Biofilm formation of serotype 19 Streptococcus pneumoniae clinical isolates in relation to clinical isolate source, pH and Fe(III) supplementation

ABSTRACT

Aims: Streptococcus pneumoniae is one the world's foremost bacterial pathogens that cause massive global mortality and morbidity in young children and immunocompromised adults especially in developing countries. Biofilms have been increasingly recognized as an important prerequisite to disease. Individual S. pneumoniae strains differ markedly in their virulence phenotypes, but genetic heterogeneity has complicated attempts to identify any association between a given clonal lineage and propensity to cause a particular disease type. This study investigated serotype 19 S. pneumoniae from blood and ear isolates for biofilm formation capacity in relation to isolate source, pH and ferric oxide [Fe(III)] supplementation. Methodology and results: Viable count and density biofilm assays, microscopy and multi locus sequence typing (MLST) were applied to investigate biofilm formation capacity and genetic diversity of serotype 19 S. pneumoniae from blood and ear isolates. Generally, blood isolates were observed to produce more biofilms at both pH 7.4 and 6.8 compared to the ear isolates. The supplementation of Fe(III) was also found to support biofilm growth. Upon MLST typing of the isolates, marked differences in biofilm formation within the same sequence types (ST) of ST199 and ST177 was observed. This strongly indicated that strains within the same sequence type show differences in biofilm formation capacity. Conclusion, significance and impact of study: This study showed that despite belonging to the same serotype, serotype 19, S. pneumoniae blood and ear isolates showed high diversity in biofilm formation ability in relation to pH and Fe(III) supplementation. Additionally, pneumococcal isolates from sequence types ST199 and ST177 also gave rise to differences in biofilm formation ability within the same sequence type (ST). The diversity of biofilm formation within serotype 19 seen in this study is significant to further inform of vaccination strategies against pneumococcal infections, in that due to variations in biofilm formation capacity within the same ST. It is possible that within serotype 19 may show variable vaccination or drug treatment responses. This also indicates that the current treatment strategy which employs specific serotype selection as for PCV14 and PCV7 pneumococcal vaccines may not produce the desired therapeutic results.