



Editorial

The exposome and allergy

Discovering and applying new insights to a classical clinical tool



I remember my first week as an allergy fellow in the mid-1980s, particularly for the feedback I got from my mentor, Dr Phil Lieberman, when I presented my first new allergic rhinitis patient to him. I dutifully presented the patient's chief complaints, history of present illness, previous medical and surgical history, and physical examination findings. If you know Dr Lieberman, he has a way of letting you know your presentation left much to be desired, but in a kind and affirming way. His major question was "what about an exposure history? If you are going to be a competent allergist, you need to know that all of your clinical and lab findings are not going to get you anywhere if you don't know whether specific exposures initiate or exacerbate the patient's symptoms." That lesson has never left me in more than 30 years of practice. Exposure history is fundamental to any accurate diagnosis of an immunoglobulin E-mediated illness.

The relatively new field of omics research encompasses the particular component of the study in terms of its sources and effects on normal and pathologic physiology.¹ For example, genomics is the study of the genome—the complete set of genes or genetic material present in an organism. Accordingly, exposomics describes the entire exposure history of an organism that may affect some or all the physiological as well as risk for disease.² This field originally emerged from toxicology, in which lifetime exposures to various toxins could be measured by sample various tissues. Measuring cumulative exposures to various environmental agents is a more formidable effort, because the accumulation of many environmental agents is not directly measurable. This is particularly true for most allergens.

The emphasis for this month's issue of the *Annals of Allergy, Asthma, and Immunology* is the relationship between various exposures and the development and exacerbation of allergic diseases. Although many exposures such as pollens, moldy areas, specific foods, and others are qualitatively related to allergy symptom exacerbations, quantitating individual exposure to specific allergens has proven to be challenging. This month, we have 2 articles that address a specific aspect of exposomics and allergy.

One of the review articles authored by Baluch et al³ addresses the challenges associated with exposomics research. Accurately quantitating lifelong allergenic exposures is a daunting challenge, because so few allergen exposures can be directly quantitated. The authors reviewed the research approach to identify exposure effects using birth cohorts. This approach allows the investigation of the relationships between specific exposures and childhood allergic diseases with associational studies. This includes such things as increased allergic sensitization rate in children whose mothers were

exposed to high levels of traffic-related pollution, prenatal home mold exposure, and subsequent wheezing and air freshener exposures leading to increased cough. These associational studies have used increasingly sophisticated molecular techniques aimed at ultimately being able to reliably quantitate lifetime allergen and other immunomodulating agents to comprehensively assess the impact of various exposures on disease manifestations.

The microbiome is another omics discipline that addresses the totality of microbial exposures and colonization and how it affects the host organism. DeVore et al⁴ evaluated the role of the skin microbiome on the development of allergic diseases. The normal commensurable skin microbial content is an important component of host protection against developing allergic diseases. When the skin microbiome is perturbed, the risk for allergy increases. Indeed, patients with atopic dermatitis often have altered skin microbiota.⁵ This review encompasses this and more and is very thought provoking when we consider all the ways that skin microbiota can be altered, such as the excessive use of antimicrobials as well as washing of the skin with various soaps, detergents, etcetera.

I believe this discipline will become increasingly relevant to both researchers and clinicians as we seek to increase our understanding of how specific exposures can lead to allergic sensitization in some but not all. In addition, technological advances may well allow the clinician of the future to be able to quantitate specific exposures in patients who are at risk for sensitization to develop and implement prophylactic strategies to prevent allergic diseases.

Gailen D. Marshall, Jr., MD, PhD
Division of Clinical Immunology and Allergy
Department of Medicine
The University of Mississippi Medical Center
Jackson, Mississippi
gmarshall@umc.edu

References

1. Virkud YV, Kelly RS, Wood C, Lasky-Su JA. The nuts and bolts of omics for the clinical allergist. *Ann Allergy Asthma Immunol*. 2019;123(6):558–563.
2. Niedzwiecki MM, Walker DI, Vermeulen R, Chadeau-Hyam M, Jones DP, Miller GW. The exposome: molecules to populations. *Annu Rev Pharmacol Toxicol*. 2019;6(59):107–127.
3. Baluch N, Gallant M, Ellis AK. Exposomal research in the context of birth cohorts: what have they taught us? [e-pub ahead of print]. *Ann Allergy Asthma Immunol*. <https://doi.org/10.1016/j.anai.2020.09.006>, accessed October 22, 2020.
4. DeVore SB, Gonzalez T, Sherenian MG, Herr AB, Hershey GKK. On the surface: skin microbial exposure contributes to allergic disease [e-pub ahead of print]. *Ann Allergy Asthma Immunol*. <https://doi.org/10.1016/j.anai.2020.08.025>, accessed October 22, 2020.
5. Lee SY, Lee E, Park YM, Hong SJ. Microbiome in the gut-skin axis in atopic dermatitis. *Allergy Asthma Immunol Res*. 2018;10:354–362.

Disclosures: The author has no conflicts of interest to report.

Funding: The author has no funding sources to report.

<https://doi.org/10.1016/j.anai.2020.10.005>

1081-1206/© 2020 American College of Allergy, Asthma & Immunology. Published by Elsevier Inc. All rights reserved.