Environmental Assessment and Exposure Reduction of Cockroaches

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Session: Immunotherapy Track - Cockroach Immunotherapy: New Insights

December 6, 2014

1:50 PM to 2:05 PM

Boston Children's Hospital

HARVARD MEDICAL SCHOOL

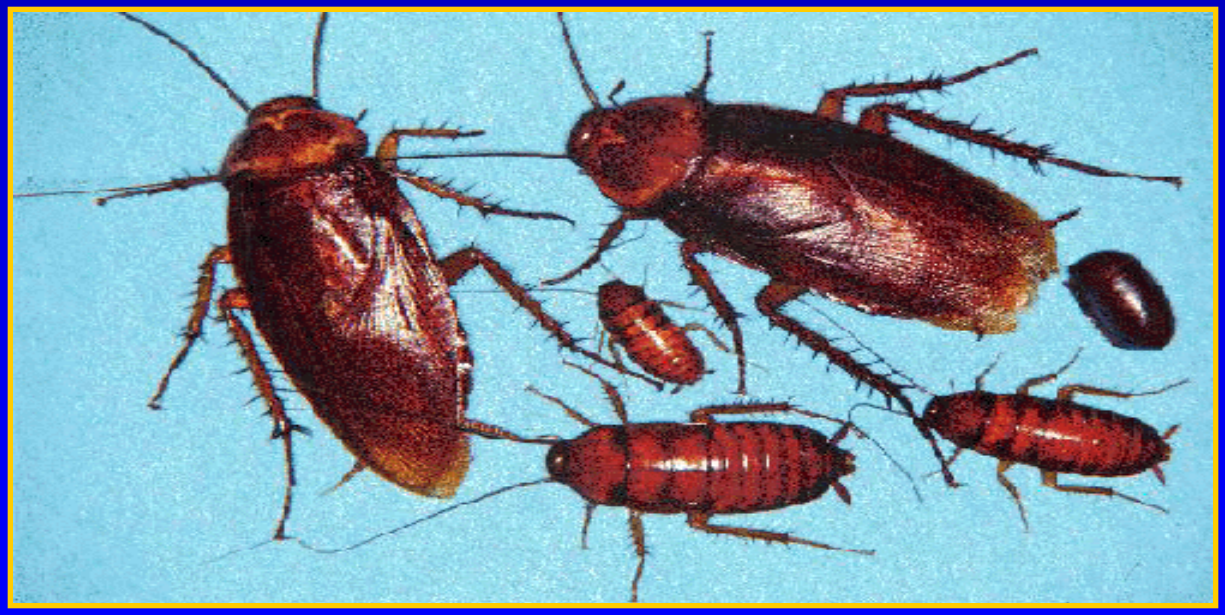
COI/Disclosures

- NIH Funding-to Institution

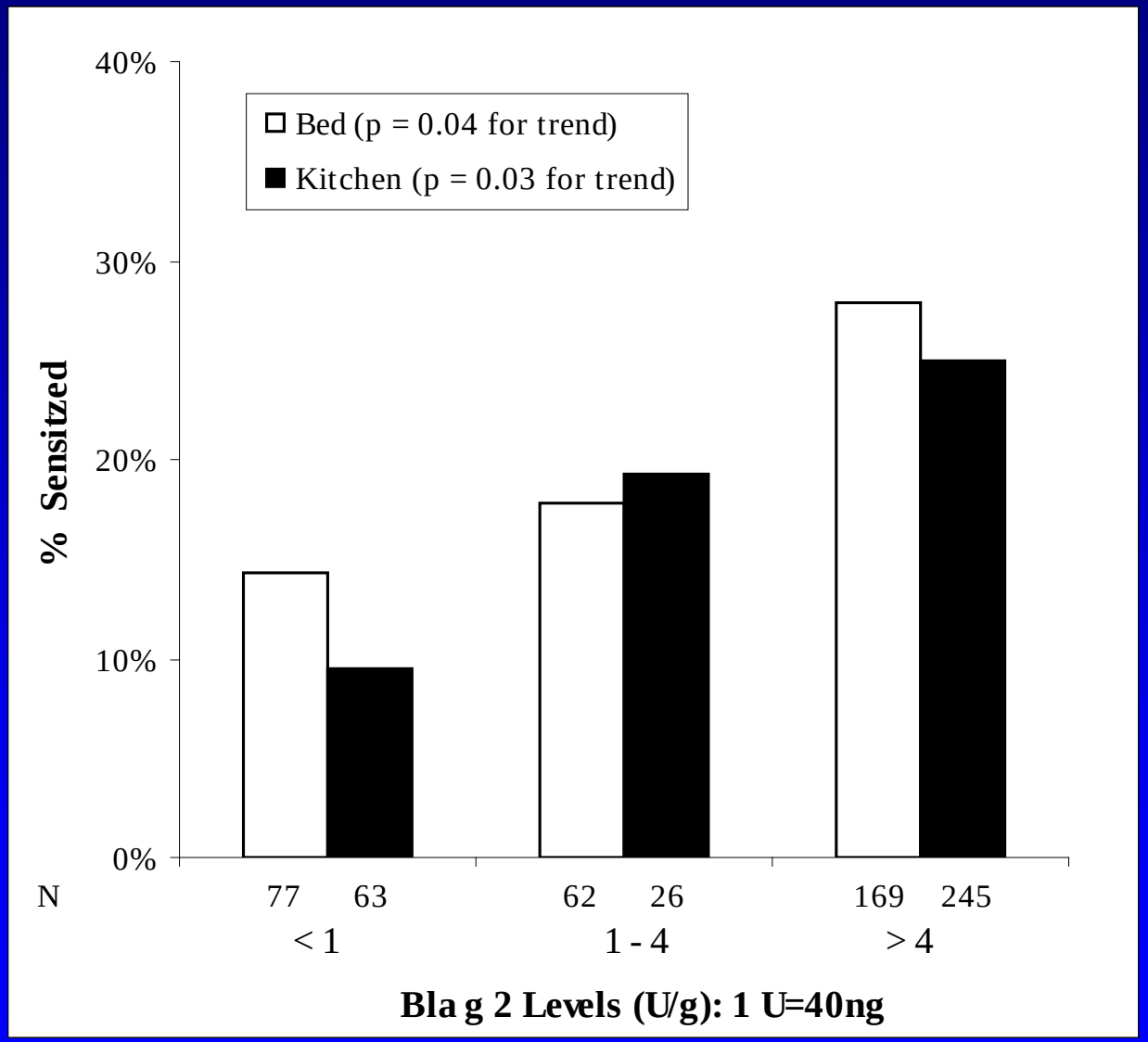
Learning Objective

- To Discuss Cockroach Practice Parameters and Key Evidence to date on the importance of cockroach allergen exposure, symptoms, and abatement

Why should an allergist care about cockroaches?



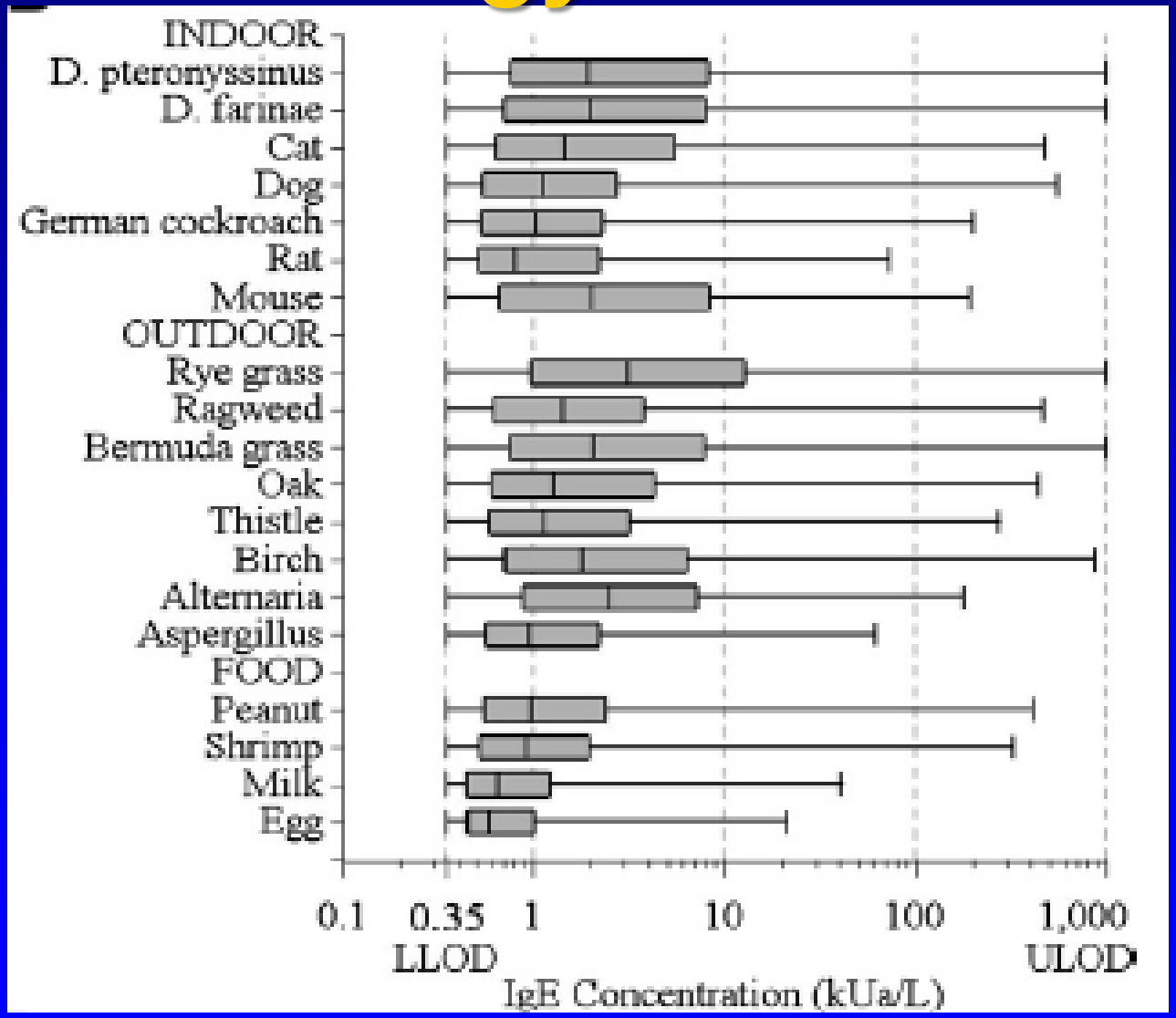
New York preschool children (n=341)



Bla g 2 levels > 1U/g in children's bed and kitchen dust samples were independently associated with cockroach-specific IgE, adjusting for other covariates (such as asthma)

Chew, Perzanowski, Canfield et al, *JACI* 2008

NHANES- US Cockroach Allergy Prevalence~20%



N= 9440
Male
Black
South
No Pet
More Pos

Roach ~20%
1/3 children age 1-5 sensitized

P Salvo, et al, JACI 2014, 134 : 350-9

Mouse/Cockroach Rural Homes

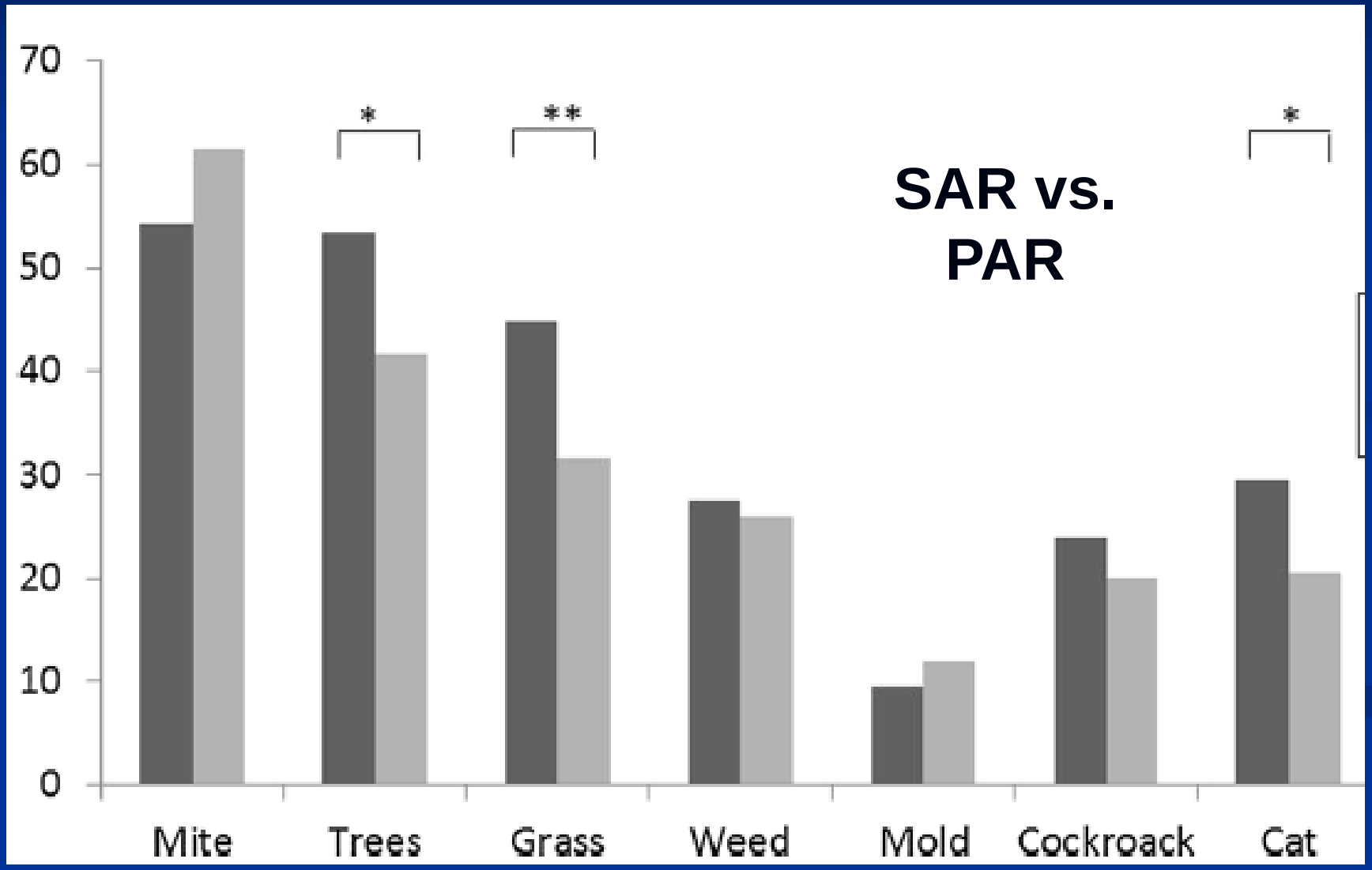
A.T. Coleman et al. / Ann Allergy Asthma Immunol 112 (2014) 256–260

	Detectable	Above Sensitation
Mus m 1	>0.01 mcg/g	>1.6 mcg/g
any room	93 (97.9%)*	32 (33.7%)*
bedroom	93 (96.7%)	21 (22.1%)
kitchen	74 (81.3%)	26 (26.8%)
Bla g 1	> 0.4 U/g	2 U/g
any room	62 (65.3%)*	38 (40%)*
bedroom	41 (43.2%)	15 (15.8%)
kitchen	53 (58.2%)	36 (39.6%)
Bla g 2	> 1 U/g	>2 U/g
Any room	38 (40%)*	35 (36.9%)*
bedroom	27 (28.4%)	19 (20%)
kitchen	34 (37.4%)	34 (37.4%)

20% bedrooms > cockroach sensitization threshold

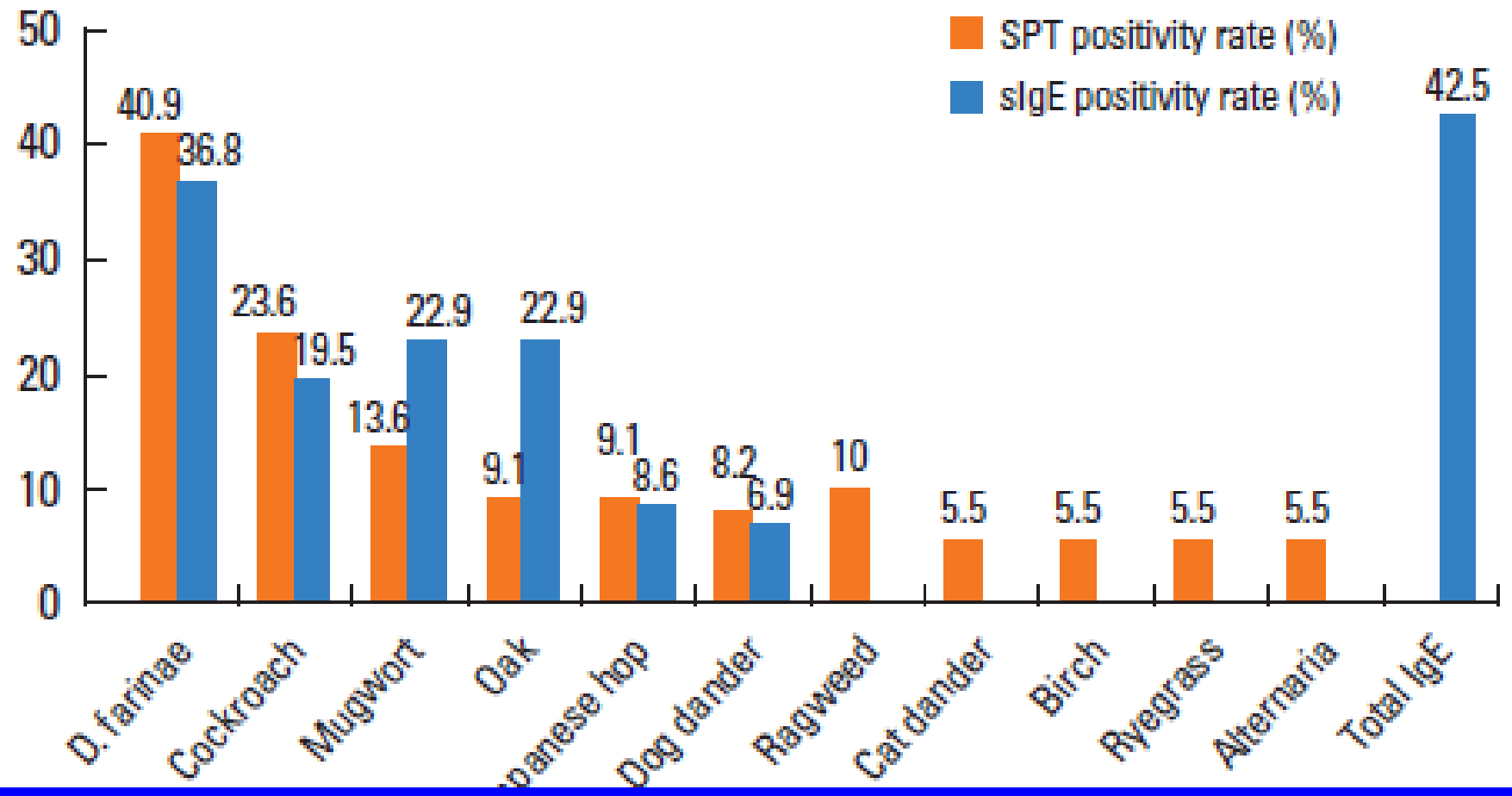
Allergy/Climate in Subtropics

Larenas-Linnemann *et al. Clinical and Translational Allergy* 2014, 4:20



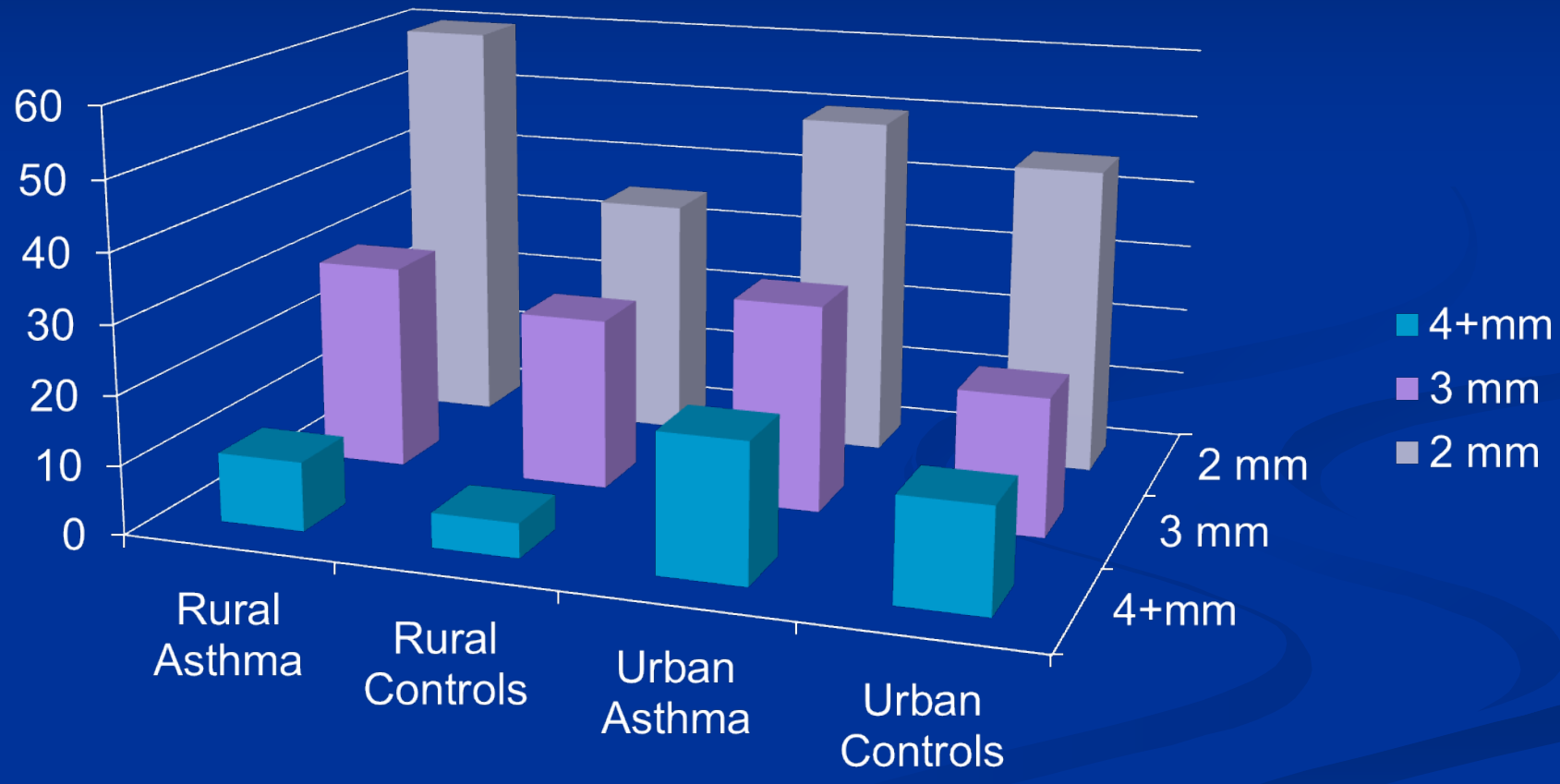
A Nationwide Survey of Inhalant Allergens Sensitization and Levels of Indoor Major Allergens in Korea

Hye Jung Park,[1,2] Jae-Hyun Lee,[1,2] Kyung Hee Park,[1,2] Hea Won Ann,[3] Moo-Nyun Jin,[3] Soo-Young Choi,[2] Yong-Won Lee,[1,2] Chein-Soo Hong,[1,2] Jung-Won Park[1,2*]



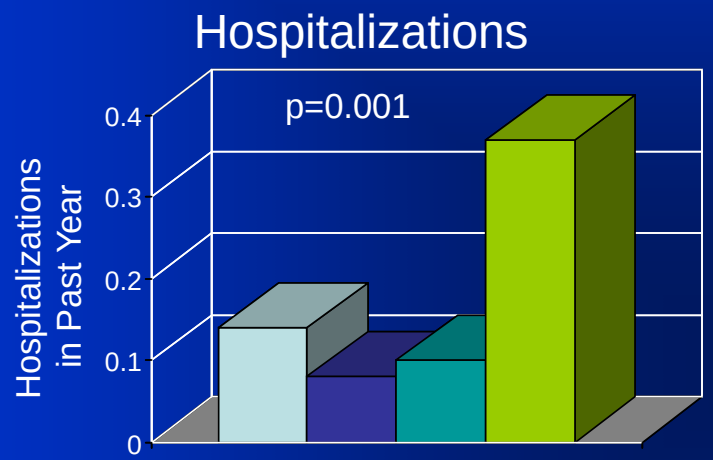
Allergy Asthma Immunol Res. 2014 May;6(3):222-227.

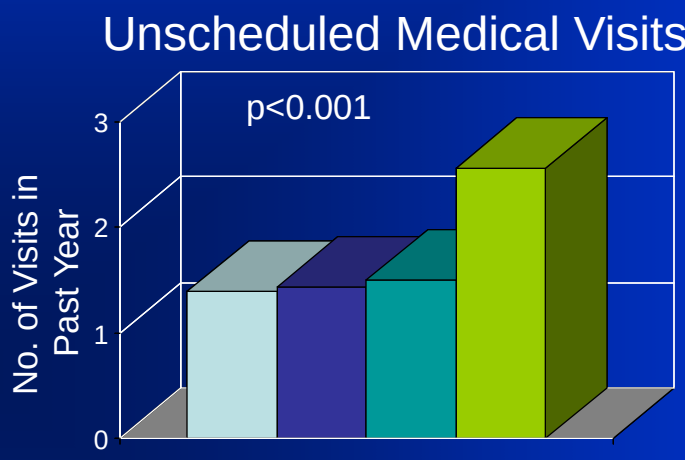
Cockroach Sensitization Rural/Urban Asthma-Africa

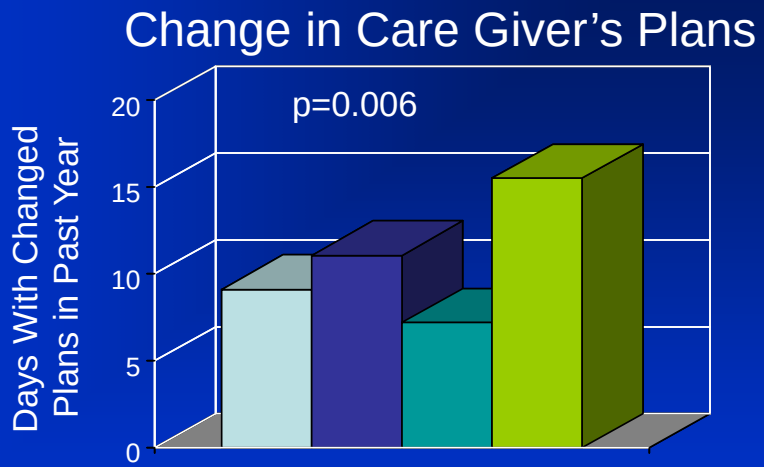


Oluwole A, African Health Sciences 2013; 13(1) 144-153

HOME Cockroach Allergen Exposure and Asthma Morbidity in Inner City Children







- neg skin test, low allergen exposure
- neg skin test, high allergen exposure*
- pos skin test, low allergen exposure
- pos skin test, high allergen exposure*

* Bla g 1 > 8 U/gram

Rosenstreich et al., N Eng J Med, 336: 1356-1363, 1997

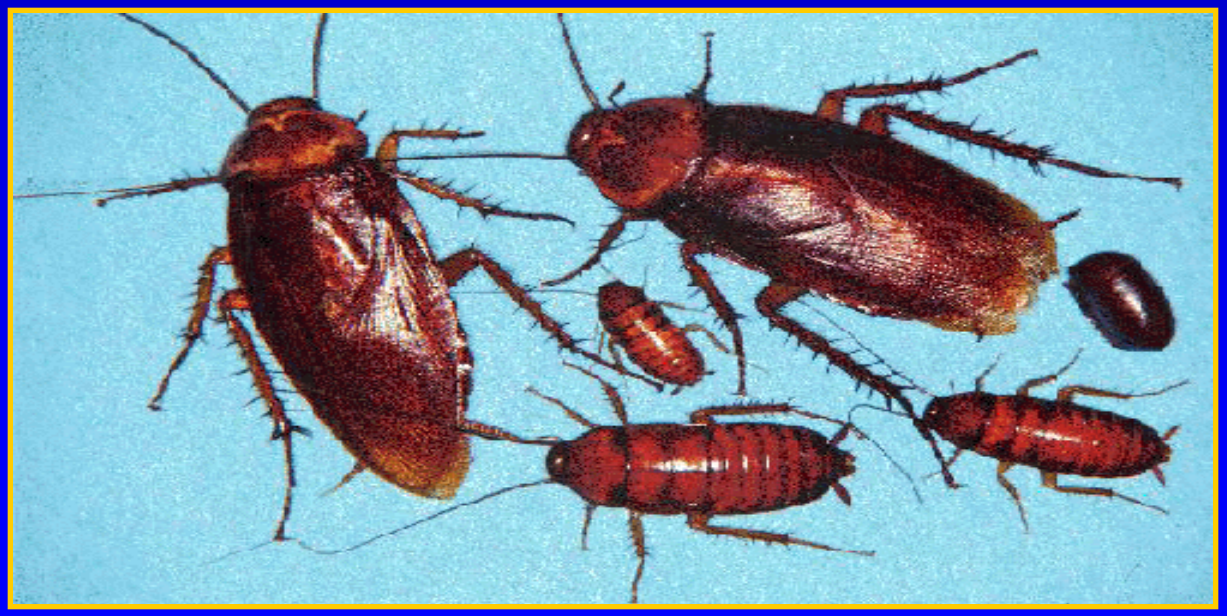
Cockroach exposure independent of sensitization status and association with hospitalizations for asthma in inner-city children

Table 4. Multivariable Regression Analyses of Children Who Were Hospitalized for Asthma vs Those With No Hospitalization

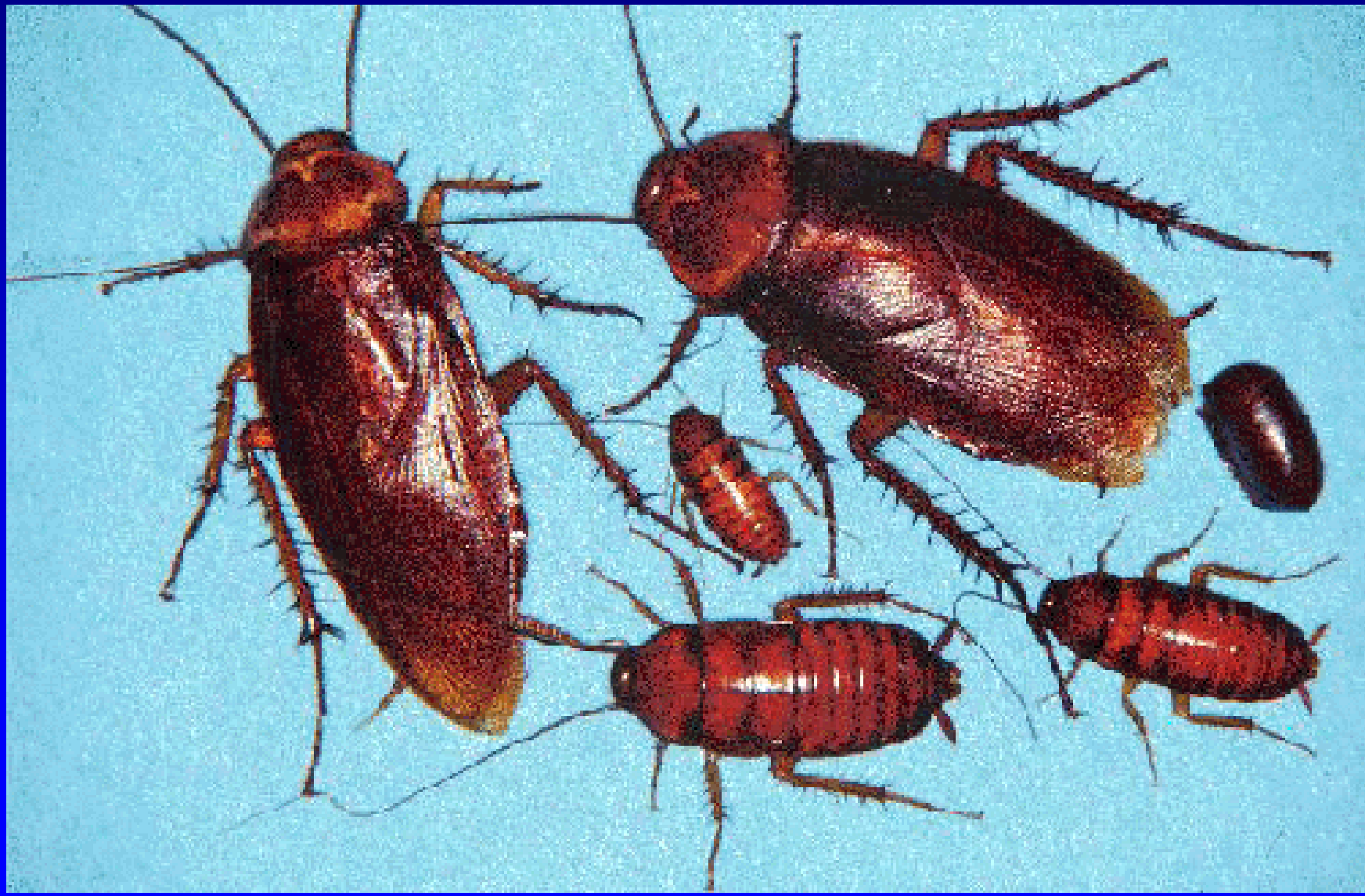
	OR (95% CI)	
	Model 1[a]	Model 2[b]
Bla g 1 exposure >2 U/g	5.41 (1.14–25.62)	4.20 (1.24–14.17)
Bla g 1 exposure >2 U/g and sensitized	0.65 (0.13–3.32)	NA
Oral corticosteroid use (≥1 × daily)	17.65 (1.52–204.75)	15.42 (1.39–171.37)
Ever admitted to the ICU for asthma	4.69 (1.29–17.01)	5.56 (1.27–16.36)

Rabito, Annals Allergy; 2011:106:103-109

Now that we have established why allergists care about cockroaches, what do you need to know?

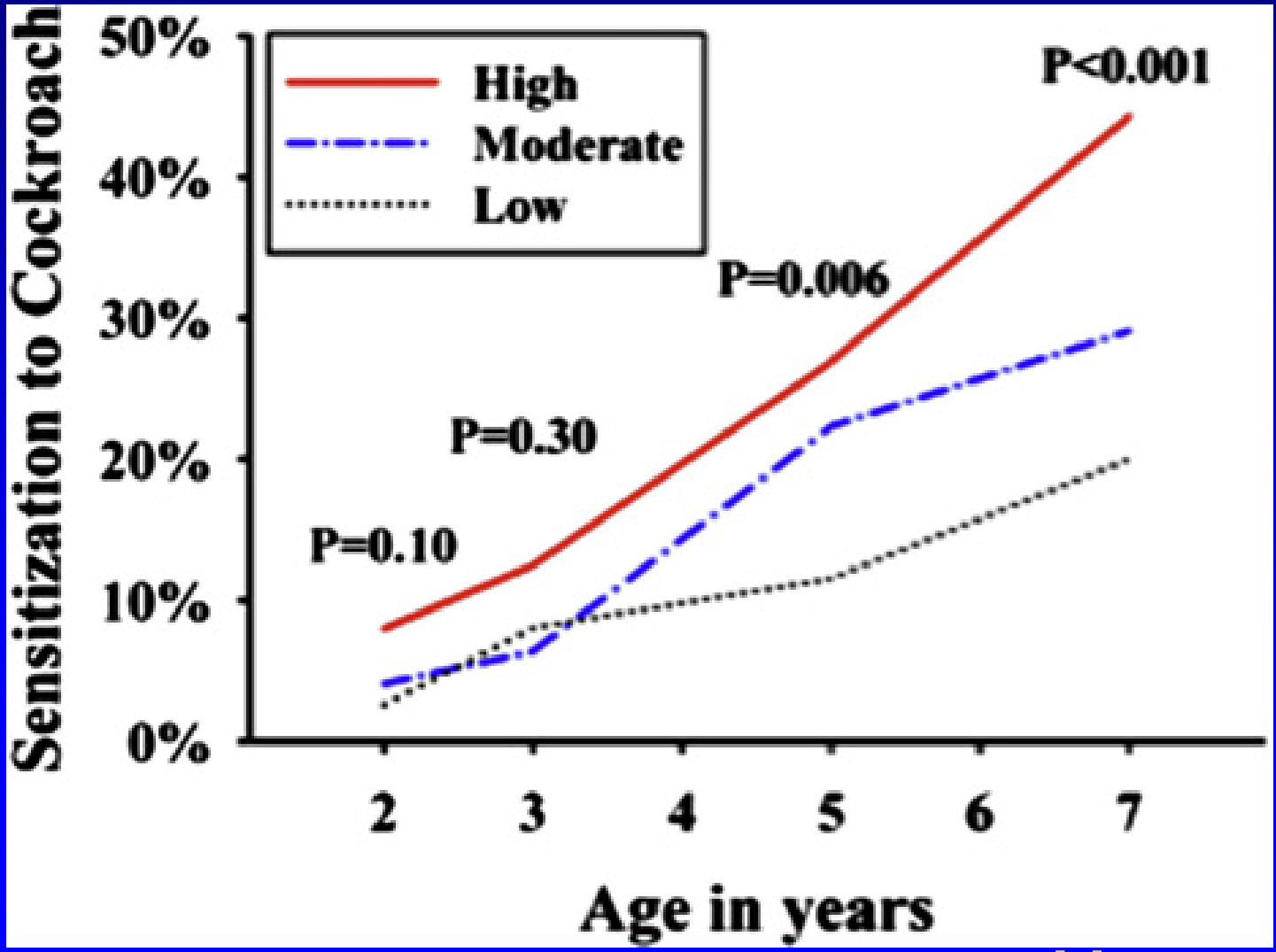


Periplaneta americana



Blattella germanica

Early-life cockroach allergen and polycyclic aromatic hydrocarbon exposures predict cockroach sensitization among inner-city children

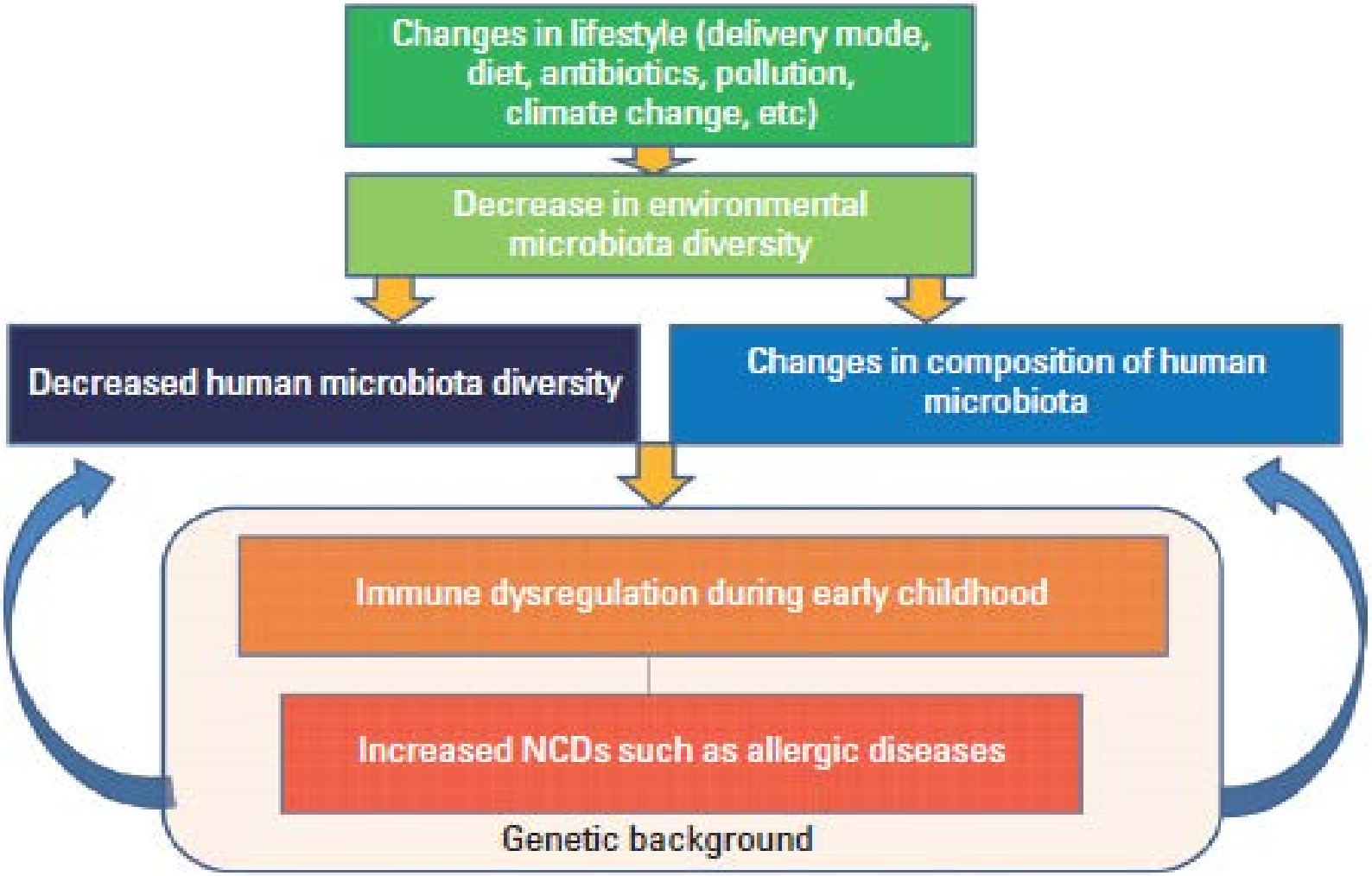


Perzanowski, JACI 2013

Environmental Changes, Microbiota, and Allergic Diseases

Byoung-Ju Kim,[1] So-Yeon Lee,[2] Hyo-Bin Kim,[3] Eun Lee,[4,5] Soo-Jong Hong[4,5]*

Allergy Asthma Immunol Res. 2014 September;6(5):389-400.



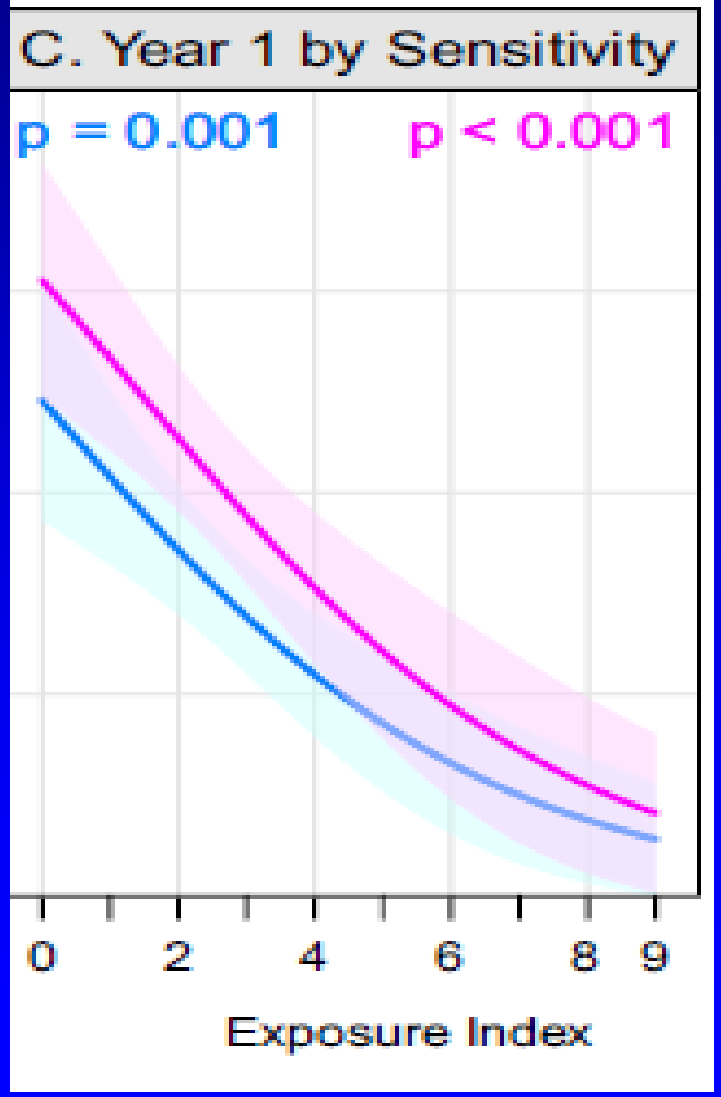
Early Mouse/Cockroach Exposure- What is Going On?

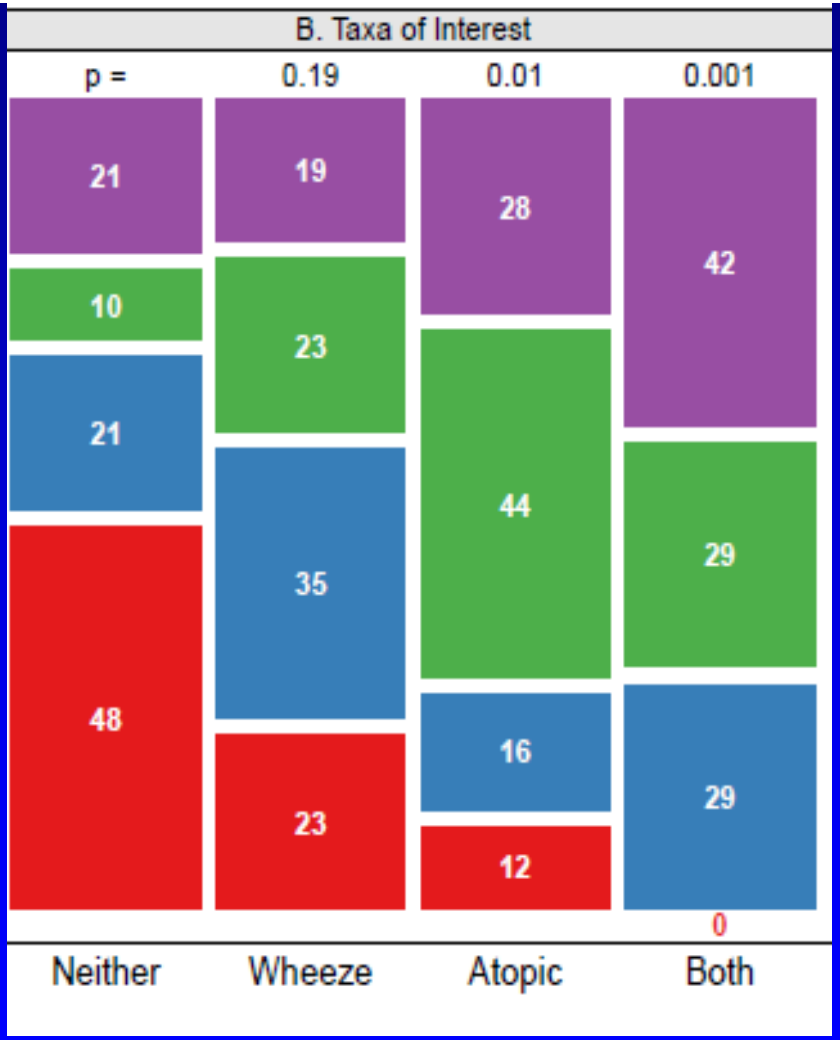
Sensitizations	n	Sensitized	Unadjusted	
		Percent (no.)	Odds ratio (95% CI)	*P* value
Any food	383	40% (155)	1.74 (1.14-2.67)	.01
Any aeroallergen	356	46% (163)	1.58 (1.02-2.46)	.04
Cat	362	17% (61)	1.78 (1.02-3.12)	.04
Dog	359	12% (44)	1.91 (1.01-3.60)	.05
Cockroach	359	14% (52)	1.62 (0.89-2.94)	.11
Mouse	366	20% (74)	1.58 (0.94-2.66)	.09
Dust mite *(Dermatophagoides farinae)*	364	11% (41)	2.18 (1.13-4.20)	.02
Dust mite *(Dermatophagoides pteronyssinus)*	360	13% (45)	1.48 (0.79-2.80)	.23

ETS, Environmental tobacco smoke; *PSS*, Perceived Stress Scale.

JACI 2014, Lynch, Wood, Gern

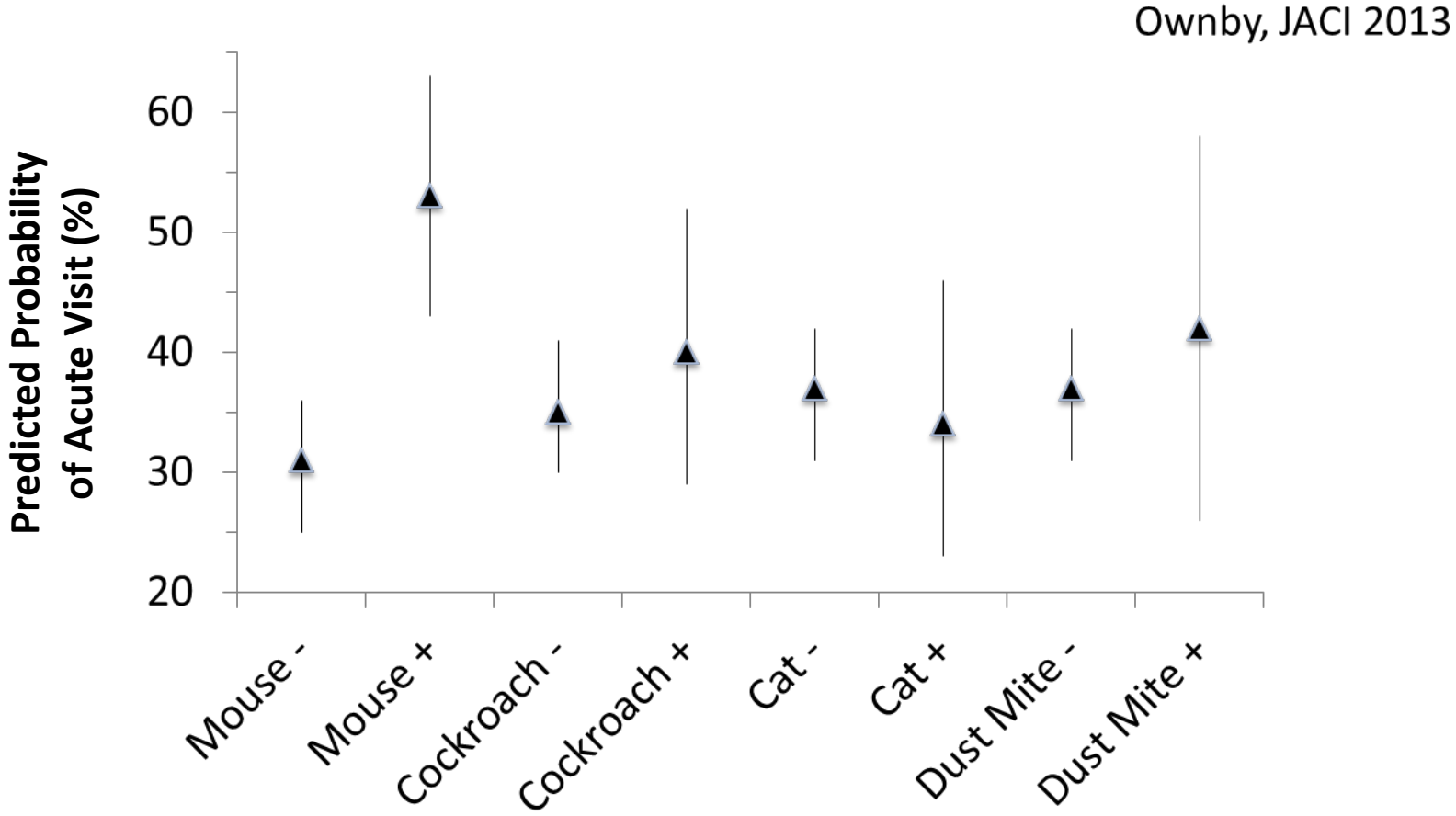
Effects of early-life exposure to allergens and bacteria on recurrent wheeze and atopy in urban children





JACI 2014, Lynch,Wood,Gern

Mouse or Cockroach? Will the Real Inner-City Allergen Please Stand Up?



Ahluwalia et al JACI 2013; 132: 830-5

Adjusted for age, gender, total IgE, and public health insurance

Summary statements

- **Keep exposures low to reduce risk of sensitization**
- Keep exposure low to reduce risk that sensitized patients will develop disease
- Keep exposure low to reduce risk of asthma morbidity in already sensitized patients
- **Patients with suspected atopy and likely cockroach exposure should be test for sensitization**

Home-based Environmental Intervention-Long Lasting Events

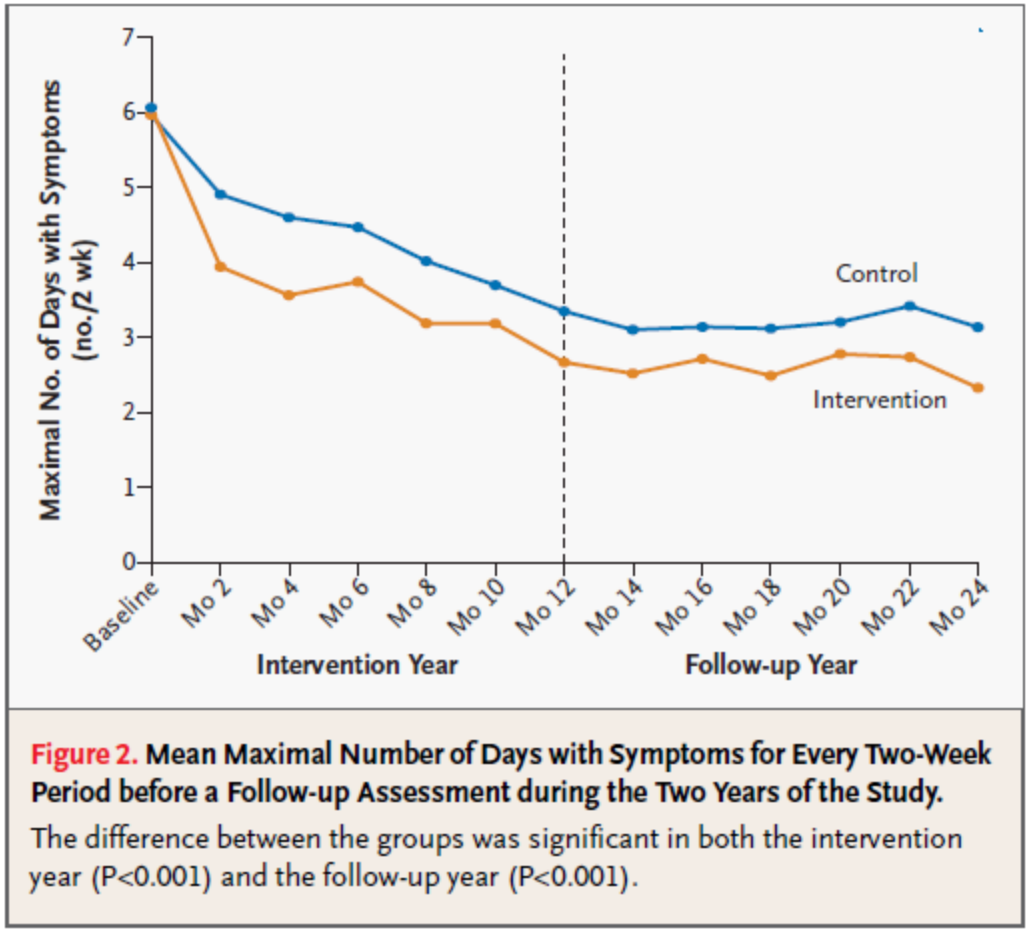


Figure 2. Mean Maximal Number of Days with Symptoms for Every Two-Week Period before a Follow-up Assessment during the Two Years of the Study.

The difference between the groups was significant in both the intervention year ($P<0.001$) and the follow-up year ($P<0.001$).

Morgan, NEJM 2004

The Critical View

- Effect size modest
- Some exposures were minimally affected by the intervention (mouse)
- Did reduction in exposures mediate the effects?
- Home-based Mouse Trial-Ongoing
- Consideration of Schools?
- Cost-Effective? $750-1000
- Daily Singulair costs more

IPM

Assess & modify facilitative factors

- •Routes of ingress
- •Sources of food, water

•Assess infestation

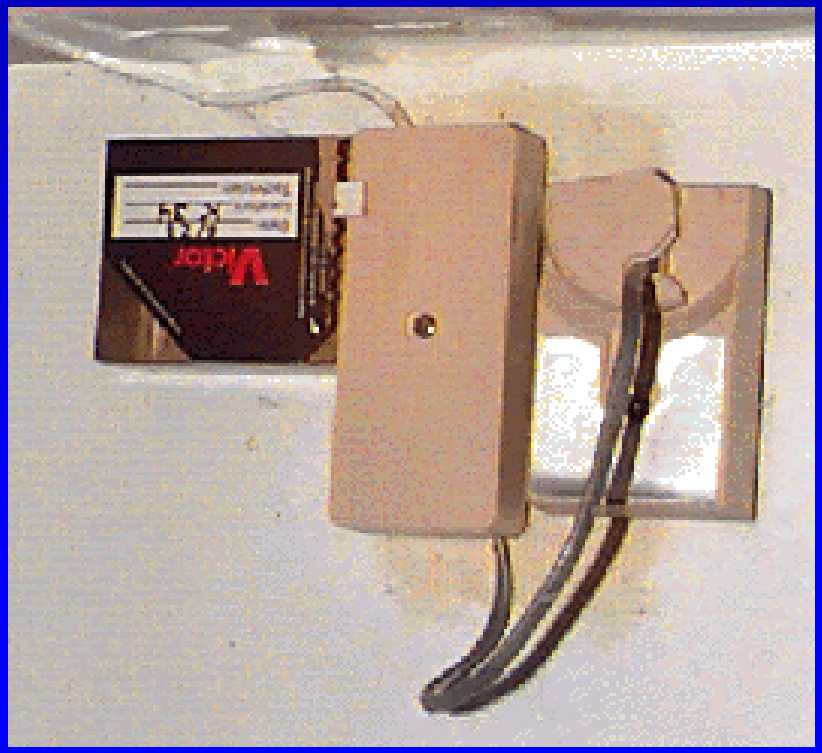
- •Location(s) of greatest activity

•Source control:

- •traps
- •+-Pesticide (low toxicidty)

•Educate/Clean

Location of Trap



Bathroom sink

Physical Exclusion

IPM in Baltimore (Asthmatic children)

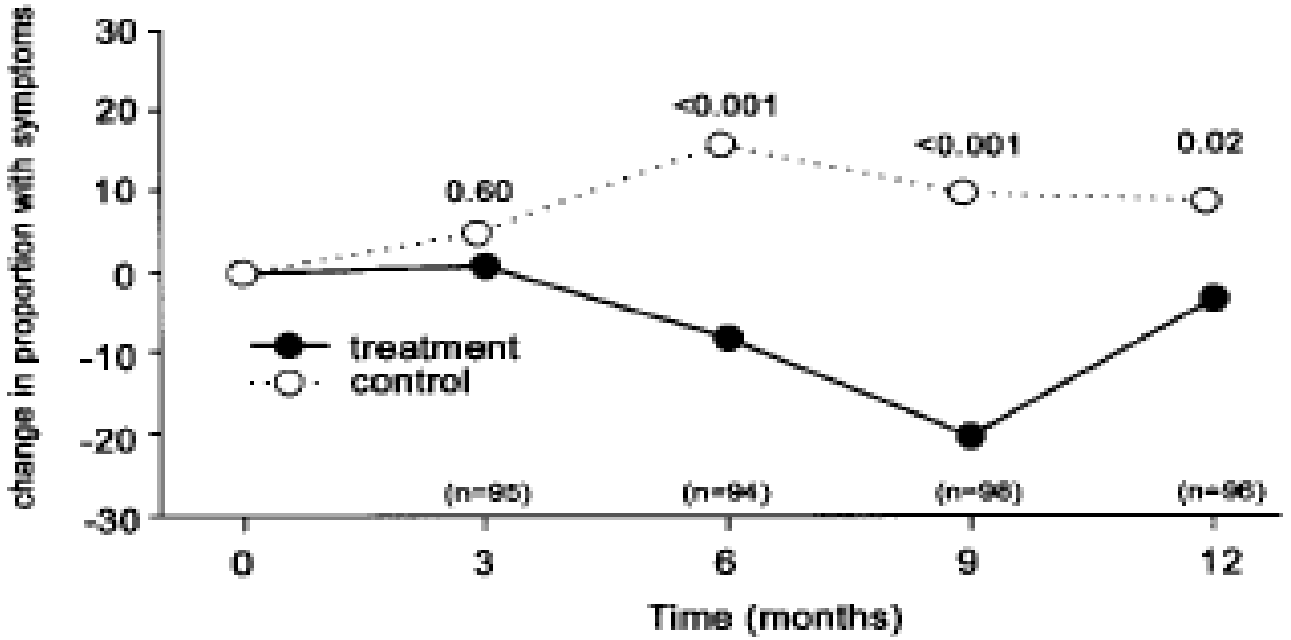


Figure 3. Change in the proportion of children with daytime asthma symptoms. The proportion was significantly lower at 6, 9, and 12 months in the treatment group (*t* test), and the average difference was significant during the first 9 months (generalized estimating equation).

Eggleston et al., *Annals of Allergy, Asthma, & Immunology* 2005

Summary statements

- **Use IPM to prevent and eliminate cockroach infestations**
- **Reservoirs should be cleaned or removed to prevent additional exposures**
- Pesticides should be used judiciously and ideally applied by a professional as part of and overall IPM program.

Suburban pest control vs. Urban pest control

Carlton, EJ, Moats HL, Feinberg M, Shepard P, Garfinkel R, Whyatt R, Evans D. Pesticide sales in low-income, minority neighborhoods. *J Community Health.* 2004

Role of environmental control in the management of asthma and allergy

Elizabeth C. Matsui, MD, MHS *Baltimore, Md*

JACI, January 2012

"Because these interventions are not covered by the patient's insurance, the family is referred to the Healthy Housing Program at the City Health Department because this organization can support the family in instituting these environmental control practices."

Multicomponent intervention

The Seattle-King County Healthy Homes Project: A Randomized, Controlled Trial of a Community Health Worker Intervention to Decrease Exposure to Indoor Asthma Triggers

James W. Krieger, MD, MPH, Tim K. Takaro, MD, MPH, MS, Lin Song, PhD, and Marcia Weaver, PhD

Community health workers:

- **reduced asthma symptom days**
- **reduced urgent health services**
- **Improved caregiver quality-of-life score**

American Journal of Public Health, 95:652-659, 2005.

Review articles: Multi-faceted interventions

Effectiveness of home-based, multi-trigger, multicomponent interventions with an environmental focus for reducing asthma morbidity

Crocker, Kinyotam Dumitru, Ligon, Herman, Ferdinands, Hopkins, Lawrence, Sipe, Task Force on Community Preventive Services, Am. J. Prev., Med., 41:S5-32, 2011.

Housing interventions and control of asthma-related indoor biologic agents: a review of the evidence.

Krieger, Jacobs, Ashley, Baeder, Chew, Dearborn, Hynes, Miller, Morley, Rabito, Zeldin. *J Public Health Manag Pract.* 16(5 Suppl):S11-20, 2010.

Cockroach Practice Parameter Workgroup

- Jay Portnoy, MD, Ginger Chew ScD, Wanda Phipatanakul MD, MS, James Sublett MD co-chair, Kevin Kennedy MPH co-chair, Charles Barnes PhD, David Bernstein MD, Jonathan Bernstein MD, Carl Grimes, Elizabeth Matsui MD, Jeffrey D. Miller MD, J David Miller PhD, James Seltzer MD, P Brock Williams PhD.