

Airway Exposure to Disperse Azo Dyes Promotes Allergic Sensitization to Peanut in Mice

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Non-oral exposure to food allergens in indoor dust (ID) during early childhood is a risk factor for allergy development. Disperse azo dyes are a ubiquitous class of textile dyes that are readily shed into the living environment and have been identified in ID. Several disperse azo dyes are known contact sensitizers, but whether they can promote allergic responses to foods is unknown. We investigated if co-exposure to peanut allergen and Disperse Orange 25 (DO-25) through the respiratory tract led to peanut sensitization and allergy development in mice. Peanut sensitization was determined by measurement of peanut-specific IgE and IgG1 serum levels and the development of anaphylaxis following peanut challenge. Mechanistic studies were performed using knock-out mice or human cell lines. We found that airway co-exposure to peanut and DO-25 induced peanut-specific IgE production and the development of anaphylaxis following peanut challenge. Inhaled DO-25 stimulated the maturation of migratory lung conventional dendritic cells, which was associated with the induction of peanut-specific T helper 2 (Th2) and Th17 responses in draining lymph nodes. DO-25 triggered IL-1 β production by human THP-1 macrophages and *in vivo* in mouse lungs. The production of IL-1 β in the airways was necessary for peanut sensitization and allergy development. Together, these results suggest that the disperse dye DO-25 can function as an environmental adjuvant and promote peanut allergy development in a mouse model. Further studies are needed to determine if environmental exposure to disperse azo dyes is a risk factor for peanut allergy onset in children.