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 d 1, cat allergy, total nasal symptom score, peak nasal inspiratory flow, cat dander, epithelium

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This research was performed as a project of the Immune Tolerance Network, an international clinical research consortium headquartered at the Benaroya Research Institute. This work was supported by the National Institute of Allergy and Infectious Diseases of the National Institutes of Health under Award Numbers U1AI109565, UM2AI117870, and HHSN272200800029C. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Disclosure of potential conflict of interest: P. Patel reports grants/pending grants and fees related to participation in review activities (such as data monitoring boards, statistical analysis, and end point committees) paid to his institution to support an element of the current study. A. M. Salapatek and P. Couroux report fees paid to their institution to support an element of the current study. S. Sanda reports grants/pending grants to his institution from the National Institutes of Health (NIH)/National Institute of Diabetes and Digestive and Kidney Diseases/National Institute of Allergy and Infectious Diseases (NIAID) during the conduct of the study. M. H. Shamji reports payments for lectures from ALK, ASIT Biotechsa, and Allergopharma outside of the submitted work; grants/pending grants from ALK, Regeneron, Merck, ASIT Biotech,sa, and the Immune Tolerance Network; and serving as a consultant for ASIT Biotech,sa outside of the submitted work. A. Lelic reports fees paid by Inflamx Research to support an element of the current study. A. Pina, W. W. Kwok, J. L. Johnson, and M. L. Sever report grants from the NIH/NIAID during the conduct of the study. E. James reports a grant/pending grant from Janssen outside of the submitted work. M. Larché reports a grant from the Immune Tolerance Network to support an element of the current study; is also a member of the scientific advisory board of Aravax Pty; has served as a consultant for Aravax Pty, Back Bay Life Sciences, Circassia Ltd, and Adiga Life Sciences outside of the submitted work; reports stock/stock options from Adiga Life Sciences and Circassia Pharmaceuticals PLC and travel/meeting expenses from Nestlé outside of the submitted work; and is also listed on patents (pending or issued) with Adiga Life Sciences outside of the submitted work. M. C. Altman reports a grant from the Immune Tolerance Network to support an element of the current study. The rest of the authors declare that they have no relevant conflicts of interest.

Received for publication October 15, 2019; revised February 25, 2020; accepted for publication February 27, 2020.

Available online March 10, 2020.

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The CrossMark symbol notifies online readers when updates have been made to the article such as errata or minor corrections 0091-6749/536.00

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https://doi.org/10.1016/j.jaci.2020.02.024