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Comparing the *Neisseria gonorrhoeae* doxycycline and tetracycline antibiotic susceptibility

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Background

Doxycycline, a tetracycline analogue, has been used for post-exposure prophylaxis to prevent certain sexually transmitted diseases. Doxycycline is effective in treating *Treponema pallidum* (syphilis causing organism) and *Chlamydia trachomatis* (chlamydia infection). According to CDC's STI treatment Guideline, an oral 7-day course of two dosages of 100 mg /day is required for the treatment. However, this is not the same for infections caused by *Neisseria gonorrhoeae* (*N. gonorrhoeae*). *Neisseria* species are well known for their mutability and ability to incorporate foreign DNA. *N. gonorrhoeae* has developed resistance to almost all the previously used first-line antibiotics. Reported cases of tetracycline resistance is approximately 30% in the US and higher in other countries, e.g. 50% in France.

Aim/Methods

There is a lack of information on the susceptibility correlations between tetracycline and doxycycline for *N. gonorrhoeae*. The primary goal of this study is to provide data on tetracycline and doxycycline susceptibility and genetic resistance biomarkers associated with *N. gonorrhoeae*. One hundred and twenty *N. gonorrhoeae* isolates (GISP, 2018, and CDC/FDA GC panel) were tested for microbial susceptibility of tetracycline and doxycycline using gradient diffusion strips (Liofilchem™ ; 0.016-256 ug/ml). The NG Genome Profiler and Typing Tool was used to extract and identify resistance related biomarkers from whole genome sequencing

data. Microbial minimum inhibition concentration (MIC) values were analyzed using Linear Regression Analysis and the Chi Square test to analyze resistance phenotypes and genetic biomarkers.

Results

The MICs of tetracycline and doxycycline were closely correlated ($r^2=0.84$). Both plasmid-mediated (tetM) and chromosomal mutation biomarkers (e.g. rpsJ, mtrR promoter region, and pilQ) appeared to be linked to resistance ($p < 0.05$).

Conclusions

We observed a direct relationship between MIC values of Doxycycline and tetracycline responses in *N. gonorrhoeae*. Both chromosomal and plasmid-mediated resistances contributed to resistance.