Adolescent Pesticide Exposures

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Defining “Adolescent”

- Youth, teen, adolescent
- Upper end of the childhood age scale
- No standardized age grouping
- Comparisons difficult

For this study: 10-19 years = adolescent

US Department of Health & Human Services, CDC, NCHS Adolescent Health Chartbook (CDC 2000)
Why this age group?

- Literature recognizes Windows of Vulnerability
- Physiologic differences
- Early development – organ systems
- Vulnerability of adolescents is hard to ascertain
- Most studies address <5 yrs. or adults
Biological systems are not commonly considered matured until age 18.

Absorption, metabolism, detoxification, and excretion of xenobiotic compounds differ by age.
Pesticides

- Toxic chemicals intentionally released into the environment to cause harm to a living thing
- Prevent, destroy, repel, or mitigate any form of life declared to be pests
- Pests can be plants, animals, insects, fungi, microorganisms
Routes of Exposure

- Dermal
- Inhalation
- Ingestion
- Ocular
Pesticide Use Associated with:

- Cancers
- Skin and respiratory disorders
- Neurological & reproductive adverse effects
- Immune function impairments

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Pesticide Exposure Surveillance

- Surveillance = “data for action”
- There is no systematic collection of pesticide exposure data in many states
- Concerns about health consequences from exposures may prompt calls to Poison Control Centers
  - Toxic Exposure Surveillance System
  - Systematic, Standardized
Poison Control Centers

- 61 nationwide
- Provide free telephone consultation for suspected exposure to toxic substances
- Staffed by registered nurses (RNs) and/or pharmacists with physician and clinical toxicologist back-up
- In 2006, received more than 2.5 million human exposure calls
Poison Control Center Specialist
PCC Medical Record

- Searchable variables from standardized fields
- Narrative free-text section for additional comments by the Specialist in Poison Information about the case
- “Tox Notes” supply valuable information
- Notes section is underutilized

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Objective of the Study

Identify the distribution, determinants, and effects of pesticide exposures among adolescents in the lower Mississippi River Delta Region of the US and develop prevention strategies appropriate for this age group.
Parent Study

“Improving Surveillance of Pesticide and Other Agricultural-related Poisonings”

- Supported by CDC/NIOSH cooperative agreement U5O OH07547-03, under human subject protocol 01-0757-P3B
- Conducted by the Southeast Center for Agricultural Health & Injury Prevention, University of Kentucky, Lexington, KY.

Retrospective, descriptive, population-based epidemiological study (n= 4435)

Harmonized archival data from 9 poison control centers in 8 states to examine pesticide exposures in lower Mississippi River Delta
Mississippi River Delta Counties

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Why this Area?

- Mississippi River Delta is an agriculturally intensive region.
- Little is known about pesticide exposures occurring in the region.
- Even less is known about pesticide exposures incurred by local adolescents.
- Opportunity to look for occupational and non-occupational exposures.

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Study Population

- 4,435 reports received by study centers during 2001 & 2002
- Ages ranging from 4 months – 95 years
- 159 reports involved exposures to person 10-19 years old
Four Steps to Better Data: Retrospective Exposures from CY 2001

1. Print Each Exposure Report
2. Read It
3. Abstract Items from the Narrative
4. Append the Abstracted Data to the TESS Data File
Results

- Substances implicated
- Route of exposure
- When occurred
- Site of the exposure
- Reason for the exposure
- Severity
- Prevention strategies
Route of Exposure

Number of Reports

80
70
60
50
40
30
20
10
0

Ingestion
Inhalation
Dermal
Ocular

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## Substances Implicated

<table>
<thead>
<tr>
<th>Substance</th>
<th>N</th>
<th>%</th>
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</thead>
<tbody>
<tr>
<td>Insecticides</td>
<td>113</td>
<td>71.1</td>
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<tr>
<td>Rodenticides</td>
<td>17</td>
<td>10.7</td>
</tr>
<tr>
<td>Fertilizers</td>
<td>15</td>
<td>9.5</td>
</tr>
<tr>
<td>Fungicides</td>
<td>12</td>
<td>7.5</td>
</tr>
</tbody>
</table>
Insecticides Implicated

- Chlorinated hydrocarbons
- Carbamates
- Organophosphates
- Pyrethrin/pyrethroid

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Seasonality

Pesticide Exposure Reports Received

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Who placed the call

- Self (6.9%)
- Health professional (20.8%)
- Relative (65.3%)
- Parents (55.3%)
- Unknown (7%)
Exposure Reason #1
Ingestion of contaminated food (n=17)
Exposure Reasons

- Premature re-entry into treated area (n=12)
- Foggers (n=11)
- Contact with animal products (n=10)
- Applying pesticides in a confined space (n=10)
Exposure Reasons

- Ingestion of product in non-standard container (n=7)
- Mistook pesticide for oral medications (7)
- Inappropriate handling of pesticide (n=6)
- Exposure through Drift (n=6)
- Malfunctioning equipment (n=4)
- Public Health mosquito spraying (n=2)
Severity Measurement

- Where the case was managed
- The medical effect from the exposure
Severity

- 64.8% (n=103) managed on site, no health care facility involvement
- 33.3% (n=53) referred to a health care facility
- About 29 were treated as outpatients
- 8 were admitted – non-critical care unit
- 2 admitted to a critical care unit
Severity

- 61% (97 cases) were followed to a known medical outcome
- Minor medical effects = 31.4%
- Moderate medical effects = 7.5%
- Major medical effects = 1 case
### Haddon Matrix

<table>
<thead>
<tr>
<th>Who is affected</th>
<th>Host</th>
<th>Agent</th>
<th>Environment</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-event</td>
<td></td>
<td></td>
<td></td>
<td>Social and legal norms and practices</td>
</tr>
<tr>
<td>Event</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-event</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Proximate cause**

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## Haddon Matrix

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<thead>
<tr>
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<th>Agent</th>
<th>Environment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Physical</td>
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<tr>
<td>Pre-event</td>
<td></td>
<td></td>
<td>Social</td>
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<tr>
<td>Primary</td>
<td>Prevention</td>
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<td></td>
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<tr>
<td>Event</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>Prevention</td>
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<td></td>
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<tr>
<td>Post-event</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Tertiary</td>
<td>Prevention</td>
<td></td>
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</tr>
</tbody>
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Primary Prevention

- Identify & follow-up exposures as sentinel events
- Increase awareness of toxicity of pesticides & safe handling practices
- Educate professional exterminators to educate their clients

- Increase support for pesticide prevention efforts
- Encourage increased funding to PCCs
- Increase literacy of residents
- Assess attitudes on pesticide use, handling & storage
Adolescent Risk Perception & Behavior

- Legitimate users of pesticides
- Self-determination – Find themselves in new environments
- May misjudge the risk to themselves

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Adolescent Risk Perception & Behavior

- Emotional maturity & judgment
- Perception of illness vulnerability
- Habits & attitudes affect how risk communication information is interpreted

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Secondary Prevention

- Educate adolescents to recognize the symptoms of pesticide poisoning
- Encourage use of personal protective equipment
- Use pesticides with the least human toxicity to do the job well
- Develop foggers or sprayers with slow initial release to allow departure from spray area & shut off valve
Tertiary Prevention

- Call Poison Control Center
- Provide first aid skills
- Identify and follow-up sentinel events
- Support PCCs
- Increase access to full PCC record
- Ensure training of Emergency personnel
This study provides greater understanding of pesticide poisoning concerns of this age group.

Poison Centers may greatly underestimate the true number of pesticide exposures to this age group (Crude incidence rate of 4.4 reports per 100,000 Mississippi Delta adolescents/year).

Each case should be looked at as a possible sentinel event.
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