

93% of the isolates (n=297) had MICs of <0.03 mg/l which were classified as susceptible (CroS). All CroRed isolates were analysed for mutations in penA (PBP2), mtrR (MtrR), porB (PorB) and ponA (PBP1). 123 (42%) CroS isolates were randomly selected as coselected

**Results** In total, nine mutation patterns were observed in penA. Patterns I (31.7%), IX (29.2%) and XXII (26%) were most common in the 123 CroS isolates; while patterns IX (60.8%, p<0.05) and XXII (21.5%, p>0.05) were predominant in the 23 CroRed isolates. The mosaic penA pattern X was observed in only one isolate (Cro MIC=0.06 mg/l). Seven mutation patterns were noted in mtrR. Among the CroS isolates, 35.8% had a single mutation (G45D or A39T) in the DNA binding domain (DBD) and 17.8% of the isolates carried an A<sup>n</sup> nucleotide deletion (A<sup>-</sup>) in the mtr promoter coupled with a G45D mutation. Among the CroRed isolates, 65.2% carried G45D or A39T single mutations, significantly higher than that of CroS isolates (p<0.05). The mutation of A<sup>-</sup>/H105Y was observed in 21.7% of CroRed isolates as compared to 4% of CroS isolates (p<0.05). Five mutation patterns at residues G120 and A121 of PorB were observed in the CroRed isolates including double (47.8% vs 13% CroS isolates, p<0.05) or single (21.7% vs 26% CroS isolates, p>0.05) mutations. L421P in PBP1 was detected in 87% CroRed and 13% CroS isolates, respectively (p<0.05).

**Conclusions** Mosaic penA pattern X was only observed in one CroRed isolate. The mutations associated with CroRed phenotypes include pattern IX of PBP2, mutations in DBD and a double mutation of A<sup>-</sup>/H105Y in mtrR, double mutations in PorB (positions G120 and A121) and L421P of PBP1.

**P1-S1.41** **EMERGENCE OF AN AFRICAN ANTIMICROBIAL RESISTANCE GENOTYPE IN NEISSERIA GONORRHOEA STRAINS ISOLATED IN GUANGZHOU, CHINA, 2001–2009**

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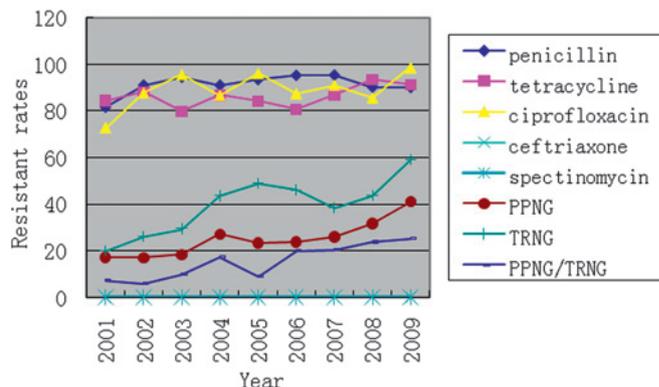
**Background** The continuing spread of drug-resistant gonococci has posed a challenge for successful treatment worldwide. Recently third-generation cephalosporins-resistant strains were isolated in Japan. Guangdong Province in South China has one of the highest gonococcal resistance rates in China and a large number of international migrants. We investigated the invitro antimicrobial susceptibility and genotypes of *N gonorrhoeae* strains isolated in Guangzhou, the capital city, from 2001 to 2009.

**Methods** MICs to penicillin, ceftriaxone, tetracycline, ciprofloxacin, and spectinomycin were determined by agar plate dilution and susceptibilities were interpreted according to WHO standards.  $\beta$ -lactamase production was determined by paper acidometric testing. The resistant plasmids were determined for penicillinase-producing *N gonorrhoeae* (PPNG) and high-level tetracycline resistant *N gonorrhoeae* (TRNG) by PCR and the isolates were genotyped.

**Results** Of 1132 consecutive gonococci isolated from 2001 to 2009, no ceftriaxone and spectinomycin resistant strains were found, but the prevalence of strains less susceptible to ceftriaxone rose from 18.2% to 38.5%. The MIC<sub>90</sub> for ceftriaxone showed intermediate sensitivity (0.06–0.125  $\mu$ g/ml) and spectinomycin near the resistant level (16–32  $\mu$ g/ml). The resistance to penicillin, tetracycline and ciprofloxacin increased from 81.8%, 84.5% and 72.5% in 2001 to 90.1%, 91.4% and 98.7% in 2009, respectively. A total of 313 (27.7%) PPNG and 486 (42.9%) TRNG strains were detected. 206 (18.2%) strains were both PPNG and TRNG. PPNG rose from 21.8% to 29.8% and TRNG rapidly increased from 27.2% to 56.3%. Genotyping TEM-1 gene showed 267 (99.6%) PPNGs in 2001–2008 carried the Asian-type  $\beta$ -lactamase plasmids and one African-type in 2008. Genotyping of tetM gene showed that all 486 TRNGs were Dutch variants.

**Conclusion** Gonorrhoea resistance continues to be a major public health problem in Guangzhou. The emergence of an African gonor-

rhoea resistance variant may be related to the large African diaspora in Guangzhou, migration of Chinese to Africa, or other migration patterns. More research is needed to determine what practices, systems, and behaviours contribute to escalating resistance patterns.



Abstract P1-S1.41 Figure 1 Resistance of *N gonorrhoeae* isolates in Guangzhou during 2001–2009.

**P1-S1.42** **RUSSIAN GONOCOCCAL ANTIMICROBIAL SUSCEPTIBILITY PROGRAMME (RU-GASP) - RESISTANCE LEVELS IN 2010 AND TRENDS DURING 2005–2010**

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**Background** Antimicrobial resistance (AMR) in *Neisseria gonorrhoeae* is a major concern worldwide. AMR surveillance globally is crucial for guiding effective treatment and accordingly for public health purposes. In the former Soviet countries, the knowledge regarding AMR has been limited. However, in 2004 the Russian gonococcal antimicrobial susceptibility programme (RU-GASP), which now acts also under WHO protocols, was initiated. The aims of the present study were to examine and describe the prevalence of *N gonorrhoeae* AMR in 2010 in Russia, and reveal trends during 2005–2010.

**Methods** In 2010, *N gonorrhoeae* isolates (one isolate per patient; n=407) collected from 46 surveillance sites distributed in all eight Federal Districts of Russia were examined regarding their susceptibility to ceftriaxone, spectinomycin, azithromycin, penicillin G, ciprofloxacin, and tetracycline using agar dilution method, according to CLSI and WHO protocols.  $\beta$ -Lactamase production was identified using nitrocefin discs.

**Results** In 2010, the AMR (intermediate susceptibility) levels were as follows - ceftriaxone 0% (0%), spectinomycin 4.4% (12.3%), azithromycin 4.9% (10.4%), penicillin G 32.5% (39.9%), ciprofloxacin 53.2% (3.0%), and tetracycline 41.9% (26.6%). Three isolates (0.7%) were resistant to all antimicrobials except ceftriaxone. During 2005–2010, the AMR has remained high to penicillin G, tetracycline, and ciprofloxacin. The proportion of resistant isolates to spectinomycin and azithromycin has ranged from 0% (2005) to 7.2% (2008), and 0.4% (2008) to 4.9% (2010), respectively. All isolates in 2005–2010 were susceptible to ceftriaxone. Nevertheless, the minimum inhibitory concentration (MIC) distribution of ceftriaxone has rapidly shifted to higher MICs, and isolates at the breakpoint for intermediate susceptibility/resistance (0.25 mg/l; n=8 [2%] in 2010) have rapidly increased over the years.

**Conclusions** The AMR of *N gonorrhoeae* in Russia is high and ceftriaxone (<sup>3</sup>250 mg) should be first-line for empirical treatment. If there are no access to ceftriaxone or in the presence of severe  $\beta$ -lactam antimicrobial allergy, spectinomycin is recommended for use.

However, despite exceedingly rare in most countries spectinomycin resistance is annually identified in Russia, and accordingly the level of this resistance is crucial to monitor. Continuous, quality assured and quality controlled gonococcal AMR surveillance in Russia is crucial. RU-GASP now also works under WHO protocols.

**P1-S1.43** **ANTIMICROBIAL SUSCEPTIBILITY AND MOLECULAR EPIDEMIOLOGICAL CHARACTERISTICS OF *NEISSERIA GONORRHOEA* IN 2009–2010 IN BELARUS**

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**Background** Antimicrobial resistance (AMR) in *Neisseria gonorrhoeae* is a global concern, and gonorrhoea may become untreatable. However, AMR data from Eastern Europe are scarce beyond Russia, and in Belarus no AMR data or other characteristics of gonococci have been published in over 20 years. The aim was to describe the AMR and molecular epidemiological characteristics of gonococci circulating in 2009 and 2010 in Belarus.

**Methods** *N gonorrhoeae* isolates cultured in 2009 (n=80) and 2010 (n=78) in the two different cities Minsk (n=45) and Mogilev (n=113) were examined using Etest for nine antimicrobials and nitrocefin solution for  $\beta$ -lactamase production. Where available, breakpoints for susceptibility and resistance according to The European Committee on Antimicrobial Susceptibility Testing (EUCAST; <http://www.eucast.org>) were used. Moreover, screening for penA mosaic alleles, full-length porB gene sequencing, and *N gonorrhoeae* multiantigen sequence typing (NG-MAST) were performed.

**Results** The levels of resistance in 2009–2010 to antimicrobials evidently used in the gonorrhoea treatment in Belarus were—ceftriaxone 0%, spectinomycin 0%, azithromycin 14.4%, tetracycline 30.9%, ciprofloxacin 34.6%, and erythromycin 59.2% (only tested in 2009). The levels of resistance to other antimicrobials of international interest but not used in Belarus were—cefixime 0%, gentamicin 1.3%, and penicillin G 9.9% (only tested in 2009). Extraordinarily, no  $\beta$ -lactamase producing isolates were detected. The circulating *N gonorrhoeae* population identified was very heterogeneous and contained many divergent NG-MAST STs, of which more than half have not been previously described worldwide.

**Conclusions** Due to the high levels of resistance to all antimicrobials previously recommended as first-line treatment, only ceftriaxone and spectinomycin can be recommended for empirical gonorrhoea treatment in Belarus. Continuous and quality assured gonococcal AMR surveillance in Eastern Europe is crucial, in Belarus this surveillance is now initiated using WHO protocols.

**P1-S1.44** **ANTIMICROBIAL SUSCEPTIBILITY PROFILE OF *NEISSERIA GONORRHOEA* ISOLATES IN THE PROVINCE OF QUÉBEC - 2010**

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**Background** Regular monitoring of antimicrobial resistance of *N gonorrhoeae* is necessary to detect the trend in antimicrobial resistance, increases in minimum inhibitory concentrations (MICs) and to assist in the development of treatment guidelines.

**Methods** In 2010, all *N gonorrhoeae* strains isolated in clinical laboratories throughout the province were submitted to the Laboratoire de santé publique du Québec where their susceptibility profile to azithromycin, cefixime, ceftriaxone, ciprofloxacin and spectinomycin was determined by the agar dilution method.

**Results** A total of 831 strains isolated from 607 males and 224 females were tested. The strains were recovered from (data available for 819 strains) the following specimens—urethra, 432; cervix, 191; anus, 100; throat, 90; eye, 4; and synovial fluid, 2. All strains were susceptible to cefixime, ceftriaxone and spectinomycin, 270 (32.5%) were resistant to ciprofloxacin and 11 (1.3%) were resistant to azithromycin (MIC  $\geq$  2 mg/l). The azithromycin resistant isolates were retrieved from 11 males aged 16–55 years (mean, 30) from the Montreal area (urethra, 8; throat, 3). The azithromycin MIC distribution was as follows—4 mg/l (n=1), 8 mg/l (n=6), 16 mg/l (n=4). No highly resistant organism (MIC > 128 mg/l) was identified. Among the azithromycin resistant isolates, one was resistant to ciprofloxacin but all were susceptible to cefixime, ceftriaxone and spectinomycin. In 2010, 68 (8.2%) isolates exhibited decreased susceptibility to cefixime (MIC=0.125 mg/l [n=62] and 0.25 mg/l [n=6]). Of these 68 isolates, all were susceptible to azithromycin and ceftriaxone but all were resistant to ciprofloxacin. Only one isolate showed decreased susceptibility to ceftriaxone (MIC=0.125 mg/l)—this isolate also showed decreased susceptibility to cefixime.

**Conclusions** As observed elsewhere, *N gonorrhoeae* strains are showing a worrisome drift in susceptibility to cefixime, a first line treatment for gonococcal infections associated with resistance to ciprofloxacin. Furthermore, resistance to azithromycin, a second line treatment option, is emerging. Sustained collaborative laboratory surveillance programs are mandatory for the design of public health interventions to prevent and control gonococcal infections.

**P1-S1.45** ***NEISSERIA GONORRHOEA* ANTIMICROBIAL SUSCEPTIBILITY IN LATIN AMERICA AND THE CARIBBEAN (2000–2009) - A CONTRIBUTION TO THE TREATMENT GUIDELINES REVISION**

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**Background** Active surveillance of the antimicrobial susceptibility (AS) of *Neisseria gonorrhoeae* (Ng) isolates was carried out by the Gonococcal Antimicrobial Surveillance Program (GASP) in Latin America and the Caribbean (LAC) during the 1990s. A retrospective analysis of surveillance activities undertaken during the 2000s was conducted to describe trends in Ng AS and to re-initiate the GASP network.

**Methods** Ng isolates were collected and tested for AS to penicillin (Pen), tetracycline (Tet), ciprofloxacin (Cip), ceftriaxone (Cef), azithromycin (Azi) and spectinomycin (Spe) in 11 countries between 2000 and 2009. Agar dilution, disc diffusion and Etest methods were used as described by CLSI and previously established in the GASP-LAC network. Trends in AS were retrospectively analysed in each country and aggregated at the GASP-LAC Coordinating Centre.

**Results** 6 countries collected data over the entire study period and five countries tested for AS sporadically. In total, 9026 Ng isolates were tested. Cip resistance first appeared in 2000 with 2%, (19/784) and resistant per cent increased to 30% (297/975) in 2009. Cip resistance was observed in 10 countries. Azi resistance per cent increased from 6% (41/646) in 2000 to 27% (224/842) in 2009; one country reported no resistance. Pen resistance per cents ranged between 29% (299/1035) in 2000 and 33% (256/772) in 2006. Tet resistance percents declined from 61% (633/1041) in 2000 to 35%