ASSOCIATION BETWEEN RESPIRATORY VIRAL INFECTIONS AND MENINGOCOCCAL CARRIAGE IN BRISTOL SCHOOL STUDENTS IN 2014 - 2015

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INTRODUCTION

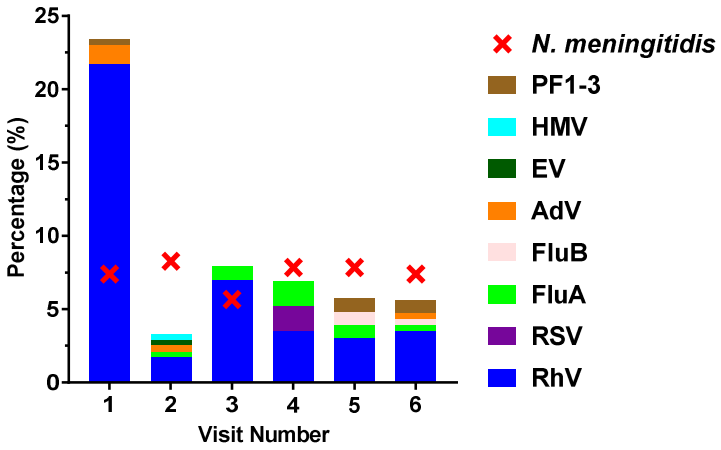
N. meningitidis causes meningococcal disease mostly in young children, yet the bacteria are most commonly found as commensal organisms in the throats of adolescents and young adults. If transmission of the meningococcus bacteria can be prevented, the incidence of disease could be reduced. The Meningococcus Gp C vaccination programme for example led to a reduction in carriage and transmission of Men C bacteria in adolescents and young adults, which has led to the protection of others, a phenomenon sometimes termed herd or population protection (1). Several studies have shown associations between influenza A and invasive meningococcal disease (IMD)(2,3), but previous studies have not directly investigated the relationship between influenza or other respiratory viral infections and meningococcal carriage as our current work aims to do.

STUDY DESIGN AND METHODS

- 5,456 pharyngeal swabs were collected from Bristol school students aged 15–19yrs, between September 2014 and May 2015, into 1.5mL skim milk-tryptone-glucose-glycerol (STGG) broth as part of a longitudinal study.
- 1,813 students were recruited for an initial swab, with 918 students taking part in a longitudinal part of the study in which pharyngeal swabs were collected from them each monthly for 6 months.
- Bacterial and viral nucleic acids were extracted from the STGG broth using a QIAsymphony machine.
- Quantitative real-time polymerase chain reaction (qPCR) was used to identify the presence of *N. meningitidis* by identifying the SodC gene (Ct≤36) within a month of a pharyngeal swabs being received.
- In the initial phase of analysis of swab samples for viruses we have processed the first 230 pharyngeal samples per visit (total 1,380) using reverse transcriptase* (rt)-PCR methods for the presence of a panel of 11 viruses: adenovirus (AdV), influenza A viruses (H1N1/09, seasonal H1N1 and H3N2) (FluA), influenza B (FluB), respiratory syncytial virus (RSV), human metapneumovirus (HMV), rhinovirus (RhV), parainfluenza virus types 1-3 (PF1-3) and enterovirus (EV). (* for all viruses except ADV which is a DNA virus)

RESULTS

Results 1



Results 1 – *N. meningitidis* and viral detection rates in the pharyngeal swabs at each visit time point.

Each 'X' represents the percentage detection rate of *N. meningitidis* in pharyngeal swabs at a visit time point, and each bar represents the percentage detection of a virus at each visit time point. Results only shown where the detection rate of a virus was at least 1% per visit. n=1,380.

Results 2

A)

	N. meningitidis+	*N. meningitidis*-	Total
Virus+	11.8%	88.2%	100%
Virus-	7.0%	93.0%	100%
Total	102	1278	1380

p= 0.0564

B)

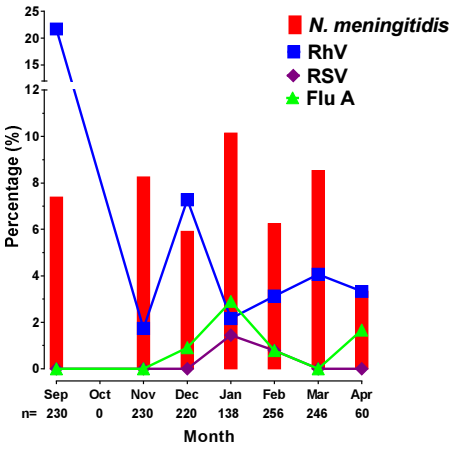
	N. meningitidis+	*N. meningitidis*-	Total
RhV+	12.9%	87.1%	100%
RhV-	7.0%	93.0%	100%
Total	102	1278	1380

p= 0.0354

Results 2 – Association in the same sample between the presence of *N. meningitidis* and A) the presence of a virus and B) the presence of Rhinovirus.

Percentages indicate in A) the percentage of virus positive or negative samples and B) the percentage of Rhinovirus positive or negative samples that had the presence or absence of *N. meningitidis*. No other individual viruses showed a statistically significant association with *N. meningitidis*. Chi Square test was used to generate p values. n=1,380.

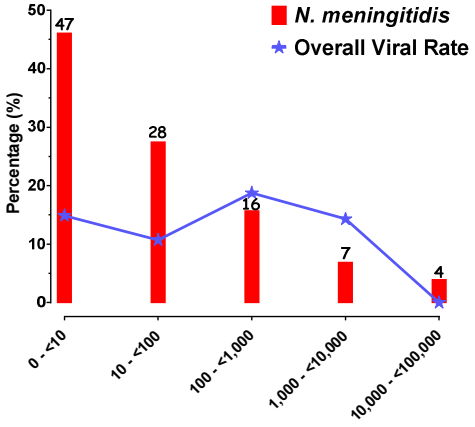
Results 3



Results 3 – Detection rates of *N. meningitidis* and viruses by calendar month.

Data are only shown for viruses with detection rates of at least 1% in any one month. n values are numbers of samples, total 1,380. Chi Square analysis was used to show the association between *N. meningitidis* and the detection of a virus by calendar month. A significant association was only found in January with a p value of 0.017. However, no correction for multiple comparisons was made.

Results 4



Results 4 – Association between *N. meningitidis* density and viral rate.

All samples detected as *N. meningitidis* positive (n=102) were split into five density groups as shown, with the presence of a virus (overall corresponding virus detection rate) shown by the blue stars and line. Chi Square analysis showed no significant associations between these parameters, although numbers in the higher density carriage groups were small.

CONCLUSIONS

- The overall viral detection rate is low, but clear peaks of certain viruses at particular time points were identified.
- Rhinovirus is the most frequently detected virus with an overall rate of 6.7%.
- There is evidence of an association between the detection of any respiratory virus and of Rhinovirus and *N. meningitidis* in the samples assayed to date.
- In January the highest rate of carriage of *N. meningitidis* was observed. This was the only single month in which evidence of a relationship between the presence of a virus and *N. meningitidis* was found. In this month peaks in the rates of Influenza A (FluA) and RSV detection were also observed, although neither virus showed clear evidence of association with *N. meningitidis* carriage.
- In samples identified as *N.meningitidis* positive, no association was found between the *N.meningitidis* density level and the detection of a virus. However numbers of high density carriers shown are small.
- We will have greater power to explore these relationships further as more analysis is done on the remaining 4,076 pharyngeal swabs.
- The longitudinal design of this study will permit analysis as to whether antecedent viral infection predicts subsequent meningococcal carriage or carriage density.
- The results of this study will help to inform us whether current flu control strategies may impact upon meningococcal carriage, transmission and so disease rates .

REFERENCES

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