


Presentation entitled “Assessing insecticide exposures during pregnancy: Results from a biomarker validation study” by Dr. Robin Whyatt

Assessing insecticide exposures during pregnancy: Results from a biomarker validation study




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Funded by: U.S. EPA Star Grant



Three recent epidemiologic studies (EHP, 112,2004) report significant associations between:

- Umbilical cord chlorpyrifos levels and decreased birth weight and length but not head circumference (Whyatt et al.)
- Prenatal maternal urinary TCPY1 levels and decreased head circumference (with PON1 activity as a modifier) but not birth weight or length (Berkowitz et al.)
- Umbilical cord colinesterase levels and gestational age but not maternal urinary TCPY1 levels and birth outcomes (Eskenazi et al.)


13,5,6 trichloro-2 pyridinol



Biomarker Validation Study

102 mother/newborn pairs (2001-04) nested within our ongoing prospective cohort study (N 700 pairs, 1998-present)


Race/Ethnicity: African American and Dominican
Residence: Northern Manhattan and South Bronx
Exclusion: Smokers, Illicit Drug, HIV, Hypertension, Diabetes




Environmental measures of exposure



48 hour personal air 32nd week 2 week integrated indoor air 32nd wk. delivery





Biologic Samples

- Repeat maternal prenatal spot urine
- Maternal blood
- Umbilical cord blood
- Postpartum meconium

Background On Meconium

Meconium accumulates in bowels from 16 weeks gestation.

Xenobiotics enter meconium through bile excretion and fetal swallowing of amniotic fluid.

Evidence suggests significant trapping of xenobiotics in meconium.



Insecticides measured

Organophosphates

Chlorpyrifos
Diazinon
Malathion
Methyl parathion

Carbamates

Bendiocarb
Carbaryl
Carbofuran
Propoxur

Pyrethroids

cis-Permethrin
trans Permethrin
Piperonyl butoxide

U.S. EPA phase out of chlorpyrifos/diazinon: 2000-02



Demographics

	N=102	
Age		25.2 ± 4.9
Ethnicity		
Hispanic		68%
African American		31%
Marital Status		
Never married		69%
Education		
< High School degree		46%
Annual Household Income		
< \$10,000		43%
Duration of indoor air sampling		7.0 ± 2.3 weeks



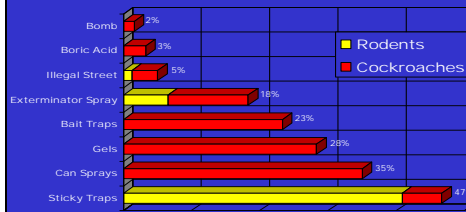
Percent reporting pest sightings and use of pest control between the 32nd week gestation and delivery

N=99

Pest sightings	91%
• Cockroaches	80%
• Rodents	51%
Pest control	61%
• By exterminator	20%



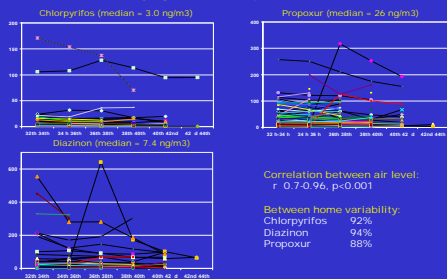
Use of 8 specific pest control methods between the 32nd-34th week of pregnancy and delivery among women reporting pest control use



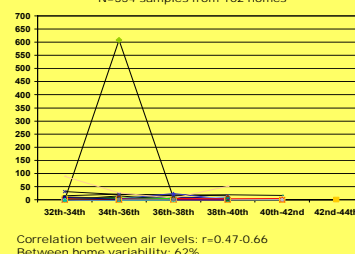
47% used one or more of the higher toxicity methods

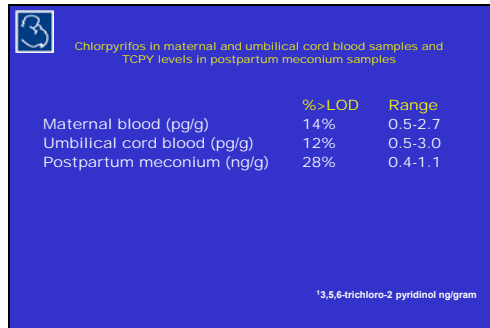
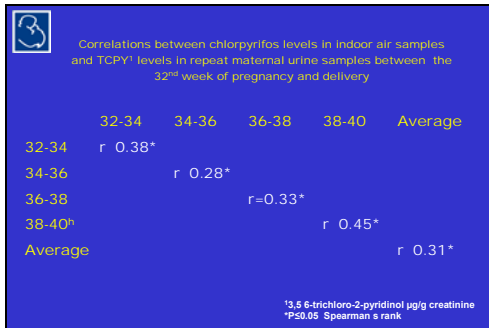
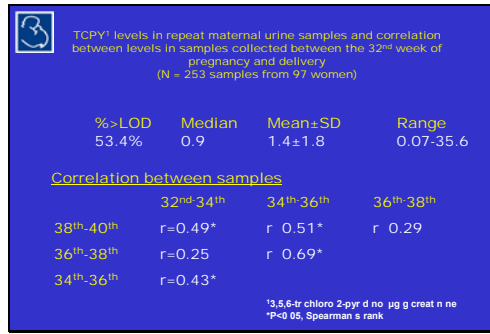
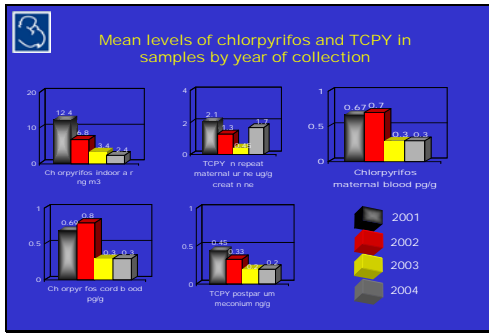
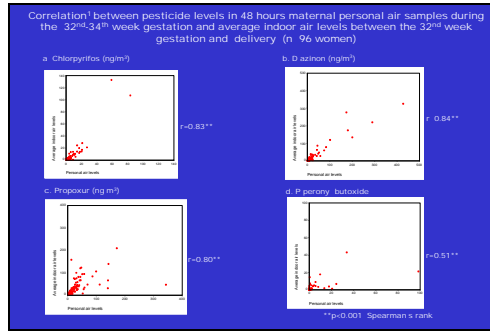
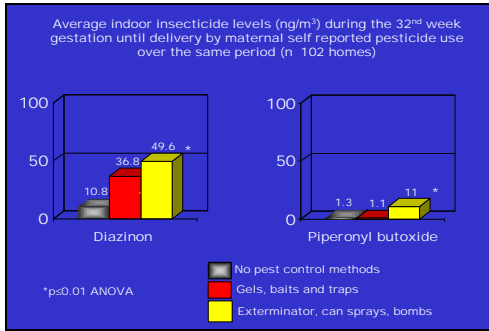


Chlorpyrifos, diazinon and propoxur were detected in 99.7%-100% of indoor air samples collected between the 32nd-34th week of pregnancy and delivery (ng/m³) N= 337 samples from 102 homes



Piperonyl butoxide was detected in 46% of indoor air samples between the 32nd-34th week of pregnancy and delivery (ng/m³) N=354 samples from 102 homes






Correlations¹ between measures of chlorpyrifos in environmental and biologic measures

	Meconium	Maternal blood	Cord blood	Maternal urine
Chlorpyrifos indoor air	r 0.17, p=0.13	r 0.04, p=0.7	r -0.06, p=0.7	r=0.31, p=0.002
TCPY maternal urine	r=0.43, p<0.001	r 0.14, p=0.2	r 0.06, 0.7	
Chlorpyrifos cord blood	r=0.44, p=0.001	r=0.9, p<0.001		
Chlorpyrifos mat. blood	r=0.35, p=0.001			

¹Spearman's rank

- Where do we go from here:
1. Assessment of prenatal exposure to the pyrethroids and other replacement insecticides to chlorpyrifos and diazinon
 2. Additional analyses of prenatal chlorpyrifos and birth outcomes/postnatal development
 - Umbilical cord chlorpyrifos
 - Meconium TCPY
 - Maternal urinary TCPY
 3. Experimental studies
 - Metabolic fate of environmental TCPY/3PBA
 - Relationship between lipid, maternal blood and cord blood insecticide levels with continuous exposure

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Acknowledgements

Co-Investigators	Research Staff
F.P. Perera	D. Diaz
P.L. Kinney	J. Dietrich
H.F. Andrews	A. Reyes
W.Y. Tsai	J. Ramirez
D.E. Camann	D. Holmes
D.B. Barr	M. Borjas
G. Rauh	B. Plaza

OB/GYN and postpartum staff at NY Presbyterian and Harlem Hospital, U. S. EPA and NIEHS

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Acknowledgements

Study Participants

