Resistance to Penicillin and Identification of Penicillinase-Producing *Neisseria gonorrhoeae* Among Clinical Isolates in Thailand

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Penicillin-resistant *Neisseria gonorrhoeae* from 405 patients were studied by determination of penicillin minimal inhibitory concentrations and penicillin production. Eighteen percent were identified as penicillin-producing *N. gonorrhoeae* and the mean minimal inhibitory concentration, for all except penicillin-producing strains, was 0.805 μg/ml.

From 1972 on, an increasing resistance to penicillin has been demonstrated among strains of *Neisseria gonorrhoeae* in Bangkok, Thailand (8). The identification of penicillinase-producing *N. gonorrhoeae* (PPNG) has been reported to the World Health Organization (1) by 27 countries in Europe, Asia, Africa, Oceania, and North America. Epidemiological evidence suggests two separate focal origins of PPNG strains, the Far East and parts of West Africa (5).

The present study correlates minimal inhibitory concentrations (MICs) with PPNG identification of laboratory-confirmed isolates of penicillin-resistant gonococci. The objectives of the study were to obtain specimens from symptomatic patients and to: (i) confirm the isolates as *N. gonorrhoeae*; (ii) select isolates with laboratory-demonstrated resistance to penicillin and determine the penicillin inhibitory concentrations (MICs); and (iii) correlate the MIC for each isolate with identification of PPNG strains.

Beginning in April 1978, a total of 230 male and 175 female patients were studied over 12- and 9-month periods, respectively. All patients attended the Royal Thai Army (Phra Mongkutklao) Hospital venereal disease clinic or the Ban Chiwi clinic of the Bangrak (Public Health) Hospital for venereal disease examination. Patients were selected on the basis of clinical symptoms suggesting *N. gonorrhoeae* infection (10). Specimens of urethral exudate were collected from male patients; cotton bud swabs were used to collect specimens from the cervical area of females. Specimens were immediately prepared for Gram stain and also were streaked onto Thayer-Martin agar (9) plates, which were then incubated for up to 72 h at 37°C under 10% carbon dioxide. Gonococci were identified by Gram stain, colonial morphology, oxidase reaction, and sugar fermentation (2). Culture-confirmed isolates were studied for the production of penicillinase by a penicillin disk diffusion technique, the isolate being streaked on a cultured lawn of a penicillin-susceptible *Staphylococcus aureus* strain (11), and by the chromogenic cephalosporin test (3). Positive agreement between the techniques was required for PPNG identification. MICs of penicillin were determined by plate dilution (8), using standardized culture suspensions and Thayer-Martin plate serial dilutions of penicillin G in concentrations of 0.06 to 24 μg/ml. Isolates with a penicillin MIC of >24 μg/ml were reported as such, and those with MICs of <0.6 μg/ml were considered "susceptible." MICs were not performed on isolates with MICs of >24 μg/ml.

The mean MIC ± 1 standard error for all isolates excluding penicillinase-producing ones, from males was 0.799 ± 0.039 μg/ml; for isolates from females it was 0.812 ± 0.032 μg/ml, and overall it was 0.805 ± 0.022 μg/ml. Seventy-five isolates, 52 from males and 23 from females, were identified as PPNG. All isolates with an MIC of ≥6 μg/ml were identified as penicillinase producing (Table 1). The percentage of PPNG isolates was 22.6% from males and 13% from females (18.5% of the total 405). The mean penicillin MICs reported in Thailand during 1972, 1973, and 1974 (8) were 0.348, 0.432, and 0.63 μg/ml, respectively. Isolates from our two unpublished studies during 1977 and 1978 of selected clinic populations, excluding PPNG isolates, exhibited mean MICs ± standard error of 0.688 ± 0.044 and 0.883 ± 0.037 μg/ml, respectively. Data from 1972 through 1974 were calculated deleting all MICs >1.2 μg/ml, and PPNG identification...
was not performed. If this exclusion was applied to our 1979 data, it would represent over 25% of the values used for calculation purposes. We found during our 1977 study that 8% of 105 study isolates were beta-lactamase positive. Of the present 405 patients, 75 (18.5%) were PPNG positive and had a demonstrable MIC of penicillin indicating drug resistance. Hence, the trend toward a higher prevalence of penicillin resistance is apparent, and the existence of beta-lactamase production among clinical isolates of N. gonorrhoeae in Thailand is established.

LITERATURE CITED