Assessing Allergic Sensitivities and Allergen Exposures

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Objectives

- Review the relationship between allergy and asthma;
- Identify common allergens important in stimulating asthmatic inflammation;
Objectives (cont.)

• Consider methods to reduce exposure to common aeroallergens;
• Examine evidence for the clinical benefits derived from environmental modifications to reduce allergen exposure in asthma.

The Facts

• Exposure to allergens has been related to disease severity in allergic rhinitis and asthma.
The Evidence

Three types of studies:

1. The epidemiologic association between the prevalence of disease and sensitization to particular allergens.
2. The delivery of allergen in the laboratory provokes the clinical condition.
3. The avoidance of allergens has been shown to result in fewer symptoms of disease.

Association Between Asthma and Sensitization to Allergens

• Genetically susceptible populations who are sensitized to house-dust mite, animal dander, cockroach, and *Alternaria* are at risk for developing asthma.
• Sensitization to pollens carries less risk for asthma.
Identification of Inhalant Allergen Exposure

- Determine relevant exposures
- Assess sensitivity to:
  - Seasonal allergens by history
  - Perennial allergens by history, and when necessary, skin or in vitro testing
- Assess significance of positive tests in context of medical history

The Allergens

Seasonal
- Tree Pollen
- Grass Pollen
- Weed Pollen
- Mold Spores (outdoor)

Perennial
- Dust Mites
- Animal Dander
- Cockroach
- Mold spores (indoor)

Occupational
- Latex proteins
Seasonal Allergens

Tree pollen (March-June)

Oak Tree Pollen Grains
Seasonal Allergens

Grass pollen (June-July)

Weed pollen (Aug-Oct)
Seasonal Allergens

Mold Spores (Mar-Nov)

Perennial Allergens: Dust Mites

Microscopic, 0.3mm in length
Eight-legged creatures (arachnids)
Allergens are present in the fecal pellets (Der p 1)
Bedding, woven fabrics are the usual habitat
Requirement for high humidity
**Perennial Allergens: Cat**

- Main allergen is produced by the sweat glands (sebaceous glands) in the skin (*Fel d 1*)
- Found to a lesser degree in the fur, saliva, and urine
- The allergen
  - clings tenaciously to carpets and furniture
  - can linger in homes for months
  - can serve as a reservoir from which allergens can become airborne when disturbed
  - is lightweight and can float in the air for hours
- People can also carry the cat allergen around on clothes, thereby spreading it to work, school, or a friend’s house

**Perennial Allergens: Dog**

- The allergen is present in dog dander, not fur
- It makes little difference whether the dog has long or short hair (i.e., you can be as allergic to a Chihuahua as you can to a sheep dog)
- Small dogs can also cause as many allergy symptoms as large dogs
Perennial Allergens: Dog

- There is no evidence that one species is less allergy provoking than another one
- No breed is non-allergenic; even poodles and wheaten terriers (often thought to be hypoallergenic) will likely induce allergy symptoms in sensitive individuals upon continuous exposure

Perennial Allergens: Cockroach

- Cockroach allergens come from
  - Shed outer coverings (cuticles),
  - Saliva
  - Eggs
  - Feces
- Cockroach allergens can be found in house dust and bedding
**Perennial Allergens: Cockroach**

- Food sources for the cockroach include various foods and their crumbs, paints, wallpaper pastes, and book bindings.
- Water sources may include sweating pipes, standing water, and any moist items or areas.
- Hiding places include cracks, crevices, cardboard boxes, newspapers, and grocery bags.

**Allergen Control**

What is recommended?
Reducing Pollen Exposure

• Avoid the outdoors between 5-10 AM and also on dry, hot, windy days.
• The best time to be outside is in the late afternoon or after a rain as pollen levels are lower during these times.
• After being outdoors, it is best to shower and change clothing as pollen can adhere to clothing, skin, and hair.
• An automatic clothes dryer should be used rather than hanging clothes outside.

Reducing Pollen Exposure

• Pets can transport pollen into the home.
• The windows in the home and car should be kept closed.
• An air conditioner, not fans, should be used to cool the air.
• HEPA air filtration removes pollen that has entered the home.
Reducing House-Dust Mite Exposure

- The most effective avoidance measure is to cover the mattress, duvet, and pillows with covers that are impermeable to mite allergens.
- Mites and mite allergens can accumulate on exposed bedding, and this should be washed in a hot cycle (above 55° C) to kill the mites.
- Low-temperature washing removes allergen, but dust mites can survive it.

Reducing House-Dust Mite Exposure

- Carpets and sofas represent a large reservoir of mite allergens
- Removal of carpets and the use of wooden or linoleum floor coverings
- Replacement of fabric-covered seating with leather or vinyl coverings
Reducing House-Dust Mite Exposure

- Replacement of curtains with blinds
- Intensive vacuuming will remove large amounts of dust from the carpets but inadequate exhaust filtration may actually increase airborne mite allergen levels.

Acaricides

- Benzyl benzoate, pirimiphos methyl
- Applying to carpets is time-consuming
- Repeated applications required every 2 to 3 months
- Penetration deep into carpet and soft furnishings is difficult
- Generally no longer recommended
Reducing House-Dust Mite Exposure

**Tannic Acid**

- Tannic acid is a protein-denaturing substance
- High levels of protein in dust can block its effects
- Tannic acid only destroys allergen and does not kill mites
- It can be used in conjunction with other acaricides such as benzyl benzoate

Reducing House-Dust Mite Exposure

**Controlling humidity**

- Mites require high levels of humidity to survive.
- Central mechanical ventilation heat recovery units can reduce indoor humidity in houses where outdoor humidity is low and home insulation is good.
- However, such units have not proven effective in homes in mild, humid climates where outdoor humidity is very high or where homes are relatively poorly insulated.
Reducing Animal Dander Exposure

- Removal of the animal is the most effective measure.
- Even after permanent removal, it can take many months for the allergen levels to fall.
- Airborne pet allergens increase five-fold when the pet is in a room.

Reducing Animal Dander Exposure

- Many pet-allergic individuals keep their pets
- Kept out of bedrooms and living room areas
- High efficiency particulate air (HEPA) filter air cleaners can reduce the airborne concentrations of cat and dog allergens in homes with pets.
Reducing Animal Dander Exposure

The effect of cat washing on Fel d 1 levels

- Most studies suggest that the effects are transient.
- Only modest reductions in allergen are achieved.
- It is unlikely that the short-term and modest reduction in the airborne allergen would significantly improve asthma control in sensitized individuals.

Reducing Cockroach Exposure

- Both physical and chemical procedures can be used to control cockroach populations in infested houses.
- Pesticides are preferably, used in gel or bait form.
- Successful treatments will provide significant reduction in 2 weeks, max. effect within 1 month, and will keep populations under control for 3 to 6 months.
Reducing Cockroach Exposure

- Extensive cleaning after cockroach eradication is necessary to remove allergen.
- Field trials have shown extermination to be much easier than removal of allergen.

Reducing Mold Exposure

- Closing doors and windows and using air conditioning for cooling can reduce spore infiltration from outside.
- HEPA filters can be used to remove particles from the air.
- Contaminated heating, ventilation, or air-conditioning systems can circulate spores through a building.
Reducing Mold Exposure

- Indoor fungal growth is dependent on moisture; growth can be reduced or stopped by controlling moisture.
- Increase bathroom and kitchen ventilation.
- Contaminated surfaces should be washed with 5%-bleach solution and detergent.

Reducing Irritant Exposure

Tobacco Smoke

- Advise patient and others in home who smoke to stop or to smoke outside.
- Discuss ways to reduce exposure from day care, workplace, and other settings.
Reducing Irritant Exposure

Indoor/Outdoor Pollutants and Irritants

• Discuss ways to reduce exposure to
  ▪ Wood-burning stoves or fireplaces
  ▪ Non-vented stoves or heaters
  ▪ Outdoor pollutants (e.g., avoid outdoor exercise during high-pollution days)
  ▪ Other irritants (e.g., perfumes, cleaning agents, sprays)

The Environmental Intervention

- 6 educational modules: dust mites; cigarette smoking; pets; cockroaches; rodents; and mold.

- Equipment and support:
  - Allergen-impermeable bed wraps
  - HEPA-filtered vacuum cleaners
  - HEPA room air filter
  - Cockroach extermination

Mean Maximal Number of Days with Symptoms for Every Two-Week Period before a Follow-up Assessment during the Two Years of the Study


**Summary**

- There is good evidence for the link between allergen exposure and sensitization to these allergens, and between sensitization and the development of asthma.
- Effective allergen avoidance measures in the home can make a difference to the severity of established asthma.
Summary

• The questions become:
  How to identify suitable patients who may benefit from such interventions and whether a substantial reduction in allergen levels can be achieved by measures which are practical and flexible to suit the individual's needs.