

## Survey of Antimicrobial Resistance of Pharyngeal $\alpha$ -Hemolytic Streptococci among School Children

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$\alpha$ -hemolytic streptococci (AHS) are common normal oropharyngeal flora that can transfer antibiotic-resistance genes to *Streptococcus pneumoniae*. Reports on antibiotic resistance in AHS from throats are rare in Korea. A total of 333 healthy school children were subjected to recovery of AHS from the throat, and antibiotic susceptibility tests were screened with the disk diffusion method. The rate of resistance to er-

ythromycin was 22.2%, to clindamycin 12.0%, and to cefotaxime 3.0%. Whereas the resistance rate of *S. pneumoniae* to erythromycin exceeds 70% in Korea, pharyngeal AHS showed low resistance rates. (Korean J Clin Microbiol 2008;11:69-70)

**Key Words:** Viridans group streptococci,  $\alpha$ -hemolytic streptococci, Antibiotic resistance

$\alpha$ -Hemolytic Streptococci (AHS) are common normal oropharyngeal flora. Most of AHS belong to viridans group streptococci (VGS). VGS not only can cause infective endocarditis or sepsis, especially in the neutropenic patient, but also serve as reservoirs of antimicrobial resistance genes[1]. They may transfer these determinants to more pathogenic bacteria, such as *Streptococcus pneumoniae* or *Streptococcus pyogenes*. The *mef(A)* gene from clinical isolates of VGS has been transferred by conjugation to an erythromycin-susceptible *S. pneumoniae* strain in vitro[2]. Considering the high rate of antimicrobial resistance of *S. pneumoniae* throughout the world, it is necessary to survey the current status of antibiotic resistance of AHS.

Pharyngeal swabs were taken from 333 healthy school children (9~12 years old) in Jinju in 2006. A cotton swab was inoculated onto a sheep blood agar plate, which was incubated overnight at 37°C in air. Partial hemolysis with a green color around the colony was regarded as diagnostic of AHS. The optochin test was performed to rule out *S. pneumoniae*. If there were different types of  $\alpha$ -hemolytic colonies, the predominant form was chosen on a visual basis. Only one colony per child was tested. The disk diffusion test was performed according to the CLSI guidelines[3]. Six antibiotics, erythromycin, clindamycin, tetracycline, cefotaxime, and chloramphenicol (BD BBL Sensi-Disk, BD Biosciences, Sparks, MD, USA) were included.

Resistance rates to tetracycline, erythromycin, clindamycin, cefotaxime, and chloramphenicol were 45.0, 22.2, 12.6, 12.0, 3.0,

and 1.5% respectively (Table 1). Intermediate resistance to erythromycin was present in 7.8%.

Among 200 isolates of VGS from the oropharynx of healthy Greek children, 43.0% were resistant to penicillin, 38.5% to erythromycin, 7.5% to clindamycin, and 23% to tetracycline[4]. These resistance rates were similar to those of VGS from blood or *S. pneumoniae* in Greece. In Spain, resistance rates of VGS from healthy children to erythromycin and clindamycin were reported as 48.3% and 13.8%, respectively[5], suggesting a carrier role for resistance genes of pharyngeal VGS. Resistance to erythromycin and tetracycline of the VGS from normal flora was found to be 22.4% and 27.3%, respectively in Finland[6]. The distribution of phenotypes among VGS resembled that found in *S. pyogenes*, with a predominance of the M phenotype. The erythromycin-resistance rate of AHS also was similar to that of *S. pyogenes* in our community[7]. Among blood culture isolates of VGS in the United States, 56.3% were resistant to penicillin, 38% to erythromycin, and 12% to tetracycline[8].

Rates of non-susceptibility of VGS from blood cultures in Korea were reported as 57.6% to penicillin, 33.9% to

**Table 1.** Antibiotic susceptibilities (%) of 333 isolates of  $\alpha$ -hemolytic streptococci

	Erythromycin	Clindamycin	Tetracycline	Cefotaxime	Chloramphenicol
R	22.2	12.0	45.0	3.0	1.5
I	7.8	0.3	0.9	0	0
S	70.0	87.7	54.1	97.0	98.5

Abbreviations: R, resistant; I, intermediate resistance; S, susceptible.

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erythromycin, 17.9% to clindamycin, and 9.4% to ceftriaxone[9]. Nasal strains of *S. pneumoniae* in healthy children in Korea showed very high levels of resistance, such as 85.8% to penicillin and 79.7% to erythromycin[10]. *Streptococcus pneumoniae* obtained from throat swabs of healthy children in Korea showed macrolide resistance in 77.8% of cases, and most of these strains also had documented resistance to penicillin and clindamycin[11]. The AHS from healthy school children in this study showed much lower antibiotic resistance rates than expected.

In conclusion, although rates of resistance to erythromycin in *S. pneumoniae* are reported to exceed 70% in Korea, randomly selected pharyngeal AHS showed unexpectedly low resistance rates: erythromycin 22.2%, and clindamycin 12.0%. The mechanism of acquisition of antibiotic resistance genes by *S. pneumoniae* in our community might be different from that in the other countries. Erythromycin and clindamycin resistance rates were similar in AHS and *S. pyogenes*.

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=국문초록=

## 초등학생 인두에서 분리된 알파 용혈성 연쇄구균의 항생제 내성 조사

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고은하, 김선주

알파용혈성 연쇄구균은 내성 유전자를 폐렴구균에 전달할 수 있다. 건강한 초등학생의 인두에서 분리된 333균주의 알파 용혈성 연쇄구균에 대해 디스크 확산법으로 항생제 감수성 검사를 시행하였다. Erythromycin에 22.2%, clindamycin에 12.0%, cefotaxime에 3.0%의 내성률을 보였다. 한국에서 폐렴구균의 erythromycin 내성률이 70% 이상임을 감안하면, 인두 알파용혈성 연쇄구균은 낮은 내성률을 보였다. [대한임상미생물학회지 2008;11:69-70]

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