through a species-specific PCR) was still very low, similar to that reported when whole-genome sequencing is used (12). Interestingly, a few isolates presented atypical multiple reactions by PCR. One isolate presented a positive reaction with serotypes 1, 2, and 11. A similar result was reported for some isolates in the past (13). Another isolate presented a double reaction for serotypes 4 and 7, though this was rather exceptional.

In conclusion, constant monitoring of serotypes of the 3 pathogens provides important information for practitioners. When multiple *S. suis* isolates are recovered within the same farm, serotype distribution data can be a good indication

Table 3. Distribution of serotypes of 196 isolates of *Glaesserella parasuis* recovered from diseased pigs over 4 y (2020 to 2023).

Serotype	%	Serotype	%
1	9.2	9	1.5
2	9.2	11	0.0
3	2.6	13	7.1
4	17.9	14	0.5
5/12	25.0	15	3.6
6	1.0	4,7	0.5
7	11.7	1,2,11	0.5
8	3.1	UT	6.1

UT — Untypable.

of which ones are to be selected for inclusion in an autogenous vaccine. For *A. pleuropneumoniae,* data presented in this report suggest that serotypes 7 and 5 should be tested in priority using serology to identify subclinically infected herds. High-health-status herds should be, if possible, free of all *A. pleuropneumoniae* serotypes. Similarly, data on *G. parasuis* presented in this report may help practitioners to decide the appropriate bacterin to be used on a farm.

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