

Environmental Management of Pediatric Asthma

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Children's Environmental Health
Excellence Award



National Environmental
Education Foundation

Knowledge to live by

Asthma

- **300 million people worldwide suffer from asthma**
- **Worldwide deaths due to asthma have reached 255,000 annually**
- **Global economic costs associated with asthma are estimated to exceed those of TB and HIV/AIDS combined**

Pediatric Asthma

- **Most common chronic disease among children**
- **6.8 million US children**
- **In the WHO European Region, an average of over 10% of children suffer from asthmatic symptoms**

World Health Organization, 2005

National Center for Health Statistics, 2007

Guidelines for the Diagnosis and Management of Asthma

Four Components of Asthma Care

- 1) Assessing and Monitoring Asthma Severity and Asthma Control**
- 2) Education for a Partnership in Care**
- 3) Control of Environmental Factors**
- 4) Medications**

Global Strategy for Asthma Management and Prevention

Four Components of Asthma Care

- 1) Develop Patient/Family/Doctor Partnership**
- 2) Identify and Reduce Exposure to Risk Factors - Environmental Triggers**
- 3) Assess, Treat, and Monitor Asthma**
- 4) Manage Exacerbations**

Environmental Triggers

- **Indoor**
 - Animal Dander
 - Dust Mites
 - Roaches
 - Mold
 - Solvents
 - Second Hand Smoke
- **Outdoor Air Pollution**
 - Particulate Matter
 - Ozone
 - VOCs (Solvents)
 - Metals
 - Chromium, Cadmium, Cobalt, Nickel
 - Sulfur and Nitrogen Dioxides
 - Carbon Monoxide
 - Outdoor Allergens

Environmental Management of Pediatric Asthma: Guidelines for Health Care Providers



**Released by the National Environmental Education
Foundation in August 2005**

<http://www.neefusa.org/health/asthma/index.htm>

Overview

- **Founded upon NAEPP Guidelines**
- **To be used in conjunction with its clinical and pharmacological components**
- **Developed for providers of pediatric primary care: pediatricians, family physicians, internists, pediatric nurse practitioners, pediatric nurses, and physician assistants**
- **Authored by expert steering committee and peer-reviewed**
- **Built on scientific literature and best current practices**



Overview

- **Endorsed by:**
 - Ambulatory Pediatric Association**
 - American Association of Colleges of Nursing**
 - Association of Faculties of Pediatric Nurse Practitioners**
- **Supported by:**
 - American Academy of Pediatrics**
 - National Association of Pediatric Nurse Practitioners**



Overview

- Developed for children 0-18 years, already diagnosed with asthma
- Applies to all settings where children spend time
 - Outdoors
 - Homes, schools, and daycare centers
 - Cars and school buses
 - Camps, relatives'/friends' homes, other recreational or housing settings
 - Occupational environments
- Available online, in hard copy, and on CD-ROM



Components

- Educational competencies
- Environmental history form
- Environmental intervention guidelines
- Sample Patient Flyers and References
- Strategies for integrating into health care provider curricula and clinical practice
- Supplemented by online list of resources with web-links



Environmental History Form (P. 17)

- Quick intake form
- Available online as PDF and Word document
- Copy into electronic medical record template
- Questions in yes/no format
 - Follow up yes answer with in-depth questions on Intervention Guidelines Fact Sheets

Environmental History Form for Pediatric Asthma Patient

Specify that questions related to the child's home also apply to other indoor environments where the child spends time, including school, daycare, car, school bus, work, and recreational facilities.

	Follow up/ Notes
Is your child's asthma worse at night?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Is your child's asthma worse at specific locations? If so, where?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Is your child's asthma worse during a particular season? If so, which one?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Is your child's asthma worse with a particular change in climate? If so, which?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Can you identify any specific trigger(s) that makes your child's asthma worse? If so, what?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Have you noticed whether dust exposure makes your child's asthma worse?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Does your child sleep with stuffed animals?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Is there wall-to-wall carpet in your child's bedroom?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Have you used any means for dust mite control? If so, which ones?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Do you have any furry pets?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Do you see evidence of rats or mice in your home weekly?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Do you see cockroaches in your home daily?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Do any family members, caregivers or friends smoke?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Does this person(s) have an interest or desire to quit?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Does your child/teenager smoke?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Do you see or smell mold/mildew in your home?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Is there evidence of water damage in your home?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Do you use a humidifier or swamp cooler?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Have you had new carpets, paint, floor refinishing, or other changes at your house in the past year?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Does your child or another family member have a hobby that uses materials that are toxic or give off fumes?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Has outdoor air pollution ever made your child's asthma worse?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Does your child limit outdoor activities during a Code Orange or Code Red air quality alert for ozone or particle pollution?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Do you use a wood burning fireplace or stove?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Do you use unvented appliances such as a gas stove for heating your home?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
Does your child have contact with other irritants (e.g., perfumes, cleaning agents, or sprays)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not sure
What other concerns do you have regarding your child's asthma that have not yet been discussed?	
<hr/> <hr/>	

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Intervention Guidelines

- **Two-visit concept**
- **Separate fact sheets:**
 - **Dust Mites**
 - **Animal Allergen**
 - **Cockroach Allergen**
 - **Mold/Mildew**
 - **Environmental Tobacco Smoke**
 - **Air Pollution**



Intervention Guidelines

- Short introduction
- In-depth questions
 - Explore exposure sources
 - Parents' current practices
- Intervention recommendations
- Sample patient handouts to download
- Additional resources on initiative's website



Dust Mite Control

- Danish study in children (n= 60)
 - Allergen impermeable mattress covers
- Significant reduction in dust mite concentration for intervention group
- Significant decrease in effective dose of inhaled steroid

Halken S, et al. *J Allergy Clin Immunol* 2003;112:220.

Dust Mites P. 20

Simple, but Effective Interventions

- Encase all pillows and mattresses of the beds the child sleeps on with allergen impermeable encasings www.nationalallergy.com
- Wash bedding weekly to remove allergen
- Wash in HOT water (130°F) to kill mites
- Results generally seen in 1 month
- Avoid ozone generators and some ionic air cleaners that produce ozone



Dust Mites

P. 20

Other Interventions

- Synthetic materials in bedding
 - Remove or wash and dry stuffed toys weekly
- 
- Vacuum with a HEPA-filtered vacuum cleaner
 - Avoid humidifiers
 - Additional suggestions in guidelines

Cats Stick with You



- Classrooms with many (>25% of class) cat owners had cat allergen than other classrooms
- Allergen levels in non-cat owners' clothes increased after one day in that classroom
- Exposure through school can exacerbate asthma in sensitized children even if they don't own a cat

Almqvist C. J Allergy Clin Immunol 1999;103:1002-4.

Almqvist C et al. Am J Respir Crit Care Med 2001;163:694-8.

Control of Cat Ag

- RCT with 35 cat-allergic (and owner) subjects
 - HEPA room air cleaner
 - Mattress and pillow covers
 - Cat exclusion from bedroom
- Reduced airborne cat allergen levels
- No effect on disease activity
- In cat allergic individuals with asthma, intranasal steroids were effective

Wood RA *Am J Respir Crit Care Med* 1998;158:115-20.

Wood RA, Eggleston PA. *Am J Respir Crit Care Med* 1995;15:315-20.

Animal Allergens P. 21

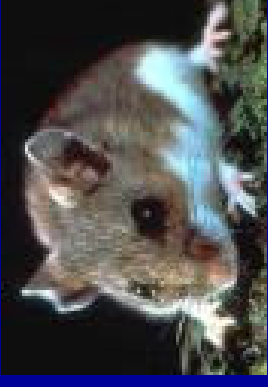
Effective Interventions



- Find a new home for indoor pets
- Keep pet outside
- If these aren't possible...
 - Similar interventions as with dust mites
 - Encasings, HEPA air cleaner, HEPA Vacuum,
 - Keep pet out of bedroom
- Takes 24-30 weeks before allergen levels reach those of non-cat households¹

Wood RA et al. *J Allergy Clin Immunol* 1989;83:730-4.

Mouse Ag



- **18 homes of children with persistent asthma and positive mouse allergen**
- **Integrated pest management**
 - Filled holes
 - Vacuum and cleaning
 - Low-toxicity pesticides and traps
- **Mouse allergen levels significantly reduced during 5 month period**

Phipatanakul W et al. Ann Allergy Asthma Immunol 2004;92:420-5.

Cockroach Ag Control



- Occupant education, professional cleaning
- Insecticide bait
- Substantial reductions in cockroach allergy levels achieved¹
- Second Study– Professional cleaning
 - Bait traps with insecticide
 - Bait traps without insecticide
 - Significant reduction in cockroach allergen²

Arbes SJ et al. *J Allergy Clin Immunol* 2003;112:339-45.
McConnell R et al. *Ann Allergy Asthma Immunol* 2003;91:546-52.

Cockroach Allergen P. 22

Do's and Don'ts of Roach Control

- **Integrated pest management (IPM)**
 - Least toxic methods first
- **Clean up food/spills**
- **Food and trash storage in closed containers**
- **Fix water leaks**
- **Clean counter tops daily**
- **Boric acid**
- **Bait stations/ gels**
- **Allergen impermeable covers**
- **Don't!!**
 - **Spray liquids in house, especially play and sleep space**
 - **Use industrial strength pesticide sprays that require dilution**



Mold and Asthma Symptoms

- Cross sectional study of 2568 children 1 - 6 years old in Helsinki, Finland
- Exposures included histories of water damage, presence of moisture and visible molds and perceived mold odor at home
- Outcomes included persistent cough, phlegm and wheezing, persistent nasal congestion and excretion during the past 12 months and current asthma
- *Mold odor during the past year and water damage over a year ago had the strongest association with the respiratory symptoms.*

Mold and Mildew P. 23

Interventions

- **Ways to control moisture and/or decrease humidity to < 50%**
 - **Dehumidifier or central air conditioner**
 - **Do not use a humidifier**
 - **Vent bathrooms/clothes dryers to outside**
 - **Use exhaust fan in bathroom/ other damp areas**
 - **Check faucets and pipes for leaks and repair**

Mold and Mildew

Cleaning up the Mess



- Items too moldy to clean should be discarded
- An area larger than 3 ft x 3 ft should be professionally cleaned
- Chlorine solution 1:10 with water is acceptable for smaller areas
 - Don't mix with cleaners containing ammonia!
- Quaternary ammonium compounds are also good fungicides if bleach isn't used



Second Hand Smoke



- Most important indoor pollutant for child health
- According to US Surgeon General Report (2006)
'60 percent of children 3 – 11' are exposed to SHS.
- Each year, secondhand smoke is associated with an 8,000–26,000 new asthma cases in children.

<http://www.hhs.gov/surgeongeneral/library/smokingconsequences>

U.S. Environmental Protection Agency. *Respiratory Health Effects of Passive Smoking: Lung Cancer and Other Disorders*. Washington, DC.

Second Hand Smoke

Possible Interventions P. 24



- Keep home and car smoke free
- Encourage support to quit smoking
 - Recommend aids such as nicotine gum/patch
 - Medication from physician to assist in quitting
- Choose smoke free social settings
- At the very least, do not smoke around your child or in the car!
 - (This should not keep us from encouraging parents to quit)



Inner City Asthma Study

- Follows 937 urban children with asthma
 - 1 year of intervention, 1 additional year of follow up
- Evaluation --questionnaire and skin testing
- Home sampling --dust, cockroach, cat and dog allergen
- Interventions aimed at patient-specific triggers
 - Allergen impermeable mattress and pillow covers
 - HEPA air filters and vacuum cleaners
 - Professional pest control

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

Inner City Asthma Study

Results and Cost Effectiveness

- Fewer days with symptoms
- Greater decline in level of allergens at home
 - Persisted through 2nd “follow up” year
 - Dust and cockroach Ag correlated with fewer complications of asthma
- *Cost Effectiveness analysis
 - 38 more symptom free days
 - Under \$30 per symptom free day

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

*Kattan M, et al. *J Allergy Clin Immunol* 2005;116:1058-63.

Reducing Traffic Reduces Asthma - 1996 Atlanta Olympics

- **The Intervention:**
 - **Around-the-clock public transportation**
 - **1,000 buses added**
 - **Downtown city streets closed to private cars**
 - **Downtown delivery schedules altered**
 - **Flexible and telecommuting work schedules encouraged**

Reducing Traffic Reduces Asthma - 1996 Atlanta Olympics

- The Result:
 - Weekday morning traffic counts dropped 22.5%
 - Peak daily ozone concentrations decreased 27.9%

Friedman, M. S. et al. JAMA 2001;285:897-905.

Acute Asthma Events During 1996 Olympics - Atlanta

Type of claim	% change in mean # of Asthma claims per day	% change in mean # of Non-Asthma claims per day
Medicaid Hosp and ED Visits	- 41.6%	- 3.1%
HMO ED, Urgent Visit, Hosp	- 44.1%	+ 1.3%

Friedman, M. S. et al. JAMA 2001;285:897-905.

2002 Summer Asian Games

- Korea

- 2002 Summer Asian Games in Busan, Korea
 - Like Atlanta in 1996, ‘Transportation Controls’ led to a reduction in hazardous air pollutant levels of up to 25%
 - Relative Risk of Asthma Hospitalization during the reduced pollution period was 73% of baseline (27% decrease)

Lee et al. J Air Waste Manag Assoc. 2007 Aug;57(8):968-73.



Air Pollution P. 26

Possible Outdoor Air Interventions

- Monitor air quality index levels
 - Ozone, Particulate Matter, NOx, SO2
 - Reduce child's outdoor activities if unhealthy
 - Orange AQI of 101-150 (unhealthy for sensitive groups)
 - Red AQI of 151-199 (unhealthy for all)
- Contact health care provider if more albuterol is needed the day after AQI level is high



Summary

- **Environmental management should be part of comprehensive asthma care**
 - **Ask about environmental exposures and seek ways to intervene**
 - **Written asthma action plans**

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