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Virus-specific airway immune response in early life is associated with childhood asthma

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Background: Virus-induced asthma-like symptoms in the first years of life have been associated with an increased risk of later asthma development, but the underlying mechanism is poorly understood.

Objectives: To investigate in situ pathogen-specific differences in upper airway immune mediator levels during episodes with asthma-like symptoms and the association with later development of asthma.

Methods: We included 493 asthma-like episodes in 277 children aged 0-4 years from the COPSAC2010 mother-child cohort. Levels of 18 different immune mediators were assessed in nasal epithelial lining fluid and were compared between children with and without viral PCR-identification (nasopharyngeal sample). Finally, we investigated whether the immune response was associated with the development of asthma.

Results: Viral detection during asthma-like symptoms were associated with upregulation of several Th1 and Treg immune mediators, including IFN-g, TNF-a, CCL4, CXCL10 and IL10, and downregulation of Th2 and Th17 immune mediators, including CCL13, CCL26 and CXCL8 ($p<0.05$). Increased levels of CCL4, CXCL8 ($p<0.05$) and lower IFN-g levels ($p<0.06$) during viral episodes were associated with asthma by age six years.

Conclusion: We demonstrated a virus-specific airway immune mediator profile during asthma-like episodes in early childhood. Furthermore, an aberrant immune profile during viral triggered episodes was associated with later asthma development, providing a potential mechanistic clue to the virus-asthma relationship.