A New Tool That Fingerprints Allergens in Homes to Individualize and Improve Patient Care

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Abstract
Rationale: Evaluate the clinical utility of a novel air-sampling device by fingerprinting allergen exposure in patient homes.

Methods: 22 allergy patients were recruited based on ownership of cats, dogs or both; given two triplicate air samplers, with instruction sheet and questionnaire; and asked to run devices in their bedrooms for 24 hours and 7 days. Patients returned devices and questionnaires. Capture cartridges were shipped to Indoor Biotechnologies for immunoassay analysis of common household allergens, molds and pollens. Values for each allergen were normalized as a ratio to the median value for the group (“exposure index”). Regression analysis was performed to correlate patient variables with allergen levels.

Results: Each home was found to have one unique allergen fingerprint, and profiles for each pair of times were internally consistent. Exposure index was consistent with patient reports on degree of pet bedroom access. Non-pet allergens: dust mite, mouse, pollens and molds were found in 13 cases. There were no positives value for the group (“exposure index”). Regression analysis was performed to the information in 17 cases: new patients, children and individuals on mid-course immunotherapy.

Review of fingerprints together with individual medical records showed actionable information in 17 cases: new patients, children and individuals on mid-course immunotherapy. Areas of utility included discovering unanticipated allergens; prioritizing triggers for environmental management; identifying individualized and targeted allergen avoidance activity; and improving patient compliance.

Conclusions: The capacity of patients to run simple allergen exposure tests in their own homes provides physicians with individualized data to make evidence-based decisions on patient management.

Question
Can we enable patients to monitor airborne allergens themselves in their own homes to assess their exposure to allergens for improved patient management?

Symptoms
IgE tests
Patient management

Exposure – the missing link???

Summary Conclusions
Here we will show for the first time that this simple, unobtrusive, device which patients can run in their own homes, provides airborne allergen profiles individualized to a person’s home. This information can potentially:

• Serve as an educational tool to improve patient compliance;
• Indicate and prioritize environmental controls to take and assess their efficacy;
• Support decisions related to targeted medication and immunotherapy.

This tool has the potential to fill in the information gap in the clinical picture for patient management and we believe this new information will drastically change the way we approach medicine.

Methods
22 patients from an allergy practice were provided with 2 devices. Devices were plugged into an outlet in patient bedrooms for 24 hours and 1 week.

Patient profiles

Efficacy of pet exclusion from the bedroom and corresponding allergen in air

Clear relationship between cat presence/absence and allergen presence/absence. Where present, value is a measure of exposure or efficacy of patient compliance. Patient 20 effectively excluded allergen. For others, exposure resulted from incomplete exclusion.

Efficacy of patient-reported remediation
Dust mites are ubiquitous. Given a sufficiently sensitive assay, they can be detected in all samples. Patient samples were assayed by Domestic DustMite ELISA with 100X sensitivity. This then provides a surrogate for allergen presence/absence.

Table indicates precautions where HEPA filter is used in the bedroom and/or dustmite remediation attempted with mattress covers. Data are sorted by the ELISA-based Domestic Mite assay. MARIA and Domestic Mite assays are consistent. The top 4 by ELISA are ones who take no precautions. However, however, both also take no precautions.

Table above suggests potential actions that would not have otherwise been considered. It is based on study data and information from medical records. The allergen profiles generated could potentially impact patient management for 17 out of 22 cases. Based on this limited study, believe everyone with symptoms could benefit from this approach.

Augmenting the medical record

The above table suggests potential actions that would not have otherwise been considered. It is based on study data and information from medical records. The allergen profiles generated could potentially impact patient management for 17 out of 22 cases. Based on this limited study, believe everyone with symptoms could benefit from this approach.

Clear relationship between dog presence/absence and allergen presence/absence. Where present, value is a measure of exposure or efficacy of patient compliance. Patients 5, 12, 16 were not successful in completely excluding allergen from bedroom.