Establishing models of RSV-pneumococcal co-infection to examine the effects of vitamin D on respiratory epithelial cell immune responses

Acute respiratory infections (ARI) are a leading cause of hospitalisation and preventable death among First Nations children. Vitamin D deficiency increases the risk of ARI and vitamin D has regulatory effects on immune responses. This study aims to determine the effects of vitamin D on respiratory immune responses to microorganisms which commonly causing ARIs. Understanding the mechanisms by which vitamin D exerts its prevention against respiratory infections could help define the utility of supplementation in clinical practice.

Abstract

Vitamin D (vitD) has diverse immunomodulatory functions. Its role during acute respiratory infections (ARI) in infants remains unclear. Paediatric ARIs have complex aetiology, with Respiratory Syncytial Virus (RSV) and *Streptococcus pneumoniae* (pneumococcus) often co-detected in the lungs. Increasing evidence demonstrates that primary viral respiratory infections can lead to opportunistic secondary infections, by common bacterial pathogens, such as pneumococcus, which have been associated with more severe disease outcomes. VitD has the potential to modulate respiratory immune responses, although evidence for its effect in response to pneumococcus or RSV-pneumococcus co-infection is limited.

The aim of this research is to characterise the effects of vitD on human respiratory epithelial cell responses to challenge with pneumococcus and RSV. Respiratory cell monolayers will be challenged with RSV, pneumococcus, or both, in the presence or absence of vitD (100nmol/L). Outcomes include adherence of pneumococcus to monolayers, measured by viable cell counts (CFU/mL); and cytokine/chemokine concentrations in culture supernatants, measured by ELISA. Bacterial adherence, and cytokine/chemokine will be compared between vitD groups.

Results show that infection with RSV enhances the attachment of pneumococcus to respiratory cells. Furthermore, preliminary experiments suggest that pre-treatment of RSV-infected cells with vitD suppresses the enhanced adherence of pneumococcus. Optimisation of vitD pre-treatment and cytokine/chemokine quantification assays are in progress.

This study is the first to explore if vitD beneficially modulates immune responses to pneumococcus and pneumococcus-RSV co-infections in the lung. It aims to better define the utility of vitD supplementation in clinical practice by examining the impact of vitD in the context of co-infections.