Role of Vitamin D deficiency in house dust mite (HDM) induced allergic asthma exacerbations.

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Introduction: Asthma is a common disease of the airway, affecting 7.3% of the general population. While the etiology of asthma is highly multifactorial, there is increasing evidence that vitamin D may play a role in the severity of allergic asthma via its effects on the innate and adaptive immune systems. We hypothesized that when exposed to allergen, vitamin D deficient mice will display an exacerbated disease phenotype compared to vitamin D supplemented mice.

Methods: Juvenile Balb/c mice were bred from either vitamin D supplemented or deficient parents to establish experimental groups. Baseline vitamin D serum levels were assessed via retro-orbital bleeding. Vitamin D deficient and supplemented mice were respectively maintained on a vitamin D deficient or supplemented water diet. Each group was divided into two subgroups and exposed to 9 intratracheal challenges by either saline or house dust mite (HDM) solutions. Airway hyperresponsiveness (AHR), bronchoalveolar lavage fluid (BALF) cytokines and cells and lung T-cell populations were assessed 24h after the last challenge.

Results: Vitamin D deficient mice had plasma 25(OH)VD levels below 25ng/ml whereas vitamin D supplemented mice had 25(OH)VD levels above 60ng/ml. Mice exposed to HDM while on a vitamin D deficient diet displayed significantly increased AHR in comparison to mice exposed to HDM while on a vitamin D supplemented diet ($p < 0.05$). The vitamin D deficient HDM group also showed increases in eosinophil and IL-13 BALF levels. Accordingly, increased accumulation of lung Th2 cells (CD44+/IL-13+) was observed in vitamin D deficient mice. An increase in IL-13+/IL-17A double-producing cells was also observed.

Conclusion: In summary, our results suggest that vitamin D deficiency promotes allergic airway responses, and that vitamin D supplementation would be beneficial for pediatric asthmatic patients.

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