



Global views

The antibiotic susceptibility of *Neisseria gonorrhoeae* isolated in Ulaanbaatar, Mongolia

Introduction

The incidence and prevalence of gonorrhoea in Mongolia appear to be high and increasing.¹ Progress towards control of gonorrhoea requires the availability of effective antibiotic treatment. However, the susceptibility of *Neisseria gonorrhoeae* isolated in Mongolia is difficult to ascertain. A brief report some years ago noted "substantial" resistance to penicillins and quinolones and, surprisingly, third generation cephalosporins.²

Other factors decrease antibiotic availability. Some efficacious antibiotics recommended for treatment of gonorrhoea in developed countries are too expensive in Mongolia¹ so that tetracyclines, gentamicin, and quinolones are most often used. Antibiotics are also freely available from pharmacies in Mongolia, and treatments obtained from these sources may be multidose and uncontrolled. There is thus the potential for the development of further antibiotic resistance.

The susceptibility of gonococcal isolates from Ulaanbaatar to a number of antibiotics recommended for treatment in WHO standard guidelines and the *in vitro* susceptibility of gonococci to gentamicin, an aminoglycoside antibiotic currently used in Mongolia, is reported. Analysis of patterns of antibiotic resistance was enhanced by phenotyping gonococcal isolates.

Materials and methods

Fifty six unselected isolates from symptomatic patients (26 males and 30 females) attending the central STD clinic in Ulaanbaatar were identified by standard procedures. The minimum inhibitory concentration (MIC) and categorisation of the susceptibility of the isolates to penicillin, ciprofloxacin, spectinomycin, and ceftriaxone were determined by the standardised techniques.^{3,4} High level tetracycline resistance (TRNG, MIC ≥ 16 mg/l) and gentamicin susceptibility were determined by the same

procedures. Chromosomal resistance to penicillin was defined as MICs ≥ 1 mg/l and quinolone resistance when MICs were ≥ 0.06 mg/l. Quinolone resistant strains were further divided into a "less susceptible" (MIC 0.06–0.5 mg/l) or "resistant" (MICs ≥ 1 mg/l) group on the basis of ciprofloxacin MICs. β Lactamase production was determined by acidometric methods. Control cultures were WHO reference strains.

The gonococci were phenotyped by determining their auxotype/serovar (A/S) class. Isolates were serotyped by their coagglutination reactions with a panel of 14 monoclonal antibodies (Boule Diagnostics, Huddinge, Sweden) using the nomenclature of Bygdeman.⁵ Auxotyping was performed by standard methods.⁴

Results

The susceptibility patterns of the 56 strains to the antibiotics tested are shown in table 1. Twenty seven (48%) strains were penicillin resistant either through the production of penicillinase (PPNG) (10 isolates) or by chromosomal mechanisms (CMRNG) (17 isolates). There were 19 (34%) strains showing altered susceptibility to quinolones (QRNG). Five were in the less sensitive category and 14 were resistant to ciprofloxacin with the highest MIC, 4 mg/l, recorded for two strains. All isolates were susceptible to ceftriaxone and spectinomycin and none were TRNG. MICs to gentamicin ranged between 0.5 and 4 mg/l. Criteria for defining categories of gonococcal susceptibility to gentamicin are not well established but those available⁶ suggest that 10 strains (18%) with an MIC of 4 mg/l were less sensitive.

The 56 gonococci were represented by 13 different A/S classes. Twenty four isolates were in the 1A and 32 in the 1B serogroup. Two A/S classes, Pro⁻/Arst (14 strains) and Nr/Bopt (19 strains), together accounted for 59% of all isolates. A further two A/S classes, Pro⁻/Arost and Pro⁻/Bopt, represented another 21% of the total so that 80% of strains

were allocated to four of the 13 A/S classes. The remaining nine A/S classes contained between one and three isolates each.

The 10 PPNG were distributed among seven A/S classes. Three PPNG were Pro⁻/Arst and two Pro⁻/Arost. The 19 QRNG were distributed over eight A/S classes. Eight QRNG were Pro⁻/Arst, one with a ciprofloxacin MIC of 4 mg/l, five with an MIC of 1 mg/l, and two with an MIC of 0.12 mg/l. Four QRNG were Pro⁻/Bopt over a ciprofloxacin MIC range from 0.25 to 2 mg/l. Only one of the 19 Nr/Bopt A/S class was a QRNG.

Discussion

The WHO recommends that any antibiotic treatment regimen should cure a minimum of 95% of cases treated. However, the antibiotic susceptibility of gonococcal isolates in Mongolia has been little studied. Results from this sample indicate the presence of significant resistance to the penicillins and quinolones. Resistance to the penicillins was by both chromosomal and plasmid mediated mechanisms.

Most of the isolates were concentrated among four A/S classes. However, both the PPNG and QRNG were phenotypically diverse. The large number of phenotypes and the wide range of MICs among the QRNG suggest that different mutations coding for quinolone resistance have arisen in many subtypes, rather than through spread of a single resistant "clone." This assumption would require verification by analysis of quinolone resistance determining regions of the chromosome. There were no PPNG and only a single QRNG in the commonest phenotype, Nr/Bopt.

All isolates tested were fully susceptible to spectinomycin and ceftriaxone. However, these antibiotics are not available in Mongolia, and for this reason the susceptibility of the strains to the aminoglycoside gentamicin, often used in this country to treat gonorrhoea, was examined. The correlation between *in vitro* susceptibility, as measured by MIC determinations, and clinical outcomes have not been firmly established for this antibiotic. One study in Malawi⁶ suggested that strains with MICs of 16 and 32 mg/l should be regarded as resistant. All isolates tested here had MICs of 4 mg/l or less, probably indicating clinical susceptibility. The MIC methods used here and in the study of strains from Malawi differed, so that MIC values obtained in the two studies are not directly comparable. The E-test method was unreliable for estimating the susceptibility of gonococci to gentamicin.⁶ Criteria for establishing resistance of gonococci to gentamicin by disc diffusion testing methods are yet to be established and would require the availability of gonococci with higher MICs than were

Table 1 Minimal inhibitory concentrations (MICs) of the antibiotics (AB) penicillin (pen), ciprofloxacin (cipr), gentamicin (gent), ceftriaxone (ceft), spectinomycin (spec), and tetracycline (tetr) for 56 gonococcal isolates from Ulaanbaatar, Mongolia. MICs were determined by standard methods^{3,4}

AB	MIC (mg/l)										
	≤ 0.03	0.06	0.12	0.25	0.5	1	2	4	≤ 8	≤ 64	PPNG
pen		2	10	4	13	16	1				10
cipr	37		4	1		9	3	2			
gent					1	5	40	10			
ceft	56										
spec										56	
tetr									56		

PPNG = penicillinase producing *N. gonorrhoeae*.

present in this sample. This development would assist in rapid screening of isolates for gentamicin resistance where this antibiotic is used.

The data suggest that a system for continuing appraisal of gonococcal susceptibility is needed in Mongolia to detect emergence and spread of antibiotic resistant gonococci and to guide selection of standard treatment regimens.

Dr Lkhamsuren was a visiting scholar to the WHO Collaborating Centre in Sydney and was sponsored by the WHO Western Pacific Region, Manila, Philippines.

Contributors: EL collected strains in Ulaanbaatar and examined them in Sydney; TRS and EAL assisted in susceptibility testing and phenotyping, database management, and isolate storage; EL and JWT analysed data; JWT wrote the text; and all revised the manuscript.

E LKHAMSUREN*
T R SHULTZ
E A LIMNIOS
J W TAPSALL

*WHO Collaborating Centre for STD and HIV,
Department of Microbiology, The Prince of Wales
Hospital, Sydney, New South Wales, Australia 2031*
*Current address: Department of Microbiology,
National Medical University, Ulaanbaatar, Mongolia

Correspondence to: J W Tapsall, WHO Collaborating Centre for STD and HIV, Department of Microbiology, The Prince of Wales Hospital, Randwick, New South Wales, Australia 2031

j.tapsall@unsw.edu.au

Accepted for publication 2 February 2001

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Prevalence of STDs and HIV infection among immigrant sex workers attending an STD centre in Bologna, Italy

Introduction

Recent research (ISTAT: Italian Statistics Institute, data regarding 1998) has shown that in Italy there are about 50 000 street sex workers—20 000 of them are occasional; the remaining full time workers included 5000 Italians, generally not street walking, and 25 000 migrant street walking prostitutes.

Migrant prostitution in Italy represents a real emergency because of their number, which is increasing in proportion to clandestine immigration coming from east Europe and from Africa.

Sex workers are often the focus of control measures for sexually transmitted diseases (STDs) because they are seen as the source.¹

Recent data show that in Bologna city there are about 200 street walking prostitutes every day.

Methods

Our study was conducted on 558 prostitutes who attended the STD centre in Bologna, Italy, during the period from January 1995 to December 1999. The median age was 23.5 years; 424 (76%) came from central and south America and two from Asia.

Most prostitutes attended the clinic to undergo serological tests (HIV, hepatitis B virus, hepatitis C virus), cervical-vaginal plugs for the main pathogen agents, and Papanicolaou test.

If clinical symptoms were present a medical examination was carried out.

Results

We noticed the following pathologies (table 1).

(1) Cervicitis, vaginitis, and vaginosis (including mycoplasma, ureaplasma, streptococcus B, and candida infections): 390 cases (70%). Most of these pathologies are linked to factors other than STDs (stress, distortion of vaginal flora, and immunodeficiency). Nevertheless, the high predominance in the cervical tract of ureaplasma and mycoplasma seems proportional to the sexual activity of the subjects.

(2) Trichomonas infection: 10 cases (the prevalence changes with sexual behaviour and geographical locations).

(3) Gonorrhoea and chlamydial infections: five (0.9%) out of 558 women had positive gonococcal culture; 35 (6.3%) were positive for chlamydia.

(4) Viral pathologies: 24 cases of human papillomavirus infection and 11 of herpes simplex virus infection. In our study there were no African women affected by venereal warts.

(5) Syphilis: two cases of secondary active syphilis, 65 (11.6%) cases of serological non-active syphilis. The infection had often been contracted in the past in their countries of origin (eastern Europe) where the seroprevalence and incidence of syphilis is higher than in Italy.

(6) Serological tests: 150 cases (26.9%) of HBV; 28 cases (5%) of HCV. Nine were HIV

positive—five from Nigeria, two from Ukraine, one from Romania, and one from Serbia (median age: 20 years).

Comment

With regard to our previous data² median age is decreased in the last year (23.5) and the number of east European women has increased, particularly from Moldova.

Our study shows that prostitutes do not have a prominent role in the transmission and diffusion of STDs, in fact only a few of them show clinical symptoms. On the other hand, prostitutes, because of the continuous exposure to risk, and their clients, as receivers or transmitters of STDs, seem to play an important part in transmission. Regarding HIV infection the prevalence is growing (non-condom use) and the access to therapy for HIV+ women is difficult.³ Targeted intervention programmes need to be planned, in that preventive measures are essential to bring these sexual diseases under control.^{4,5}

A D'ANTUONO
F ANDALÒ
E M CARLÀ
S DE TOMMASO

Department of Clinic, Specialistic and Experimental Medicine, Section of Dermatological Clinic, University of Bologna, Italy

Correspondence to: Dr Antonietta D'Antuono, V Massarenti 1, 40138 - Bologna, Italy

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Accepted for publication 2 February 2001

Table 1 Characteristics of the study group and the number of cases diagnosed

Period of study	January 1995–December 1999
Total of patients	558 women
Median age	23.5 years
Factor of risk	Street walking prostitution
Origin (35 countries)	
Europe (east)	424
Africa	103
America (central and south)	29
Asia	2
STD diagnosed	
Cervicitis, vaginitis, vaginosis	390
Latent syphilis	65
Chlamydial infection	35
Venereal warts	24
Herpes	11
Trichomonas infection	10
Pox virus infection	5
Gonococcal cervicitis	5
Secondary syphilis	2
Blood samples	558
HBV	150
HCV	28
HIV	9
Pap test 558	Class I or II