Effects of Interleukin-31 on MUC5AC Gene Expression in Nasal Allergic Inflammation

Background: Interleukin-31 (IL-31) is a newly discovered T helper lymphocyte-derived cytokine that plays an important role in allergic inflammation. However, the effects of IL-31 on mucus production in nasal allergic inflammation are completely unknown.

Objective: To investigate the effects of IL-31 on mucin gene expression (MUC5AC) in patients with allergic rhinitis and in human airway epithelial cells.

Methods: Expression levels of IL-31 and IL-31 receptor A (IL-31RA) were evaluated in the inferior turbinate of patients with allergic rhinitis and non-allergic rhinitis with immunohistochemistry. IL-31-induced MUC5AC gene expression was measured with a MUC5AC luciferase reporter assay in human epithelial HM3-MUC5AC cells and quantified by quantitative real-time polymerase chain reaction in human airway epithelial A549 cells.

Results: IL-31RA was primarily localized in submucosal glands and upregulated in allergic rhinitis. IL-31 was detected in submucosal tissue and increased in allergic inflammation. MUC5AC gene expression was induced by IL-31 stimulation both in HM3-MUC5AC and A549 cells. Additionally, IL-31 cooperated with Th2 cytokines on MUC5AC gene expression in HM3-MUC5AC cells.

Conclusion: IL-31 and IL-31RA are upregulated in patients with allergic rhinitis, and induce MUC5AC gene expression in human airway epithelial cells. These findings suggest that IL-31 plays an important role in mucus overproduction in nasal allergic inflammation.