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Take-Home Toxins: Threats to the Family Environment

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Section A

Background

“Take-Home Toxins”

- Sometimes called “paraoccupational exposure” or “workers’ home contamination”
- Adverse health effects in families of workers due to the workers’ hazardous exposures
 - Transmission of substances from work to home
 - Visits to workplaces—sometimes encouraged
 - Cottage industries (home = workplace) and farms

“Fouling One’s Own Nest”

- Published in 1978 by J. Chisholm
 - Children of lead battery workers exposed via mothers’ clothes
 - Organochlorines transported to home
 - ▶ TCDD—chloracne in 4-year-old; father exposed
 - ▶ PCB—electrical manufacturing plant; father exposed
 - ▶ TCE—breast milk; mother visited father at plant
- Emphasized need for occupational histories of all adults living with children

Workers' Family Protection Act

- Public Law 102-522, 29 U.S.C. 671 (1992)
- NIOSH study to “evaluate **potential for, prevalence of, and issues related to the contamination of workers' homes with hazardous chemicals and substances ... transported from the workplaces** of such workers.”
- Report to Congress—1995

Protecting Workers' Families: A Research Agenda



Reports of Home Contamination

- 28 countries; 36 states in the U.S.
- 30 different substances
- Most case reports
 - Few used epidemiologic methods to estimate relative risks
 - Full range of health effects or extent of problem not well understood
 - Most recognized because effects unique or serious
- More studies in recent years

Slipping between the Cracks!

- Whose jurisdiction is home contamination?



From Work to Home and Family

- Transmission of chemicals from work to home and family—pathways
 - Visits to worksites
 - Visiting for meals
 - Workplace in the home
 - Family members in work area
 - Exposure via chemical storage
 - Clean-up materials may expose family

From Work to Home and Family

- Transmission of chemicals from work to home and family—pathways
 - From workplace to home
 - Vectors—clothes, shoes, skin, hair, tools, motor vehicles
 - Families exposed through airborne dusts, laundering clothes, playing in contaminated areas
 - Items taken home from work
 - Farms—of special concern

Most Common Substances Transferred to Home

- Most commonly reported substances transferred to home
 - Metals
 - Pesticides
 - Asbestos



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Section B

Examples of Exposures: Metals, Pesticides, and Asbestos

Lead in Small Shops and Cottage Industries

- A worldwide problem
 - Jamaica—"backyard" radiator shops
 - Barbados—home pottery making
 - Italy—ceramic tile shops
 - U.S.—children of radiator repairmen

Lead: Workplace to Home

- Sometimes massive amounts of dust
 - Poor workplace hygiene/housekeeping
 - Shoes contaminated while walking around grounds, cars contaminated
- Hand-to-mouth activity of small children puts them at higher risk; blood lead levels can be higher than parents'
- Commonly detected due to blood lead screening

Lead in Furniture Repair

- Six furniture workers—repaired and restored
 - 18-month-old child: 26 $\mu\text{g}/\text{dL}$ (clinical management at 20 $\mu\text{g}/\text{dL}$)
 - 4-month-old: 24 $\mu\text{g}/\text{dL}$!
 - 7-month-old: 16 $\mu\text{g}/\text{dL}$
 - Among the six workers, lead levels ranged from 29 to 56 $\mu\text{g}/\text{dL}$
- Thought wood was lead-free
- Used power tools—cut and sanded
- Ate and drank in work areas, no protective equipment, wore clothes home

Study Near a Lead Smelter

- Over 40% of smelter workers' children had blood lead levels higher than 30 $\mu\text{g}/\text{dL}$
- Work clothing was vehicle of contamination
- Differences in exposure by age; highest levels in children less than 6 years old
- Comparison group matched on neighborhood and household lead

Study of Construction Workers' Children

- Whelan et al., 1997
- Children less than 6 years old—parents were construction workers with PbB >25 µg/dL
- Neighborhood controls—same environmental exposures (water, housing, etc.)
- Children of lead workers were 6 times more likely to have PbB >10 µg/dL

Study of Construction Workers' Children (cont.)

Lead workers reported that ...	
They were provided with training	50%
The company provided clothes	29%
The company provided shower facilities •And that they always used them	32% 18%
They wore some street clothes •They laundered these clothes at home	79% 91%
They drove their vehicle to work	75%

Beryllium

- Causes chronic debilitating lung disease
- Hands and vehicles of workers in a precision machine shop
- Did have showers and clean clothes available for each day
- Half did not change work clothes or shoes
- Some left premises at lunch without changing
- Concentration highest on driver's floor

Case Study: Asbestos

- Mesothelioma has long latency period
- 35-year-old worker in China in asbestos fabric industry developed mesothelioma after working only four years
- Born and raised in company housing, spun chrysotile asbestos thread when young

Asbestos Example

- Father worked in asbestos products plant, brought home cotton sacks that held asbestos insulation
- Mother cut sacks into diapers for children
- Outcome
 - Father died of asbestosis
 - Mother and one daughter died of mesothelioma
 - Young uncle died of mesothelioma (lived in home and worked briefly with asbestos)

Industrial Pesticide Exposure

- Kepone—insecticide produced in Virginia
- Wives of workers with kepone exposure had tremors similar to those seen in workers (they had washed husbands' work clothing)

Pesticide Exposures—Examples

- Crop sprayer with contaminated shoes
 - Cleaned shoes and placed towels in wastebasket
 - 1½-year-old daughter contacted either towels or shoes and became unconscious
- Brother and sister played in a swing made of a burlap sack contaminated with parathion—both died
- Company truck spilled chloropicrin in driveway

Farm Exposures

- Caustic chemicals—burns of mouth and esophagus, skin, and eyes
- Pesticides—insecticides, herbicides, fungicides, fumigants and nematocides, rodenticides
- Families of applicators and farm workers affected
- Location near fields promotes exposure

Pesticide Exposures in Children

- Pesticide left in discarded containers and improper storage such as soda bottles and cups
- Children playing with containers used to store or mix pesticides

Pesticides, Farms and Families

- Biomonitoring on 32 Ontario farm workers' homes
- Tested surfaces for the herbicide 2,4-D
- Found on all surfaces tested—faucets, door knob, washing machine
- 2,4-D not in use at the time—they had been tracked in previously and had persisted

Pesticides, Farms, and Families

- Homes of 20 farm worker children, aged 5-27 months
- Measured 29 pesticides
- House dust, surface wipes, clothing
- Residue on socks and clothing higher on toddlers than on crawling children

Organophosphate Exposure

- 218 farm worker households in Washington State
- Tested for six pesticides
 - Dust in house
 - Dust in vehicle
 - Biomarkers of exposure—metabolites in urine
- Adjusted concentrations of dimethyl phosphate (DMP) were higher in children than in adults (0.14 $\mu\text{mol/g}$ vs. 0.09 $\mu\text{mol/g}$)
- Associations
 - Car and house dust
 - Adult and child levels



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Section C

Some Prevention Ideas

Other Substances Responsible for Family Exposures

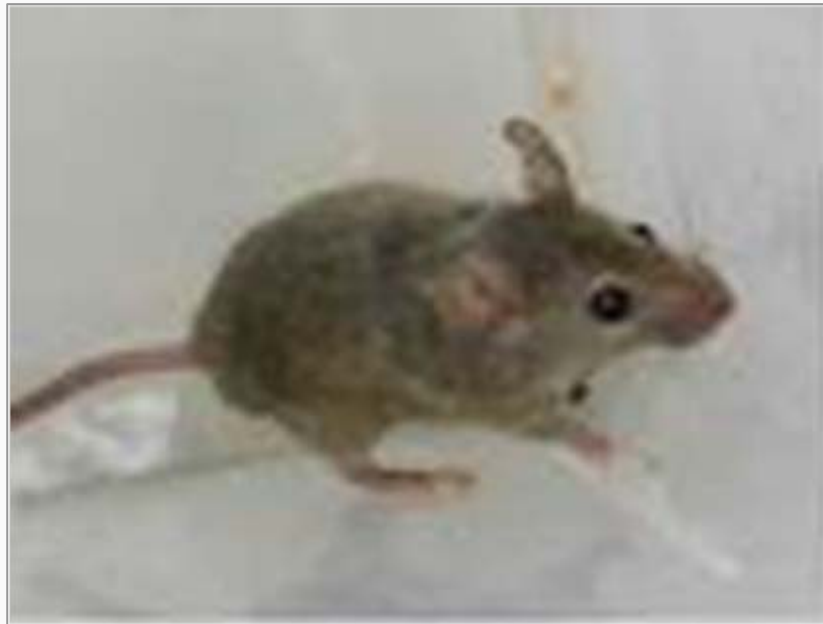
- Arsenic
- Beryllium
- Mercury
- Cadmium
- Fibrous glass
- Animal allergens
- Infectious agents
- RDX
- Radioactive agents
- Estrogens

Blood-Borne Pathogens



[Photo](#): Benny Lin. CC-BY-NC

Non-Infectious Biologicals



Firefighter Turnout Gear: Source of Unknown Hazards



Photo: Jeffrey James Bryan. CC-BY-NC-SA

Decontamination, Case Finding, Prevention

- Decontamination difficult
- Case finding difficult—clinical symptoms vs. surveillance
- Prevention paramount

Preventive Measures

- Reduce work exposures
- Care with clothing
 - Launder separately
 - Leave at work
 - Discard if heavily contaminated
- Shower before leaving workplace
- Prohibit taking toxic substances or contaminated items home
- Store/dispose of chemicals properly
- Prevent family from visiting at work

Preventive Measures

- Separate work areas from living areas
- Inform workers of risk to family members and ways to prevent
- Educate health professionals to inquire about potential exposures to workplace hazards
- Educate children, parents, and teachers about effects of toxic substances
- Develop surveillance systems to track health effects that could be related to work exposures

Key History Questions

- All members of household: Current and past jobs? Second jobs, also!
 - Recent known exposure to chemicals (including dusts, mists, fumes) or radiation?
 - Temporal relationship between current symptoms and activities at work, home, or other environments?

NIOSH

PROTECT YOUR FAMILY

**Reduce
CONTAMINATION
at Home**



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