

Serotypes of *Staphylococcus hyicus* subsp *hyicus* isolated from pigs

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돼지에서 분리한 *Staphylococcus hyicus* subsp *hyicus*의 혈청형

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초록: 돼지로 부터 분리한 *Staphylococcus hyicus* subsp *hyicus* 489주의 혈청형을 자가생산한 인자혈청을 이용한 평판응집반응으로 동정하였다.

분리군의 혈청형은 A(16.8%), C(20.4%), D(9.4%), E(7.2%), F형(29.2%) 및 미분류형(17.0%)으로 동정되었으며, 돼지의 건강상태, 신체부위 및 연령에 관계없이 F형의 분포가 가장 높았다.

Key words: *Staphylococcus hyicus* subsp *hyicus*, serotypes, factor sera, pigs.

Introduction

Exudative epidermitis is an acute generalized dermatitis of piglets characterized by greasy exudation from skin without pruritus, leading to dehydration and death. *Staphylococcus hyicus* subsp *hyicus* has been known as the etiologic organism.¹⁻⁴

Some workers investigated serotypes of *S hyicus* subsp *hyicus* in order to distinguish from nonpathogenic skin *Staphylococci*. *S hyicus* subsp *hyicus* was differentiated antigenically from *S epidermidis* although some antigens were shared.⁵ Amsberg et al⁶ and Devriese⁷ reported most strains of *S hyicus* subsp *hyicus* agglutinated with 2 antisera, S3588 and A2869C by slide agglutination test. Hajsig⁸ also revealed most strains belonged to one of three serotypes such as ATCC 19226, ZH1029 and ZH1037. Moreover, Park and Kang⁹ classified 204 strains of *S hyicus* subsp *hyicus* isolates from pigs as serotype A, B, C, D, E and F using their homogeneous factor

sera in Korea. Some antigenic differences, therefore, have been recognized in strains of *S hyicus* subsp *hyicus* and further works on serotypes are necessary.

The purpose of the present study was to classify serotypes of *S hyicus* subsp *hyicus* strains isolated from pigs.

Materials and Methods

Bacterial strains: The 489 strains of *S hyicus* subsp *hyicus* isolated from pigs in Chinju area were examined. These consisted of 216 strains from healthy adult pigs, 248 strains from healthy piglets and 25 strains from piglets affected with exudative epidermitis. These strains were previously identified culturally and biochemically by the methods of Devriese⁷ and Park and Kang.¹⁰

Serotyping: Serotypes of *S hyicus* subsp *hyicus* strains were classified by slide agglutination method of Park and Kang⁹. A drop of factor antiserum and a loop of colony described below were mixed together

on slide glass and the agglutination reaction was read in a few seconds.

Preparation of factor sera: Factor sera were produced for serotypes A, B, C, D, E and F of *S hyicus* subsp *hyicus* offered by Dr. Park, C.G. (College of Vet. Med., Kyungpook Nat'l Univ., Korea). These strains were cultured on nutrient agar at 37°C for 24 hours. Cultures were suspended in sterile saline and centrifuged at 3,000 rpm for 15 minutes, twice. Cells were resuspended in 0.3% formol saline and stored at 4°C, overnight. These were recentrifuged at 3,000 rpm for 15 minutes, twice and suspended in saline up to the concentration of standard barium sulfate turbidity (3×10^8 cells/ml). The cell suspensions were intravenously injected into healthy rabbits weighing 2 to 3kg. Each rabbit was injected with 0.5ml aliquot of inoculum for 4 times at 2 day-intervals and later 1ml,

for twice. Rabbits were bled 12 days after the final injection and antisera were collected. Rabbit antisera were added to 0.5% phenolsaline up to 10% and absorbed with strains sharing common antigen. These were centrifuged at 3,000 rpm for 15 minutes. Supernatants were stored at 4°C and used as factor sera.

Antigen preparation from strains: Strains of *S hyicus* subsp *hyicus* were cultured on brain heart infusion agar at 37°C for 24 hours. Fresh colonies were used as antigens for serotyping.

Results

Serotypes of *S hyicus* subsp *hyicus* strains from pigs: The serotypes of 489 strains of *S hyicus* subsp *hyicus* isolated from pigs were shown in Table 1. The 83.0% of the strains were classified into 5 serotypes as, A(16.8%), C(20.4%), D(9.4%), E

Table 1. Serotypes of 489 strains of *S hyicus* subsp *hyicus* isolated from pigs

Origin	No. of strains tested	% of serotypes					
		A	C	D	E	F	Untypable
Adult pig	216	17.1	19.0	11.1	6.5	25.0	21.3
Piglet	273	16.5	21.6	8.1	7.7	32.6	13.5
Total	489	16.8	20.4	9.4	7.2	29.2	17.0

Table 2. Serotypes of 273 strains of *S hyicus* subsp *hyicus* isolated from healthy piglets and piglets with exudative epidermitis

Piglets	Strains	% of serotypes					
		A	C	D	E	F	Untypable
Healthy	248	17.7	21.8	8.5	4.8	32.7	14.5
Diseased	25	4.0	20.0	4.0	36.0	32.0	4.0

Table 3. Serotypes of 489 strains of *S hyicus* subsp *hyicus* isolated from various body regions of pigs

Serotypes	% of strains				
	Nasal cavity	Snout	External ear	Abdomen	Rectum
A	19.1	19.8	19.5	14.7	6.0
C	18.0	20.8	19.5	21.7	30.0
D	11.2	8.9	9.7	8.4	6.0
E	6.7	7.9	4.9	10.5	0.0
F	30.0	28.7	29.2	30.7	30.3
Untypable	15.0	13.9	17.2	14.0	27.4

Table 4. Serotypes of 273 strains of *S hyicus* subsp *hyicus* isolated from piglets of different age groups

Serotypes	% of strains					
	1	2	3	4	5	6(week)
A	16.3	18.6	15.1	16.3	18.1	14.2
C	23.0	20.3	23.2	23.6	18.1	21.4
D	13.1	13.5	4.1	7.3	0.0	0.0
E	6.5	8.5	6.8	9.1	9.1	7.1
F	29.5	30.5	43.8	23.6	36.3	42.8
Untypable	11.6	8.6	7.0	20.1	18.4	21.5

(7.2%) and F(29.2%), and 17.0% of the strains were untypable. The most predominantly encountered serotype was type F and the isolation rates were respectively 25% and 32.6% in adult pigs and piglets.

Among 273 strains of *S hyicus* subsp *hyicus* isolated from piglets, 248 strains of healthy piglets origin belonged to serotype F(32.7%), C(21.8%), A(17.7%), D(8.5%), E(4.8%) and untypable(14.5%). In 25 strains isolated from piglets with exudative epidermitis, serotypes were identified in order of prevalence of E(36.0%), F(32.0%), C(20.0%) and A, D or untypable(4.0%) (Table 2).

Also these serotypes except E or D were isolated from different body regions and age groups of the pigs (Table 3.4).

Discussion

Some antigenic variations among strains of *S hyicus* subsp *hyicus*, the causative agent of swine exudative epidermitis, have been recognized by several workers. But criteria for serotyping of the organism are somewhat obscure at present. Recently, Park and Kang⁹ systematically classified serotypes of the organism using their homogeneous factor sera in Korea. They also reported dissimilarity of serotypes and their prevalence in healthy pigs and pigs with exudative epidermitis. Amtsberg¹¹ mentioned that pigs immunized with bacterin of *S hyicus* subsp *hyicus* were able to overcome the infection of homogeneous strain itself. For prevention of exudative epidermitis, therefore, further investigations will be needed for the serotypes of *S hyicus* subsp *hyicus*.

In the present study, the serotypes of 489 strains of *S hyicus* subsp *hyicus* isolated from pigs in Chinju

area were classified. They were serotype F(29.2%), C(20.4%), A(16.8%), D(9.4%), E(7.2%) and untypable(17.0%). Park and Kang⁹ classified 204 strains isolated from pigs in Taegu area as serotypes in order of prevalence of C, B, F, A, E, D and the isolation rates ranged from 1.5% to 30.9%. There were regional differences in prevalence of serotypes, and none of serotype B which had been 25.9% of isolates in Taegu area was isolated in Chinju area.

Among 248 strains of *S hyicus* subsp *hyicus* isolated from healthy piglets, the most prevalent serotype was F(32.7%) followed by C, A, D and E. In 25 strains of *S hyicus* subsp *hyicus* isolated from piglets with exudative epidermitis, the most predominant serotype was E(36.0%) of which isolation rate in healthy piglets was the lowest(4.8%). On the other hand, Park and Kang⁹ also reported isolation of serotype E from affected pigs but the rate was as low as 3.8%. Serotype F and D which were not isolated from the affected pigs in Taegu area were recognized and the isolation rates were 32.0% and 4.0%, respectively.

Serotypes in prevalence order of F, C, A, D and E were found with rare exceptions from various body regions and different age groups of pigs (Table 3, 4). The serotype E and D were not isolated from rectum and 5- to 6-week-old piglets, respectively.

Conclusion

Serotypes of *S hyicus* subsp *hyicus* strains isolated from healthy pigs and piglets with exudative epidermitis were identified with homogeneous factor sera.

The serotypes of 489 strains were classified into 5 serotypes as A(16.8%), C(20.4%), D(9.4%),

E(7.2%), F(29.2%) and untypable(17.0%). Serotype F was the most predominant strain regardless of health condition, body regions and age of the pigs.

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