Managing Allergies in Asthma

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Disclosure of Conflicts of Interest

- I have no financial conflicts of interest to disclose.

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Agenda

- Review the mechanism of the allergic reaction.
- Identify allergens important in asthma.
- Discuss diagnostic tests for allergic sensitivities.
- Consider available treatments, including
  - Allergen avoidance (“environmental modification”).
  - Allergen immunotherapy (“allergy shots”).

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Definitions/Mechanisms

Allergic reactions relevant to asthma:

Immunoglobulin E (IgE) antibodies made to specific inhaled proteins (allergens) activate immune cells (esp. mast cells) and trigger a series of chemical reactions leading to bronchial muscle contraction and airway wall inflammation (including eosinophils).

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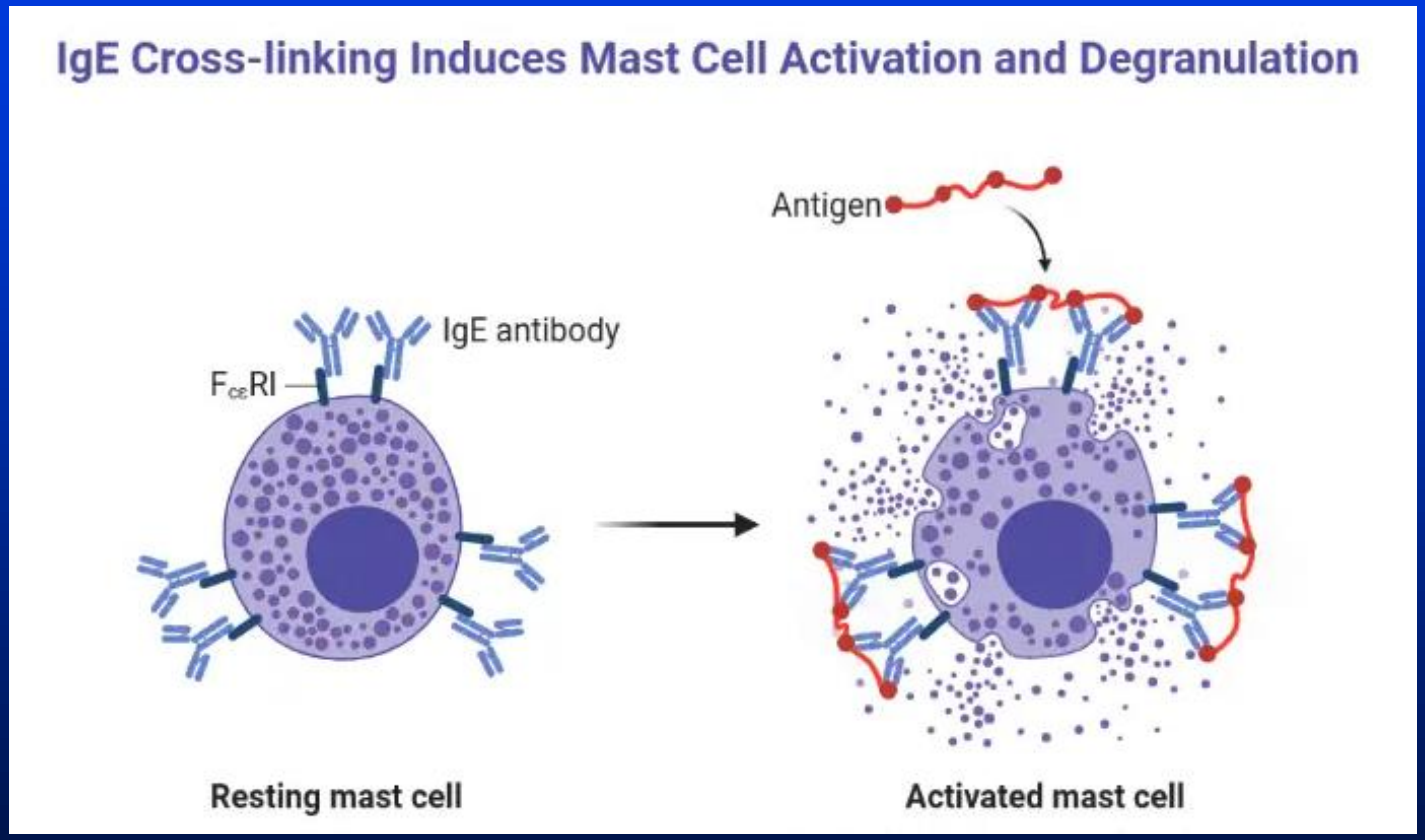
Allergen, IgE, and Mast Cell



Accessed Feb 2024: https://microbeonline.com/immunoglobulin-e-ige-antibodies/

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Definitions/Mechanisms (cont.)

Remember: we can measure the amount of IgE in the blood and the number of eosinophils (but we cannot measure the number of mast cells).

Mast cells are found in the skin, nose, eyes (conjunctivae), and bronchial tubes (as well as elsewhere).

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Definitions/Mechanisms (cont.)

Atopic march:

Tendency for young children with eczema (an allergic reaction in the skin, also called atopic dermatitis) to progress to allergic rhinitis (an allergic reaction in the nose, often called “hay fever”) and then to asthma (an allergic reaction in the bronchial tubes).

Child with eczema

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Definitions/Mechanisms (cont.)

Not everyone with asthma has identifiable allergy, BUT:

Most children have allergic asthma and probably at least 50% of adults have allergic asthma.

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Inhaled Allergens Important in Asthma

- Dust mites (microscopic insect-like creatures related to spiders)
- Animal dander ("skin flakes in an animal's fur or hair")
- Cockroach debris; mice and rats
- Mold (= fungal spores)
- Plant pollens (microscopic grains released from flowers of seed plants)

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Determining Who Has Allergies

1. Ask.

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Questions to Ask

- Dust mites: "Does your asthma worsen when you dust or vacuum?"
- Animal dander: "Do you have any pets at home?"
- Cockroach debris: "Have you seen cockroaches, mice, or rats at home?"
- Mold: "Do you smell/see mold in your kitchen, bathroom, or basement?"
- Plant pollens: "Does your asthma worsen in certain seasons?"

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Determining Who Has Allergies

2. Allergy tests.
    a. Blood tests

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Blood test: RAST

Able to measure in the blood not only the total amount of IgE antibody that the body is making, but also the amount of IgE to a specific allergen: "allergen-specific IgE test" (commonly called "RAST*" testing.

One can order a blood test for allergen-specific IgE to cat, dog, dust mite, cockroach, mouse, rat, etc.

*RAST = radioallergosorbent test

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Determining Who Has Allergies

2. Allergy tests.
    a. Blood tests
    b. **Skin tests**

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Allergy Skin Tests: Prick Test

A small, short needle is used to prick through a drop of allergen, introducing it to the superficial layer of the skin.

Multi-pronged applicator

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Allergy Skin Tests: Positive Result

In an allergic person, the allergen elicits a local hive and surrounding redness ("wheal and flare") within 15 minutes.

A positive reaction in the skin suggests that a similar allergic reaction may happen in the bronchial tubes if the same allergen is inhaled.

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Allergy Skin Tests vs. Blood Tests

Advantages of skin tests:

- Somewhat more sensitive. [functional assay]
- Immediate feedback: you can feel and see your allergy.

Advantages of blood tests:

- Allergy specialist appointment not needed.
- No need to stop certain medications (e.g., antihistamines) that block the skin reaction.

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Helping the Allergic Asthma Patient

Besides the usual medications to treat asthma, therapeutic options for the allergic patient include:

1. Allergen avoidance/reduction
2. Allergen immunotherapy (“allergy shots”)

We will emphasize the former, because that is where you can help the most.

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Allergen Avoidance: Dust Mites

- Dust mites feed on sloughed human (and animal) skin; they especially accumulate in bedding and carpeting.
- They thrive best when humidity is relatively high.

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Dust Mites: What Can Be Done?

- Allergen-proof wraps for mattress and pillows; wash sheets in hot water.
- Minimal or no carpeting in bedroom.
- Maintain low humidity (ideally <40%).
- Use vacuum cleaner with built-in HEPA filter.
- Stand-alone room-air HEPA filter not effective (dust mite allergen settles from air too quickly).

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Allergen Avoidance: Furry Animals

- Humans can make allergic reactions to all furry animals.
- In general, cats > dogs trigger allergic asthma.
- One can have allergy to proteins in animal urine and saliva as well as dander.

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Allergen Avoidance: Cats and Dogs

- Cat dander is particularly “sticky.” It can adhere to fabric and carried on clothing and can be detected in vacuumed dust for up to 6 months after the cat has been removed from the home.
- Some people react to certain breeds of dogs more than others, but there is no such thing as a “non-allergenic” dog.

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Cats and Dogs: What Can Be Done?

- Don’t acquire the pet! Find a new home for the pet.
- Keep the pet out of the bedroom/off the bed.
- Bathe a dog (bathing cats is dangerous!).
- Room air HEPA* filters.

*HEPA = high-efficiency particulate air

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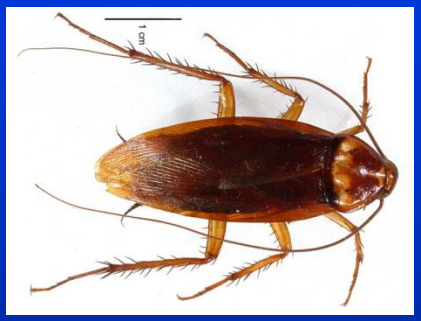
Allergen Avoidance: Pests

- Cockroaches, mice, and rats: survive on crumbs, small amounts of water.
- They hide in cracks, crevices, and clutter.
- They can be particularly hard to eradicate in multi-family dwellings.



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Pests: What Can Be Done?

- Recommended approach:
  "Integrated Pest Management"
  - Eliminate sources of food and water.
  - Seal entry points.
  - Remove cluttered hideaways.
  - Various baits and traps.
- Professional extermination services.

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Allergen Avoidance: Indoor Mold

- Mold (a type of fungus) grows in moist, water-soaked areas: bathroom, kitchen, basement, water leaks.
- It reproduces by shedding spores into the air – to which people can be allergic (e.g., the mold called *aspergillus*).
- "Iceberg" concept: there is typically much more mold growth than is seen superficially.

Aspergillus mold spores

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Indoor Mold: What Can Be Done?

- Clear superficial mold with dilute bleach (1 part bleach to 10 parts water).
- Maintain low humidity with dehumidifier.
- Professional mold remediation.
- Move out.

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Allergen Avoidance: Plant Pollens

- Pollen consists of tiny granules released by flowering/cone-bearing plants.
- In the Northeast:
  - Trees pollinate in Spring.
  - Grasses pollinate mid-summer.
  - Weeds pollinate in the early Fall.
  - Outdoor molds: Spring through Fall.
- Pollens often trigger nasal and eye symptoms.

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Plant Pollens: What Can Be Done?

- Indoors: Keep windows closed with air conditioning to filter the air.
- Outdoors: Exercise in the early morning; dry, warm, windy days are the worst.
- Bathe/shower and change clothes when coming in from the outside.

Note: Major lifestyle changes are only worthwhile if the severity of symptoms warrants them.

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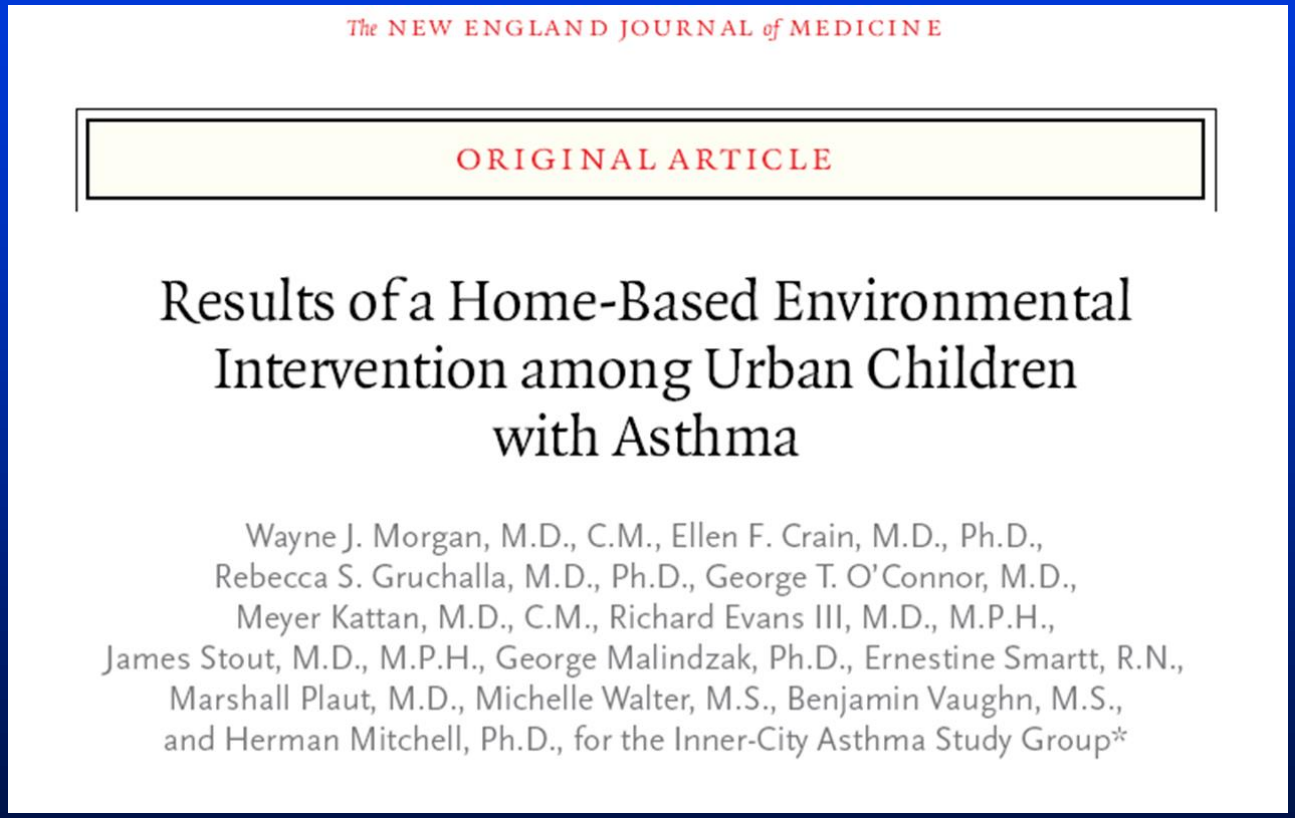
Do "Environmental Modifications" Really Help Asthma?



The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Results of a Home-Based Environmental Intervention among Urban Children with Asthma

Wayne J. Morgan, M.D., C.M., Ellen F. Crain, M.D., Ph.D., Rebecca S. Gruchalla, M.D., Ph.D., George T. O'Connor, M.D., Meyer Kattan, M.D., C.M., Richard Evans III, M.D., M.P.H., James Stout, M.D., M.P.H., George Malindzak, Ph.D., Ernestine Smartt, R.N., Marshall Plaut, M.D., Michelle Walter, M.S., Benjamin Vaughn, M.S., and Herman Mitchell, Ph.D., for the Inner-City Asthma Study Group*

Morgan, WJ et al. *N Engl J Med* 2004;351:1068-80.

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Study Results

- At the end of 1 year, children in the intervention group had significantly fewer days with asthma symptoms than children in the control group.
- The benefit was sustained for the second year of follow-up, even though families no longer received environmental control coaching during the second year.

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The Environmental Interventions

- 6 educational modules:
  - dust mites; cigarette smoking; pets; cockroaches; rodents; and mold.
- Equipment and support:
  - Allergen-impermeable bed wraps
  - HEPA-filtered vacuum cleaner
  - HEPA room air filters
  - Cockroach extermination

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Value of the Asthma "Home Visit"

- Can identify allergen/irritant exposures ("asthma triggers") not recognized (or ignored or denied) by the patient/caregiver.
- Can assess patient's/family's capacity to make changes.
- Can enlist help from governmental or non-profit organizations to make home improvements.

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Allergen Immunotherapy: The Concept

- Exposure to slowly increasing amounts of allergen will lead to tolerance of the allergen; that is, no reaction or milder reactions.
- Over time, the immune system comes to make different antibody responses to the allergen rather than IgE.

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Allergen Immunotherapy: The Practice

- Begins with weekly subcutaneous injections of minute amounts of the allergen(s).
- Over time the dose is gradually increased and after about 6 months, the interval spaced to monthly.
- Treatment duration is typically 3-5 years.

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Allergen Immunotherapy: The Benefits

- Better asthma control/fewer asthma flares, especially in the allergic patient who cannot avoid allergen exposure.
- Can interrupt the “atopic march” – prevent the development of asthma in the allergic child.
- Possible resolution of allergic sensitivity (“remission”) after several years of treatment.
  - In most patients, effect wanes after stopping

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Allergen Immunotherapy: The Risk

- Asthmatic (or anaphylactic) reaction to the allergen.
- Change in allergen preparation from one manufacturer to another can lead to variable dose administered.
- Not recommended in patients with severe asthma.

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Other Therapies

- The injectable monoclonal antibody, omalizumab (*Xolair*), is approved for the treatment of severe allergic asthma in patients with an elevated total IgE level in their blood and evidence for allergic sensitization to ≥1 perennial (i.e., not seasonal) allergen (by skin test or blood test).
- Antihistamines are effective for nasal (allergic rhinitis) and eye (allergic conjunctivitis) symptoms, but *not* asthma.

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Conclusions

- Inhaled allergens are an important trigger in many patients with asthma.
- Allergen avoidance/mitigation is often possible and helps to improve asthma control.
- The home visit can aid in assessing exposure to asthma triggers and provide an opportunity for on-site asthma education.
- Allergen immunotherapy ("allergy shots") under the guidance of an allergist may be helpful in some allergic patients.

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