

Distribution of *Streptococcus suis* capsular types in Quebec and western Canada

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Abstract

Of a total of 561 isolates of *Streptococcus suis* recovered from various tissues of diseased pigs, 464 were from veterinary laboratories in Quebec and 97 were from western Canada, particularly Alberta (84). Almost 83% of all these isolates belonged to the 23 known *S. suis* capsular types. There was no marked difference between the two groups of isolates. Capsular type 2 was the most prevalent and represented 32% of all isolates. The other important capsular types were, in decreasing order, 3, 1/2, 8 and 4. Lungs, brain, and meninges were the source of the majority of isolates. More than 40% of all *S. suis* isolates were found in pure culture. The number of isolations of this microorganism was higher in piglets aged five to eight weeks than in any other age group.

Résumé

Sur un total de 561 isolats de *Streptococcus suis*, provenant de porcs soumis pour une nécropsie, près de 83% ont pu être sérotypés et associés à l'un ou l'autre des 23 sérotypes connus jusqu'à présent. Un total de 464 isolats provenaient de différents laboratoires vétérinaires du Québec et 97 autres isolats provenaient de l'ouest du Canada, plus particulièrement de l'Alberta. Aucune différence importante n'a été détectée entre les deux groupes d'isolats. Le sérotype 2 était toujours le plus prévalent, représentant 32% de tous les isolats. Les autres sérotypes les plus fréquemment isolés étaient, par ordre décroissant, le 3, le 1/2, le 8 et le 4. Le plus grand nombre d'isolats a été retrouvé dans les poumons et au niveau du cerveau ou des méninges. Plus de 40% de tous les isolats ont été retrouvés en culture pure. Enfin, les porcelets appartenant au groupe d'âge entre cinq et huit semaines étaient ceux à partir desquels *S. suis* a été isolé le plus fréquemment.

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Introduction

Streptococcus suis is responsible for a wide variety of infections in swine. It has been associated with meningitis, bronchopneumonia, endocarditis, arthritis, abortion, and other conditions (1-5). This microorganism has also been isolated from ruminants (6,7), from a horse (8), and is now considered to be one of the most important zoonotic agents (9,10). To date, 23 capsular types of *S. suis* have been described (11,12), and we have recently characterized other new capsular types (unpublished data).

In 1982, the importance of *S. suis* capsular type 2 and the lesions associated with this microorganism were reported from Ontario (13,14). Later, a report from Quebec presented a retrospective study of the importance of *S. suis* between 1976 and 1985; the nine capsular types known at that time were taken into account (15). Another report demonstrated that 94% of four to eight-week-old, clinically healthy piglets harbored, in their nasal cavities, streptococci that were biochemically compatible with *S. suis*, that 98% of the farms studied had pigs positive for *S. suis*, and that 79% of all isolates did not belong to serotypes 1-8 or 1/2 (16). Subsequently, a study on the prevalence of the nine capsular types in Quebec was carried out during a period of 16 months, from August 1987 to November 1988 (17). In that study, 52% of 349 isolates did not belong to any of the capsular types 1-8 or 1/2. More recently, a preliminary report from the same province mentioned the distribution, according to site of isolation, of 118 *S. suis* isolates belonging to capsular types 9-22 (18).

The purpose of the study reported herein was to determine the prevalence of the 23 capsular types of *S. suis* among isolates collected from diseased pigs in Quebec and the Western provinces, mainly Alberta, during a one-year period from January 1990 to December 1990. Information about the site of isolation and age of animals is presented and discussed.

Materials and methods

Field isolates

A total of 561 field isolates of *S. suis* were received between January 1990 and December 1990 for serotyping. A total of 464 isolates originated from the laboratoire de bactériologie clinique de la Faculté de médecine vétérinaire de l'Université de Montréal and from Quebec provincial veterinary diagnostic laboratories. A total of 84 were from Alberta Agriculture,

Table 1. Distribution of capsular types of 561 *Streptococcus suis* isolates recovered in Quebec and western Canada in 1990

Capsular type	No. of isolates	(%)	Capsular type	No. of isolates	(%)
1	4	(0.7)	12	4	(0.7)
1/2	52	(9.3)	13	2	(0.4)
2	179	(32.0)	14	0	(0.0)
3	77	(13.7)	15	2	(0.5)
4	25	(4.4)	16	3	(0.5)
5	8	(1.4)	17	3	(0.5)
6	7	(1.2)	18	3	(0.5)
7	16	(2.8)	19	6	(1.0)
8	38	(6.8)	20	3	(0.5)
9	15	(2.7)	21	0	(0.0)
10	4	(0.7)	22	6	(1.0)
11	7	(1.2)	UT ^a	97	(17.3)

^aUntypable isolates

Table 2. Distribution of 561 *Streptococcus suis* isolates recovered from diseased pigs in Quebec and western Canada, according to capsular type and tissue origin

Tissue	Number of isolates by capsular type ^a																							
	1	1/2	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	UT ^b
Lungs	2	42	75	63	17	8	2	11	27	4	1	3	2	1	0	2	1	2	3	2	0	0	0	40
Meninges/brain	1	6	36	6	2	0	1	1	4	6	1	0	1	1	0	1	1	0	0	2	2	0	4	15
Multiple tissues ^c	1	6	28	8	3	0	1	2	2	1	0	1	0	0	0	0	1	0	2	0	0	0	13	
Heart	0	6	36	3	3	0	2	0	4	1	1	1	0	0	0	0	1	0	0	0	1	0	0	16
Joints	0	0	3	0	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	0	0	0	1	3
Others	0	7	14	2	3	0	2	1	2	3	0	1	0	0	0	0	1	0	0	0	0	0	1	17
Total	4	67	192	82	28	8	8	16	39	16	4	6	4	2	0	3	4	3	3	6	3	0	6	104

^aSome isolates were recovered from two different origins

^bUT = untypable

^cIsolates found in three or more different tissues. Fetuses were included in this category

Animal Health Division, Edmonton, Alberta, 11 from the Western Veterinary College of Veterinary Medicine, Saskatoon, and two from Manitoba. All these isolates were recovered from diseased pigs. In Quebec, biochemical identification of isolates was primarily based on four tests: all isolates NaCl and acetoin negative, and trehalose and salicin positive, were submitted to serotyping. All untypable isolates were tested with seven other biochemical tests as described earlier (19), and kept for subsequent studies. In Alberta, biochemical identification was based on similar tests as in Quebec but excluded 6.5% NaCl, arginine dihydrolyase, and glycerol fermentation, and included esculin hydrolysis, growth on bile-esculin, fermentation of xylose, arabinose, and raffinose.

Serotyping

Streptococci biochemically identified as *S. suis* were serotyped by the coagglutination technique and, when needed, serotyping was confirmed with the capsular reaction technique (19). Antisera against capsular types 1-22 had been raised in rabbits according to a previously described procedure (19).

Results

The overall distribution of the 561 *S. suis* isolates, according to their capsular type, is shown in Table 1. All known capsular types were found in this study

except 14 and 21. Capsular type 2 was the most prevalent (32%), followed in decreasing order by capsular types 3, 1/2, 8, and 4. A total of 17.3% of isolates were untypable.

The distribution of the isolates from Quebec and western Canada, according to their capsular type and to their tissue origin, is presented in Table 2. The situation in Quebec appeared to be very similar to that in western Canada. In both locations, capsular type 2 represented about 30% of all isolates and the number of untypable isolates was about 17%. In Quebec, the most prevalent capsular types were, in decreasing order, 2, 3, 1/2, 8, 4 and 7. In western Canada, the most prevalent capsular types were 2, 1/2, 3, 8, 9 and 4.

Capsular type 2 was isolated from all sites in both areas, and capsular type 9 was also present in all sites of isolation in Quebec. Most *S. suis* isolates were found in lungs, followed by meninges/brain and multiple tissues (possibly due to septicemia). As many as 41% of all isolates were recovered in pure culture, whereas others were recovered in association with *Pasteurella multocida*, *Actinobacillus pleuropneumoniae*, *Actinomyces pyogenes*, and *Haemophilus parasuis*. There was no correlation between the isolation of any of these pathogens and the isolation of particular *S. suis* capsular types.

More than 40% of all isolates were recovered from pigs 5–10 weeks of age, 23% were from pigs 11–18 weeks of age, 9% from pigs one to four weeks of age, 5% from pigs 19–24 weeks of age, 5% from pigs more than 24 weeks of age, and 2% of isolates were from piglets aged less than one week. Ten isolates (2%) were recovered from cases of abortion in which capsular types 3, 10 and 16 were involved, as well as untypable isolates. Age-related data were not available for 12% of the isolates.

Discussion

To our knowledge, this is the first report on the prevalence of all 23 capsular types of *S. suis* in Quebec and western Canada. Almost 83% of all isolates could be serotyped with antisera against the recognized capsular types 1–22 and 1/2. This represents an important decrease in the number of untypable isolates compared to previous reports from Canada (15–17), the United States (20), and Belgium (21), in which only antisera to capsular types 1–8 had been used. We expect that this number would diminish considerably with the use of antisera against other new capsular types.

The high prevalence of *S. suis* capsular type 2 is consistent with other reports (15,16,20,21). Only Scandinavian countries have reported a higher incidence of capsular type 7 over capsular type 2 (5,11). The large number of isolates belonging to capsular types 1/2, 3, 4 and 8 in this study is also in accordance with earlier papers concerning isolates from diseased pigs (17) as well as clinically healthy pigs (16).

In our study, capsular types 14 and 21 were not found among the 561 isolates tested. These capsular types had already been reported in a previous study in Quebec (18), but capsular type 21 has so far been found only in clinically healthy pigs. It is noteworthy that the three isolates belonging to capsular type 20 and recovered from diseased pigs were the first to be found since the isolation of the reference strain from a diseased calf in the United States (12). Two isolates belonging to this capsular type originated from the brains of piglets with meningitis, and the other was isolated from the heart of a five-month-old pig with lesions of myocarditis (Dr. M. Chagnon, personal communication, 1990). Among the new capsular types, type 9 always appeared to be the most prevalent. In western Canada, its importance was comparable to that of capsular type 8. Capsular type 9 was associated with several cases of septicemia in that part of Canada (23), and was also isolated from diseased pigs in Quebec (24).

Isolation of *S. suis* was more frequent from lungs and meninges than from other sites. This agrees with previous reports (5,14,15,18). The percentage of isolates recovered in pure culture (41%) was almost identical to that reported earlier (17). The isolation of *S. suis* in association with other microorganisms such as *A. pleuropneumoniae*, *P. multocida*, or *A. pyogenes* also appears to be common (14,17).

The overall prevalence of *S. suis* was higher in pigs between 5–10 weeks of age. This is in agreement with previous reports (17,22). The higher incidence of

untypable isolates in pigs aged more than 24 weeks, which was reported in our earlier study (17), was not seen in this study. Finally, three out of four isolates belonging to capsular type 1 were found in piglets aged five to eight weeks. In Europe, this capsular type had been isolated from preweaned piglets (25).

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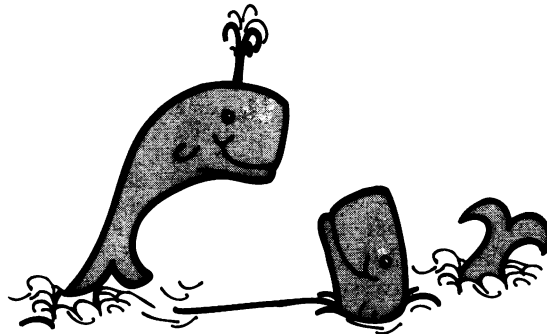
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