The Increasing Importance of Allergies in Asthma

Environmental Considerations

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Disclosures

• Medical Advisory Boards
  - Baxter Biologics
  - CSL Behring
  - GlaxoSmithKline
  - Merck
  - Novartis

• Grant – CSL Behring
• Clinical trials – Janssen
• Data safety monitoring board – Boston Scientific
Objectives

• Evaluate factors increasing the allergic burden in respiratory disease
• Highlight the impact of concomitant allergic rhinitis and asthma
Does Air Pollution Increase the Effect of Aeroallergens on Hospitalization for Asthma?

Sabit Cakmak, Robert E Dales and Frances Coates
Health Canada Biostatistics and Epidemiology, Univ. Ottawa Depts. Medicine and Epidemiology and Aerobiology Research Laboratories

J Allergy Clin Immunol 2012; 129: 228-31
Does Air Pollution Increase the Effect of Aeroallergens on Hospitalization for Asthma?

Objective: To compare the effects of ambient aeroallergens on hospitalization for asthma between high and low air pollution days in 11 large Canadian cities


3 data sets used in analysis:

**Daily admissions for asthma** (principal reason for hospitalization) – ICD 493 or J45 and J46
Does Air Pollution Increase the Effect of Aeroallergens on Hospitalization for Asthma?

**Aeroallergen** data collected by Aerobiology Research Labs
- 24 h collections using rotational impaction method
- Periods of allergen defined as measurable pollen / mold spores on 5 of 7 days initially and completed when none measurable for 7 days

Trees
Grasses
Weeds
Basidiomycetes
Ascomycetes
Deuteromycetes
Does Air Pollution Increase the Effect of Aeroallergens on Hospitalization for Asthma?

**Air pollution** data supplied by Environment Canada and the National Air Pollution Monitoring System

- 24 h concentrations of:
  - Sulfur dioxide
  - Nitrogen dioxide
  - Carbon monoxide
  - Particulates - PM 10 and PM 2.5 µm
  - Ozone (1 h maximum daily concentration)
Aeroallergens in Canadian Cities

The graph illustrates the airborne concentrations of various allergens in Canadian cities. The x-axis represents different types of allergens, while the y-axis for the left side shows pollen counts (per m$^3$) and the y-axis for the right side shows spore concentrations (per m$^3$). The allergens include weeds, trees, grass, basidio, ascom, and deutro. The graph is marked to highlight Vancouver.
Human health effects of climate change?

Red alder (Alnus rubra) male catkins and alder pollen
Air Pollutants in 11 Canadian Cities

FIG 1. Air pollution concentrations for 11 Canadian cities between April 1, 1994, and March 31, 2007. CO, Carbon monoxide; NO2, nitrogen dioxide; O3, ozone; SO2, sulfur dioxide. ●, Calgary; ○, Edmonton; ▼, Halifax; △, Hamilton; ■, London; □, Ottawa; ♦, St John; ◇, Toronto; ▲, Vancouver; ▼, Windsor; ●, Winnipeg.
Does Air Pollution Increase the Effect of Aeroallergens on Hospitalization for Asthma?

- Average # daily hospitalizations for asthma 28.67
- Significant ↑ with each of the aeroallergens
- Comparing RR of asthma hospitalizations for an allergen interquartile range on days with low air pollutant vs. high air pollutant concentrations.

Significant ↑ noted for:
- Trees: $PM_{2.5}$
- Weeds: $PM_{10}$
- Molds: $PM_{10}$, CO, NO$_2$, SO$_2$
Birch Pollen obtained from:

Rural area

Urban area

Diesel Exhaust Particles

- ↑ local IgE production
- ↑ Th$_2$ cytokines e.g. IL-4, IL-5, IL-13
- ↓ IFN$_\gamma$
- ↑ Antigen-specific IgE 16-fold

A.E. Nel et al. JACI 102:539,19
Pollen Counts Correlate with CO$_2$ Levels and Temperature

Allergic Rhinitis (AR)

- Affects 10-25% of population
- Often associated with asthma
- Impacts quality of life, sleep, work
- National and international (ARIA) guidelines available
Severity of Rhinitis Increases Risk of Developing Asthma

“United Airway”

- Cohort of over 18,000 patients treated for asthma
- Simultaneous treatment of their allergic rhinitis with nasal steroids and/or antihistamine significantly decreased their ER visits and hospitalizations for asthma
- Allergic rhinitis *not* treated - rate 9.6%
- Intermittent treatment - rate 6%
- Regular treatment - rate 3.3%

Ronberg E. et al., *JACI* 1998;101;S236:A980
Impact of Nasal Congestion in Respondents With Allergic Rhinitis: Survey Results

Patient Survey Results (n=2002)

- Most likely to result in physician visit: 54% (Children) to 69% (Adults)
- Most bothersome symptom: 58% (Children) to 48% (Adults)
- Affected at work/school: 61% (Children) to 59% (Adults)

Data on file, Schering Corporation, Kenilworth, NJ.
Allergic Rhinitis Impairs Learning in Pediatric Patients

Mean Composite Learning Scores in Children 10-12 Years of Age At 2 Weeks

$P=0.007$

Nasal Congestion Impacts Respondents’ Sleep: Survey Results

Data on file, Schering Corporation, Kenilworth, NJ.
Allergic Rhinitis Increases Incidence of Sleep Apnea

Conclusions:

- Changes in environment increase amount of allergen, alter allergenicity of pollens and increase prevalence of atopy (Urbanization with ↑ temperature, CO₂ and particulate pollutants)
- Allergic rhinitis is a significant co-morbidity of asthma
- Treatment of allergic rhinitis improves asthma control
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