

## Cleaning Cockroach Allergen

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Cockroach Allergen Reduction Using Precision-Targeted IPM and  
the Lead Dust Cleaning Protocol  
HUD Healthy House Grant  
Cooperative Agreement #OHLHH0069-99



2004 NATIONAL LEAD & HEALTHY HOMES GRANTEE CONFERENCE  
PARTNERS FOR PREVENTION

## GIANT ROACHES INVADE CLEVELAND!

They're as big as kittens — and eat bread by the loaf!

CLEVELAND — It may sound heeey, but scared-stiff health officials warn this city is being overrun by super-aggressive, giant cockroaches — some the size of kittens!

By GEORGE SANFORD  
Special Staff Writer

It was 13 inches long," commented a Department of Health official who spoke on the phone at first, apparently about 200 eggs in the crumb which ended up in a warm house in downtown Cleveland — but the insects bred prodigiously," the official said. A police officer announced that one of the bugs which swarmed a rat on a crack house.

"We also suspect there is a hole in the dry and that at night, say experts. The mayor's office has refused to comment on the crisis, but all the roach as side gave some advice.

"Can someone sense. Don't go out at night unless you have to, keep your feet in

Weekly World News 1/22/02

## Project Partners:

- Environmental Health Watch
- Cuyahoga Metropolitan Housing Authority (CMHA) – Bruce Haber
- Greater Cleveland Asthma Coalition – Norman Robbins
- USDA Research Station, Gainesville – Rick Brenner, David Milne
- Johns Hopkins Allergy and Asthma Center – Ed Horowitz

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## Project to explore improved methods for:

1. Safer and more effective elimination of cockroach infestation
2. Assessment of cockroach allergen contamination
3. More effective cleanup/decontamination of cockroach allergen

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## Cockroach allergen

- A potent, pervasive and persistent asthma trigger for low-income, inner-city populations
- National Cooperative Inner-City Asthma Study [1997]:
  - 37% of children allergic,
  - High levels in 50% of homes,
  - Sensitivity + exposure associated with morbidity measures

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## Exposure to cockroach allergen associated with:

- "exacerbation of asthma in sensitive individuals" ("sufficient evidence of a causal relationship")
- "development of asthma" ("limited or suggestive evidence of an association")

[Committee on the Assessment of Asthma and Indoor Triggers of the Institute of Medicine, 2000]

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## Study setting

- Multi-family complexes operated by the public housing authority in Cleveland.
- 18 housing units enrolled.
- Live roaches observed in 11 units and dead roaches in 16 units.

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## General design

- Confirmation of roach infestation
- Elimination by IPM methods
- Pre-cleaning allergen measurement
- Cleaning interventions
- Post-cleaning allergen measurement
- Occupant education
- Follow-up allergen measurement

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Sticky traps and roach debris confirmed high levels of cockroach infestation.



## Roach reduction by IPM

- USDA precision-targeted IPM
- Roaches flushed with a hot air gun and captured with a HEPA vacuum
- Gel baits and borate powders placed in harborages identified by the flushing
- Occupants educated to reduce food debris and clutter

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Roaches flushed from cove base.



Flushed roaches then vacuumed.

## Roach allergen is persistent

- Elimination of infestation alone found not sufficient to reduce exposure below clinically relevant level in several studies.
- Recent study [Arbes 2004] found significantly lowered allergen from infestation reduction.

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## Cockroach allergen measurement

- Vacuum sample of settled dust
- 1 m<sup>2</sup> area of floor vacuumed for two minutes, using canister vacuum with sample collection sleeve
- Vacuum samples from the kitchen, bedroom and one other room
- Sampled pre-cleaning, post-cleaning and follow-up

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## Ordinary cleaning

- Occupant or professional house cleaning not found effective.
- Allergens were missed or concentrated into hot spots

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## Cleaning intervention

- Based on the HUD protocol for cleanup of lead dust on hard surfaces
  - HEPA vacuuming
  - Wet mopping and rinsing
  - HEPA vacuuming

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## Cleaning intervention

- Two modifications to the standard lead cleaning protocol were tested,
  - wet vacuum rather than a mop to pick up dirty wash and rinse water
  - substituting bleach/detergent cleaner for the detergent-only cleaner

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## Cleaning treatment differences

Treatment types:	Treatment steps:			
lead cleaning	Apply TSP wash solution with mop; scrub	Pick up wash solution with mop	Apply rinse water with clean mop	Pick up rinse water with mop
lead cleaning-wet vacuum	Apply TSP wash solution with mop; scrub	Pick up wash solution with wet vacuum	Apply rinse water with clean mop	Pick up rinse water with wet vacuum
lead cleaning-wet vac-bleach	Apply bleach wash solution with mop; scrub	Pick up wash solution with wet vacuum	Apply rinse water with clean mop	Pick up rinse water with wet vacuum



Roach stains on walls, doors and door frames.



Roaches and roach debris found when a kitchen cabinet was removed.



Roach stains on walls, ceiling and floor



Clutter provides roach harborage and makes inspection and baiting difficult.

**Summary of changes in cockroach allergen concentration pre-post cleaning and at follow-up**

Testing interval	Bla g 1 concentration
Pre-to-post-cleaning changes	All 3 cleaning types had significant reductions. (p=0.01, 0.05, 0.01*) No differences by cleaning type
Pre-cleaning-to-follow-up changes	All 3 cleaning types had significant reductions. (p<0.01, <0.01, 0.04*) <b>Lead Cleaning</b> reduction was significantly greater. (p=0.01)
Post-cleaning-to-follow-up changes	<b>Lead Cleaning</b> and <b>Lead Cleaning-Wet Vacuum</b> had significant reductions (p=0.01, 0.03 respectively) <b>Lead Cleaning</b> reduction was significantly greater (p=0.01)

\* For Lead Clean, Wet Vac, and Wet Vac + Bleach respectively

**Bla g 1 values greater than or equal to 2 U/g**

	Lead Cleaning		Lead Cleaning - Wet Vac		Lead Cleaning-Wet Vac-Bleach	
	N		N		N	
Pre	6	83.3% (5)	15	93.3% (14)	11	81.8% (9)
Post	6	16.7% (1) (p=0.01)	15	86.7% (13)	11	54.5% (6)
Follow up	6	0% (0) (p=0.01)	11	36.4% (4)	8	37.5% (3)

(N= number of rooms.  
Values in parentheses are the number of rooms that were greater than 2U/g)

## Maximum Bla g 1 at pre-cleaning, post-cleaning and at follow-up (U/g)

	Lead Cleaning	Lead Cleaning-Wet Vac	Lead Cleaning-Wet Vac-Bleach
Pre-Cleaning	73.4	68 (994.2*)	223.0 (572.0*)
Post-Cleaning	8.2	14.2 (18.2*)	24.1 (1.3*)
Follow-up	1.8	4.0	6.8

(\* = Bla g 1 values for rooms for which follow-up samples could not be obtained)

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## Why was Lead Clean better?

- Better performance of standard lead cleaning may be due to the increased mechanical abrasion from additional mopping in this treatment as compared to the other two.

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## Why continued decline post-cleaning to follow-up

- No continuing input of allergenic material from roach infestation
- Reservoirs cleaned, e.g., rugs, upholstered furniture and bulk debris, which could have contributed to recontamination
- But some reservoirs were not treated, e.g., bedding, clothes, and wall voids
- Occupants continued cleaning

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## Why low pre-cleaning allergen levels

Large amount of allergenic material removed prior to the first sampling for cockroach allergen:

- Pre-cleaning sampling done after the initial IPM work had been completed
- Flushing and HEPA vacuuming removed large numbers of cockroaches and a considerable amount of roach debris

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## Overall, the combination of

- cockroach infestation reduction through precision-targeted IPM (including hot air flushing and HEPA vacuuming),
- a one-time professional cleaning based on the HUD lead dust cleaning protocol,
- occupant education and occupant on-going cleaning effort

was able to reduce cockroach allergen to near proposed levels of sensitization

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### Cockroach Allergen Reduction Using Precision-Targeted IPM and the Lead Dust Cleaning Protocol

HUD Healthy House - Cooperative Agreement #OHLHH0069

Summary & Final Report  
Model Contractor Program for Cockroach IPM  
Recommendations to Public Housing Authorities  
Cockroach Control Guide  
at  
[www.ehw.org/Asthma/ASTH\\_home1.htm](http://www.ehw.org/Asthma/ASTH_home1.htm)

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