

# Antimicrobial Susceptibility of *Neisseria gonorrhoeae* in Baltimore, Maryland – 2016



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## Background and Aim

*Neisseria gonorrhoeae* (NG), the causative agent of gonorrhea, has progressively developed resistance to all commonly-prescribed antimicrobials and the threat of untreatable gonorrhea is a global health concern. In order to prevent the emergence and spread of untreatable gonorrhea, the World Health Organization and CDC recommend enhanced surveillance practices to monitor levels of antimicrobial resistance at the local, national, and international level. The objective of this project was to determine the prevalence of antimicrobial-resistant NG in Baltimore

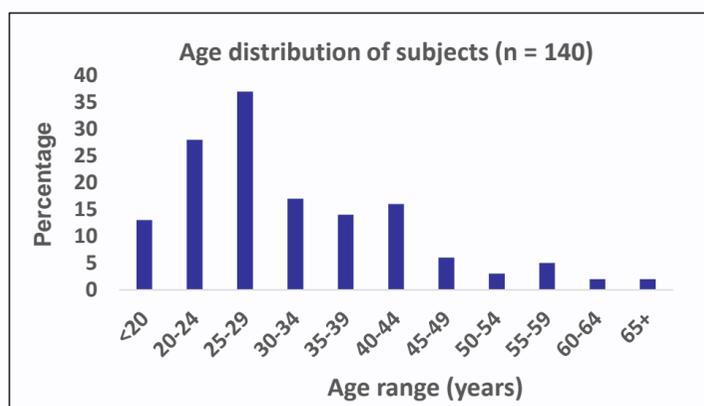
## Methods

NG isolates, collected from men at the Baltimore City Health Department (BCHD), were recovered from freezing media, and confirmed as NG by culture and PCR.

Following confirmation, the minimum inhibitory concentration (MIC) of each isolate to ciprofloxacin, azithromycin, penicillin, ceftriaxone, tetracycline, and gentamicin was determined using the E-test strip method. The MIC to each antimicrobial was determined from the E-test readings and susceptibility reported as susceptible, intermediate, or resistant based on breakpoints from the Clinical Laboratory Standard Institute (CLSI) guidelines.

The mechanism of resistance to ciprofloxacin and penicillin was also investigated using previously-described molecular approaches. Mutations in the *GyrA* gene, which are associated with decreased susceptibility to ciprofloxacin, were identified with a real-time PCR assay targeting wild-type *GyrA* sequences. A second PCR assay was used to determine if isolates harbored a plasmid conferring resistance to penicillin. Plasmid-harboring isolates were classified as penicillinase-producing *Neisseria gonorrhoeae* (PPNG).

### 1. Subjects demographics



- 96.8% African American; 88.8% heterosexual
- 6.6% of subjects were HIV positive; 5.8% syphilis positive

### 2. Antimicrobial susceptibility/resistance phenotypes of *Neisseria gonorrhoeae* isolates (n = 143)

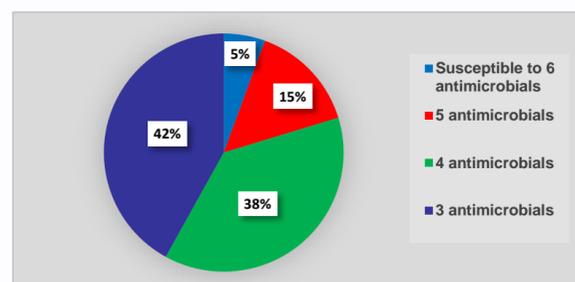
	MIC breakpoint (µg/mL)			Number of isolates			Percentage of isolates		
	S	I	R	S	I	R	S	I	R
Ciprofloxacin	≤0.06	0.125-0.5	≥1	79	1	63	55.2	0.7	44.1
Penicillin	≤0.06	0.12-0.5	≥2	19	92	32	13.3	64.3	22.4
Tetracycline	≤0.25	0.5-1	≥2	24	104	15	16.8	72.7	10.5
Azithromycin	≤1 (WT)		≥2 (NWT)	140		3	97.9	0.0	2.1
Ceftriaxone	≤0.25			143			100		
Gentamicin	≤4		≥8	143			100		

S – Sensitive I – Intermediate R – Resistant  
WT – Wildtype NWT – Non-wildtype

## RESULTS

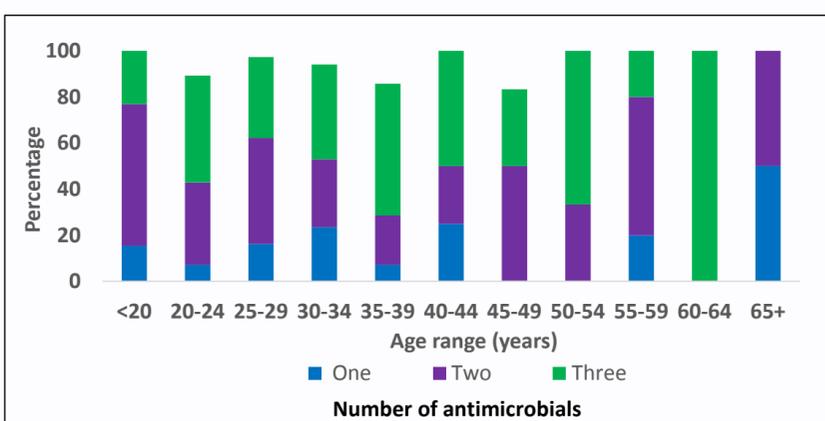
- All isolates were susceptible to gentamicin and ceftriaxone, but 2.1% of isolates displayed high level resistance to azithromycin.
- Plasmid-mediated resistance is the primary mechanism of penicillin resistance.
- All ciprofloxacin-resistant strains had mutations in the *GyrA* gene.

### 3. Susceptibility profile of NG isolates to multiple antimicrobials



High prevalence of multi-drug resistant gonorrhea

### 4. Distribution by age groups of NG isolates with resistance/decreased susceptibility to multiple antimicrobials



Age does not appear to be associated with the acquisition of multi-drug resistant gonorrhea

## CONCLUSIONS

- Levels of multi-drug resistant gonorrhea are high in Baltimore.
- NG isolates are susceptible to ceftriaxone, but resistance to azithromycin is beginning to emerge.
- Gentamicin could be a suitable alternative for the treatment of gonorrhea.
- Multi-drug resistant gonorrhea is common among all age groups.
- Enhanced surveillance practices are necessary to monitor the evolution of antimicrobial resistance in Maryland.

## ACKNOWLEDGEMENTS & REFERENCES

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