Original Report

Penicillin susceptibility and molecular characteristics of clinical isolates of *Streptococcus pneumoniae* at the University of Malaya Medical Center, Kuala Lumpur, Malaysia

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**Objective:** To determine the prevalence of penicillin resistance and molecular characteristics of pneumococcal isolates at the University of Malaya Medical Center.

**Methods:** From March 1999 to July 2000, 100 clinical isolates of *Streptococcus pneumoniae* were obtained from 93 patients of various ages and from various body sites. The minimum inhibitory concentrations (MICs) for penicillin and ceftriaxone were determined by E test, and results were interpreted according to guidelines recommended by the National Committee for Clinical Laboratory Standards (NCCLS). Fifty isolates were further serotyped, and analyzed by pulsed-field gel electrophoresis (PFGE) and polymerase chain reaction/restriction fragment length polymorphism (PCR-RFLP) of the penicillin-binding protein (pbp) 2b and 2x genes.

**Results:** The majority of the isolates were from respiratory sites. Thirty-one isolates showed decreased susceptibility to penicillin (PRSP), and many of these also showed decreased susceptibility to ceftriaxone. Twelve serogroup/types (SGTs) were present, with 19F being the most common. PFGE analysis identified two dominant profiles, consisting mainly of PRSPs that had common serotypes (19F) and *pbp* gene patterns within their respective groups, although PCR-RFLP analysis showed different patterns of *pbp* genes among the PRSPs as compared to penicillin-susceptible strains, which had a uniform pattern.

**Conclusion:** PRSPs were more related as shown by PFGE and serotype. The consistency of *pbp* gene patterns, observed among many of the PRSPs within their respective PFGE profiles, supported their relatedness as established by PFGE.

**INTRODUCTION**

In the past, most clinical isolates of *Streptococcus pneumoniae* were highly susceptible to penicillin and a variety of other antimicrobial agents. Penicillin itself has remained the drug of choice for most pneumococcal infections for more than 50 years. Presently, bacterial infections caused by *S. pneumoniae* strains with decreased susceptibility to penicillin are being increasingly reported worldwide. This is compounded by the tendency of such isolates to be multiresistant. Pneumococcal resistance has been reported for *beta*-lactam antibiotics, including the third-generation cephalosporins, as well as other non-*beta*-lactam drugs, such as macrolides, chloramphenicol, clindamycin, tetracyclines, and trimethoprim–sulfamethoxazole. Multiresistance limits treatment options, prolongs hospitalization, and increases the cost of antibiotic therapy. Hence, studies have been carried out throughout the world to determine the prevalence rate of the pneumococcal isolates with decreased susceptibility to penicillin, their serotypes, and their patterns of susceptibility to other commonly used antibiotics. Molecular investigations of the isolates have also been carried out to determine the molecular epidemiology of antimicrobial resistance. One of the useful and widely used techniques is pulsed-field gel electrophoresis (PFGE). This technique, which involves digesting all of the genomic DNA with a rare cutting restriction enzyme (e.g. *SmaI*), is useful in evaluating the overall genetic relatedness of chromosomal DNA, and has been shown to be highly