Rate of Neisseria meningitidis Serogroup B carriage among undergraduate students at Ohio University

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Introduction
Meningitis, inflammation of the three layers of membranes covering the spinal cord and brain, can be caused by many organisms. Bacterial meningitis caused by Neisseria meningitidis is of concern as the infection can progress from first symptoms to death within only hours. Additionally, meningococcal meningitis is fatal in 50% of cases if left untreated and those who recover often have permanent disabilities.\(^1\)\(^2\) Vaccines available to protect against meningococcal meningitis contain capsule carbohydrate, and thus are serogroup specific. Currently, routine vaccination with the conjugate vaccine (A, C, Y, W) is recommended by the CDC for adolescents.\(^3\)\(^4\) The development of a vaccine against serogroup B lagged behind its counterparts due to a capsule carbohydrate that was difficult to antigenize.\(^5\) However, in 2014 the FDA licensed a first 3-dose vaccination series for protection against N meningitidis serogroup B.\(^5\)

In recent years, there have been several meningococcal outbreaks at universities.\(^1\) One such outbreak occurred at Ohio University between January 2008 and November 2010. This resulted in 13 cases of meningococcal meningitis, 10 of which were serogroup B, and ended with the death of one student.\(^1\) The analyses presented below was performed at Ohio University just after the confirmed outbreak.

Methods

**262 Swabs Collected (100%)**
- Culture on media selective for pathogenic Neisseria
- 101 Samples Grew on Selective Media (39% of Total)
- Isolate DNA and amplify rpf gene to confirm as Neisseria
- 77 Samples Confirmed as Neisseria species (29% of Total)
- Sequence rpf gene to identify the species
- 54 Samples Confirmed as Neisseria meningitidis (21% of Total)
- Multi-plex PCR to determine the N. meningitidis serogroup
- 6 Samples Confirmed as Neisseria meningitidis Serogroup B (2% of Total)

Results

**A. Samples that Grew**

**B. Total Samples**

![Figure 2: 29% of samples collected contain the Neisseria specific rpf gene. A. Of the 101 strains that grow on selective media, 77 contained the Neisseria specific rpf gene, as detected by polymerase chain reaction (PCR). B. Of the 262 samples that were collected, 101 were eliminated due to no growth on selective media and 24 were eliminated due to an inability to detect the rpf gene. Only those samples (77) that grew and were rpf positive were carried forward in the study. Next step: Species identification.](image)

**A. rpF-positive Samples**

**B. Total Samples**

![Figure 3: 21% of samples collected confirmed as Neisseria meningitidis. A. Of the 77 strains in which rpF was detected, 54 were found to be Neisseria meningitidis by sequencing of the rpF amplicon. B. Of the 262 samples that were collected, 101 were eliminated due to no growth on selective media, 24 were eliminated due to an inability to detect the rpF gene, and 23 were eliminated because they were found not to be N. meningitidis. “ND” indicates that species could not be determined. Only those 54 samples that grew, were rpF positive and were found to be N. meningitidis were carried forward in the study. Next step: Serogroup Identification.](image)

**Conclusions**

- 262 throat swabs were collected from healthy undergraduate students at Ohio University following a confirmed outbreak of Meningococcal meningitis caused by Neisseria meningitidis serogroup B
- 101 samples (39% of total) resulted in growth on media selective for pathogenic Neisseria species
- 77 collected strains (29% of total) were confirmed to be Neisseria by the detection of the Neisseria specific gene rpF using PCR
- 54 collected samples (21% of total) were determined to be N. meningitidis by sequencing of the amplified rpF gene
- 6 of the collected samples (2%) of total were determined to be N. meningitidis serogroup B by species specific Multiplex PCR

**References**


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