

*Streptococcus pneumoniae* is a major bacterial pathogen causing severe illnesses like meningitis, sepsis, and pneumonia, resulting in over 150 million cases and 1.9 million deaths annually [1]. While invasive diseases are serious, pneumococcal conjunctivitis and otitis media are even more common. Despite being part of the normal human nasopharyngeal flora, with carriage lasting days to months [2,3], and typically involving different capsular types in successive episodes, invasive disease can develop ...within weeks of carriage [2]. Recent research focuses on