Incidence of Penicillin-Resistant *Streptococcus pneumoniae*

Niro OKIMOTO, Tadashi KATOH, Hisataka TANAKA, Toshikiyo HAYASHI
Takeyuki KURIHARA and Naoyuki MIYASHITA

*Department of General Internal Medicine 1, Kawasaki Hospital, Kawasaki Medical School, 2-1-80, Nakasange Kitaku, Okayama 700-805, Japan*

**ABSTRACT** Sensitivity to penicillin G of 190 *Streptococcus pneumoniae* strains detected by sputum culture from January 2006 to December 2011 was investigated using old criteria (PSSP: 0.06 μg/ml or less, PISP: 0.12~1 μg/ml, PRSP: 2 μg/ml or greater) and new criteria (without meningitis) (PSSP: 2 μg/ml or less, PISP: 4 μg/ml, PRSP: 8 μg/ml or greater). The results by the old criteria were PSSP: 43.2%, PISP: 44.7%, and PRSP: 12.1%, whereas the results by the new criteria were PSSP: 97.4%, PISP: 2.1%, and PRSP: 0.5%. Based on the above, it was concluded that the majority of *S. pneumoniae* from sputum were penicillin-sensitive strains. *(Accepted on May 23, 2012)*

Key words: Penicillin-Sensitive *Streptococcus pneumoniae*, Penicillin-Intermediate *Streptococcus pneumoniae*, Penicillin-Resistant *Streptococcus pneumoniae*

**INTRODUCTION**

With regard to *Streptococcus pneumoniae*, the National Committee for Clinical Laboratory Standards (NCCLS) in the USA has, until recently, defined Penicillin-Sensitive *S. pneumoniae* (PSSP) as a penicillin G (PCG) minimum inhibitory concentration (MIC) of 0.06 μg/ml or less, Penicillin-Intermediate *S. pneumoniae* (PISP) as 0.12~1 μg/ml, and Penicillin-Resistant *S. pneumoniae* (PRSP) as 2 μg/ml or greater. However, new NCCLS criteria (without meningitis) define PSSP as 2 μg/ml or less, PISP as 4 μg/ml and PRSP as 8 μg/ml or greater. To evaluate whether a change in frequency of PRSP obtained from the sputum would occur as a result of this criteria change, we investigated the difference in incidence of PRSP by both the old criteria and the new criteria.

**MATERIALS AND METHODS**

**Materials**

The materials were 190 *S. pneumoniae* strains detected by sputum culture at Kawasaki Hospital, Kawasaki Medical School from January 2006 to December 2011. *S. pneumoniae* strains were obtained from 190 patients (118 males and 72 females aged 27 to 91 years, 187 outpatients and 3 inpatients).
**Methods**

We measured MIC of PCG for these strains and compared their sensitivities using the old and new criteria.

The MIC was measured by microbroth dilution method.

**RESULT (Fig.1)**

According to the old criteria, of the 190 strains, 82 strains (43.2%) were PSSP, 85 strains (44.7%) were PISP, and 3 strains (12.1%) were PRSP. On the other hand, according to the new criteria, of the 190 strains, 185 strains (97.4%) were PSSP, 4 strains (2.1%) were PISP, and 1 strain (0.5%) was PRSP.

**DISCUSSION**

The world’s first PRSP was reported in 1965. The first case in Japan was reported in 1977. Thereafter, PRSP have spread. A nationwide surveillance in 2008 revealed that 52.6% were PSSP, 35.5% were PISP, and 11.8% were PRSP, showing that nearly half of *S. pneumoniae* are penicillin-resistant. This rapid increase has become a major concern.

However, in the clinical setting, the strategy of treating even pneumonia caused by PRSP was recommended penicillin, because pneumonia caused by PRSP has been cured when a sufficient amount of penicillin is administered. The new criteria (without meningitis) stipulate PSSP as 2 μg/ml or less, thus many strains which had been conventionally judged to be PRSP are now judged to be PSSP. The present study showed that results of PSSP: 43.2%, PISP: 44.7%, and PRSP: 12.1% by the old criteria changed to PSSP: 97.4%, PISP: 2.1%, and PRSP 0.5% by the new criteria, showing that the majority of strains are penicillin-sensitive strains. Another Japanese study on 211 strains performed in 2008 showed that results of PSSP: 52.6%, PISP: 35.5%, and PRSP: 99.5% by the old criteria changed to PSSP: 99.5%, PISP: 0.5%, and PRSP 0% by the new criteria, showing that nearly all the strains were penicillin-sensitive. A study performed in the USA in 2006 on 2897 strains revealed PSSP: 93.0%, PISP 6.3%, and PRSP 0.7% by the new criteria, showing that nearly all the strains were penicillin-sensitive.
These results clarified the reason that administration of penicillin cured even pneumonia caused by \textit{S. pneumoniae} which have been conventionally judged to be penicillin-resistant.

Based on the above, it was concluded that the majority of \textit{S. pneumoniae} detected from sputum is penicillin-sensitive and the drug of first choice for \textit{S. pneumoniae} pneumonia should be penicillin.

REFERENCES
1) National Committee for Clinical Laboratory Standards: Performance standards for antimicrobial susceptibility testing. M100-S8. Villanova, PA. National Committee for Clinical Laboratory Standards Institute, 1998
2) National Committee for Clinical Laboratory Standards: Performance standards for antimicrobial susceptibility testing. M100-S18.Wayne, PA. National Committee for Clinical Laboratory Standards Institute, 2008