Nasal allergen challenge and environmental exposure chamber challenge: A randomized trial comparing clinical and biological responses to cat allergen

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Background: The direct-instillation nasal allergen challenge (NAC) and the environmental exposure chamber (EEC) are 2 methods of conducting controlled allergen provocations. The clinical and biological comparability of these methods has not been thoroughly investigated.

Objective: We sought to compare clinical and immunologic responses to cat allergen in NAC versus EEC.

Methods: Twenty-four participants were randomized to receive either NAC followed by a 2-day challenge in an EEC or a 2-day challenge in an EEC followed by NAC. Challenges were separated by 28-day washout periods. We measured total nasal symptom scores, peak nasal inspiratory flow, nasal (0-8 hours) and serum cytokines, serum antibodies, peripheral blood antigen-specific T lymphocytes, and gene expression in nasal scrapings. The primary outcome was the total nasal symptom score area under the curve for the first 3 hours after allergen exposure in NAC or after initiation of exposure in EEC.

Results: Both challenges increased IL-5 and IL-13 in nasal fluids and serum and resulted in altered nasal cell expression of gene modules related to mucosal biology and transcriptional regulation. Changes in gene modules, more so than cytokine measurements, showed significant associations with total nasal symptom score and peak nasal inspiratory flow. Overall, EEC exposure generated larger responses and more early terminations compared with NAC. Although the 2 challenges did not correlate in symptom magnitude or temporality, striking correlations were observed in cytokine levels.

Conclusions: Although clinical outcomes of NAC and EEC were temporally different and nonequivalent in magnitude, immunologic responses were similar. Selection of a particular allergen challenge method should depend on considerations of study objectives and cost. (J Allergy Clin Immunol 2020;145:1585-97.)

Key words: *Nasal allergen challenge, environmental exposure chamber, Fel d1, cat allergy, total nasal symptom score, peak nasal inspiratory flow, cat dander, epithelium*

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