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


- 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
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?

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
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
Six furniture workers—repaired and restored

- 18-month-old child: 26 μg/dL (clinical management at 20 μg/dL)
- 4-month-old: 24 μg/dL!
- 7-month-old: 16 μg/dL
- Among the six workers, lead levels ranged from 29 to 56 μg/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 μg/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
Lead workers reported that …

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>They were provided with training</td>
<td>50%</td>
</tr>
<tr>
<td>The company provided clothes</td>
<td>29%</td>
</tr>
<tr>
<td>The company provided shower facilities</td>
<td>32%</td>
</tr>
<tr>
<td>• And that they always used them</td>
<td>18%</td>
</tr>
<tr>
<td>They wore some street clothes</td>
<td>79%</td>
</tr>
<tr>
<td>• They laundered these clothes at home</td>
<td>91%</td>
</tr>
<tr>
<td>They drove their vehicle to work</td>
<td>75%</td>
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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—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
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 μmol/g vs. 0.09 μmol/g)

- Associations
  - Car and house dust
  - Adult and child levels
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
Non-Infectious Biologicals

Photo: U.S. Forest Service.
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?