

## (1) Submission ID#1526655

A comparison of *Neisseria* pathogens: The similarities, differences, and global trends in antimicrobial resistance (AMR)

---

### Author(s)

Shravani Bobde, PhD MS

Senior Medical Manager in Global Medical Affairs *Neisseria*

GSK

Gaurav Mathur, MD Medicine

Medical Director, Global Medical Affairs - *Neisseria* Vaccines GSK

GSK

Aruni Mulgirigama, MBBS, MRCP, MFPM

Consultant in Pharmaceutical Medicine and Global Medical Affairs Leader for anti-infectives

GSK

Woo-Yun Sohn, MD Pediatric Specialist

Global Medical Portfolio Lead *Neisseria* Vaccines GSK

GSK

### Background

*Neisseria meningitidis* and *N. gonorrhoeae* are closely related, yet cause different clinical diseases. Although rare, invasive meningococcal disease has a 10–15% case fatality rate (CFR) and ~20% of patients have lifelong sequelae. *N. gonorrhoeae* infects different anatomical sites, and extensively drug-resistant strains are known. AMR is a major public health concern.

### Aim/Methods

A literature review to compare *N. meningitidis* and *N. gonorrhoeae*, global AMR trends, and consider the potential impact of treatment and vaccination on AMR.

### Results

*N. meningitidis* and *N. gonorrhoeae* share 80–90% genome sequence identity and acquire much of their diversity by recombination; however, they differ in their levels of diversity, how genome variation is acquired, and adaptive evolution in the core genomes. Evidence that *N. meningitidis* and *N. gonorrhoeae* can cross-colonize anatomical niches may be explained by their shared biology. In a World Health Organization surveillance program, 23.8%, 45.2%, 80.6%, and 100% of reporting countries described *N. gonorrhoeae* isolates as showing decreased susceptibility/resistance to ceftriaxone, cefixime, azithromycin, and ciprofloxacin, respectively, and in 2021, azithromycin was removed from the Centers for Disease Control and Prevention treatment guidelines for uncomplicated *N. gonorrhoeae*. Trends in AMR show gonorrhea treatment options are depleting, and treatment-resistant *N. meningitidis* strains have emerged including an antibiotic-

resistant MenY strain (MenY may have a 25% CFR in the US). Vaccination can reduce AMR by reducing symptomatic disease burden and antibiotic use, thus suppressing evolution of resistance mechanisms. Case-control studies have demonstrated that the 4CMenB vaccine, which protects against meningococcal B infection, offers 33–40% effectiveness against gonorrhea. Cross-protection is likely due to homology of the outer membrane vesicle (OMV) and recombinant NHBA proteins that are conserved in both pathogens and included in the vaccine; furthermore, OMV-induced antibodies recognize gonococcal proteins. Evidence of 4CMenB's effectiveness against gonorrhea, the development of new antibiotics against AMR (e.g. gepotidacin), and combination vaccines signal that vaccination and therapeutics are critical to addressing AMR and reducing the evolution of drug-resistant strains.

## Conclusions

Further characterization of the genomics and proteomics of *Neisseria* species can help inform vaccine development, strain coverage, and effectiveness. Strategies, including novel antimicrobials and vaccines, for overcoming AMR are being investigated.