IDEAS – “The cloak of invisibility. Streptococcal virulence characteristics”

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Over a century ago Sir William Osler proclaimed, that in the mortality bills Streptococcus pneumoniae has become ‘the captain of the men of death’. This statement is as true today as it was then, despite the development of vaccines and antibiotics. It is a leading cause of bacterial pneumonia, meningitis, and sepsis worldwide, and causes an annual ~ 1 million deaths in children younger than 5 years.
S. pneumoniae frequently resides in the nasopharynx of healthy individuals, and from there, it can transverse the human epithelial cells and cause severe invasive infections by migrating to other parts of the body (i.e. crossing the blood-brain barrier and cause meningitis). It is still poorly understood how and why S. pneumoniae switches from its commensal mode to its pathogenic life style, and it is the focus of our research to better understand this process.
One of the critical virulence factors of S. pneumoniae is its capsule. The pneumococcal capsule consists of polysaccharides (mostly repeats of simple sugars) excreted outside the cell wall. The capsule enables the pneumococci to avoid detection by the host immune system. Very interestingly, colonization of the nasopharynx requires less or no expression of capsule in order to expose the bacterial cell surface adhesions to promote binding to the human host cells. However, only pneumococci in intimate contact with the host cell membrane are devoid of capsule structure. Survival in different niches therefore requires tight control of capsule synthesis. Our goal is to understand how the pneumococcus can perform these extraordinary feats.