Pesticide Exposure in Oregon

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Public Health Division, Oregon Health Authority

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Presentation Coverage

• Pesticide toxicology
• Health concerns and risk management
• Pesticide exposure trends
• Public health response to pesticide exposures
• Q&A
What is a Pesticide?

• Any substance or mixture of substances intended for:
  – Preventing
  – Destroying
  – Repelling or
  – Mitigating any pest
What Actually Gets Applied is a Mixture

- **Active Ingredients**
  - Actually kill or deter the pest
    - Atrazine
    - 2,4-D
    - Glyphosate

- **Additives**
  - Mixed with active ingredients to help them kill the pest
    - Defoamers
    - Sticking agents
    - Surfactants
    - Solvents
    - Petroleum products

Some additives are as or more toxic to mammals than the active ingredients
Toxicity of Mixtures

• Additive: $1+1=2$
• Antagonistic: $1+1=1$
• Synergistic: $1+1=4$
• Potentiation: $0+0=1$
Symptoms Caused by Pesticide Exposure Are Non-Specific

- Specific
  - Mesothelioma (asbestos)

- Non-specifics
  - Headache
    - acute pesticide exposure
    - virus
    - dehydration
    - stress genetics, migraines
  - Vomiting
    - acute pesticide exposure
    - viruses
    - bacteria
Dose Influences Health Effects

Linear Dose Response

Non-Monotonic Curves
Type of Exposure Influences Health Effects

Acute

Chronic
Pesticide health concerns

• Long-term worker health effects are not well understood / controversial
• Seemingly environmentally “safe” herbicides can have chemicals that are hazardous to the worker
• Easily misdiagnosed by non-occupational physicians
Routes of exposure and PPE

- Skin/eye – PPE is specific to EPA labeling requirements for “safe” handling and are minimal legal requirements that may include:
  - Hands (gloves - pesticide type specific)
  - Head/hair (hood, hat)
  - Face/eyes (full shield, goggles, safety glasses?)
  - Body (full covering like Tyvex suite or work clothes)
  - Feet (boots)
  - None
Routes of exposure and PPE

• Respiratory tract – PPE (respiratory protection) is specific to EPA labeling requirements for “safe” handling and minimal legal requirements that may include:
  – Full-face air purifying to air supplied (fumigation)
  – Half-face air purifying
  – Filtering face piece
  – None
Routes of exposure and PPE

• **PPE effectiveness** at preventing pesticide exposure is dependent on some or all of the following:
  - Information/knowledgeable sources (the more specific the better / manufacturer specifications)
  - Understanding PPE material selection & chemical limitations (saturation/permeation/degradation rates of chemicals)
  - Fit (size, comfort, cover, safety)
  - Maintenance / storage requirements
  - Use (duration & frequency) end-of-life expectancy
  - Availability for replacement of kind
  - Worker training on all of the above
  - Worker acceptance and will to be responsible
  - Worker supervision and accountability system
  - OR-OSHA code requirements
Basic Demographics about Likely Cases (2004-2013)

- 51.1% Female, 48.8% Male
- Age Distribution of likely cases by known age group (n=954)*

*Ages or dates of birth for 225 (23.6%) of the 954 cases are unknown.
Work-Related Activity Accompanying Exposures (n=124)*
2002-2007

*Not shown are four exposures where the activity is unknown or not applicable.
<table>
<thead>
<tr>
<th>Functional Class of Product</th>
<th>Frequency</th>
<th>Percent of Product Class Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insecticide</td>
<td>384</td>
<td>55.4%</td>
</tr>
<tr>
<td>Insect Growth Regulator</td>
<td>2</td>
<td>0.3%</td>
</tr>
<tr>
<td>Herbicide/algaecide</td>
<td>145</td>
<td>20.9%</td>
</tr>
<tr>
<td>Disinfectant</td>
<td>35</td>
<td>5.1%</td>
</tr>
<tr>
<td>Insect repellant</td>
<td>33</td>
<td>4.8%</td>
</tr>
<tr>
<td>Insecticide + Fungicide</td>
<td>17</td>
<td>2.5%</td>
</tr>
<tr>
<td>Insecticide + Other</td>
<td>17</td>
<td>2.5%</td>
</tr>
<tr>
<td>Functional Class Undetermined</td>
<td>16</td>
<td>2.3%</td>
</tr>
<tr>
<td>Other (plant growth regulators)</td>
<td>13</td>
<td>1.9%</td>
</tr>
<tr>
<td>Fungicide</td>
<td>19</td>
<td>2.7%</td>
</tr>
<tr>
<td>Rodenticide</td>
<td>6</td>
<td>0.9%</td>
</tr>
<tr>
<td>Herbicide + Fungicide</td>
<td>3</td>
<td>0.4%</td>
</tr>
<tr>
<td>Fumigant</td>
<td>2</td>
<td>0.3%</td>
</tr>
<tr>
<td>Multiple function (product in multiple classes, not above)</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Total</td>
<td>693</td>
<td>100%</td>
</tr>
</tbody>
</table>
### Top 10 Reported Known Exposure Sites of “Likely” Cases
(2002 – 2007, Total n = 689 exposures)

<table>
<thead>
<tr>
<th>NIOSH Site Category</th>
<th>Frequency</th>
<th>Percent of Total “n”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm</td>
<td>29</td>
<td>4.2</td>
</tr>
<tr>
<td>Livestock production facility</td>
<td>5</td>
<td>0.7</td>
</tr>
<tr>
<td>Office/business (non-retail, non-industrial)</td>
<td>18</td>
<td>1.5</td>
</tr>
<tr>
<td>Other institution</td>
<td>5</td>
<td>0.7</td>
</tr>
<tr>
<td>Residence*</td>
<td>498</td>
<td>72.3</td>
</tr>
<tr>
<td>Retail establishment</td>
<td>6</td>
<td>0.9</td>
</tr>
<tr>
<td>School</td>
<td>10</td>
<td>1.5</td>
</tr>
<tr>
<td>Service Establishment</td>
<td>18</td>
<td>2.6</td>
</tr>
<tr>
<td>Nursery</td>
<td>10</td>
<td>1.5</td>
</tr>
<tr>
<td>Other</td>
<td>14</td>
<td>2.0</td>
</tr>
</tbody>
</table>

*Single-family home, mobile home/trailer, apartments, housing for laborers, and unspecified private residences (includes grounds of property)
Select Categories of Established APII Cases Resulting from Pesticide Drift Events (selected from 160 total cases determined to result from pesticide drift)

<table>
<thead>
<tr>
<th>Reported Site of Pesticide Release</th>
<th>Reported Site of Exposure</th>
<th>% of Total Cases from Drift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Home &gt;&gt;&gt;</td>
<td>Home</td>
<td>30.0%</td>
</tr>
<tr>
<td>Ag Operation &gt;&gt;&gt;</td>
<td>Home</td>
<td>21.3%</td>
</tr>
<tr>
<td>Ag Operation &gt;&gt;&gt;</td>
<td>Ag Operation</td>
<td>10.0%</td>
</tr>
<tr>
<td>Forest &gt;&gt;&gt;</td>
<td>Home</td>
<td>5.6%</td>
</tr>
<tr>
<td>Multi-unit housing (apts, multi-plexes) &gt;&gt;&gt;</td>
<td>Multi-unit housing (apts, multi-plexes)</td>
<td>3.1%</td>
</tr>
<tr>
<td>Ag Operation &gt;&gt;&gt;</td>
<td>Vehicle, Road or utility RoW</td>
<td>3.1%</td>
</tr>
<tr>
<td>Forest &gt;&gt;&gt;</td>
<td>Forest</td>
<td>1.9%</td>
</tr>
<tr>
<td>School &gt;&gt;&gt;</td>
<td>School</td>
<td>0.6%</td>
</tr>
</tbody>
</table>
Highlights of Findings

• Most reported work-related APP occur to bystanders not directly working with pesticides or pesticide equipment.

• Most “likely” exposures occurring in residences were connected to a pesticide event at the residence

• 30% of residential pesticide drift cases come from adjoining homes, 20% from adjoining agricultural operations.

• Ag-to-ag and forestry-to-residential drift cases present concern as well.
Pesticide incidents

- **Oregon’s response framework**
  - Agencies have complementary authorities for pesticide incident response and enforcement to protect state citizens and the environment

- **Pesticide Analytical and Response Center (PARC)**
  - Inter-agency coordination
  - Coordinate, collect, and analyze info about reported incidents which may affect humans, the environment, or animals
  - Member agencies conduct investigations in their respective areas and authorities
What to do…

• Get help if someone is sick or injured:
  – Oregon Poison Control Center
  – 911
  – Health care provider

• Leave the area

• Wash off the pesticide if your skin or hair was exposed

• Write down key information

• Report it
  – PARC – toll-free: 1.844.688.7272, parc@oda.state.or.us
What to expect…

• PARC will return your call and contact the appropriate agency or agencies within one business day

• Staff from the agencies will investigate to determine what happened

• Several agencies may work together to investigate the incident

• Law provides for fines or other actions if there are violations
Pesticide Exposure Safety & Tracking (PEST) Program

- 1 FTE funded through PARC
- Understand burden of acute pesticide illness & injury (APII) in Oregon
- Assist investigations by regulatory agencies
- Report to CDC: Oregon cases included in national analyses & EPA pesticide regulation (done as resources permit)
Relevant Oregon Laws

- ORS 433.004: reportable diseases
  - Oregon Health Authority shall by rule, specify reportable diseases

- OAR 333-018-0015: reporting requirements
  - Health care providers shall report all human cases or suspected human cases... of pesticide poisoning.
Public Health Case Interview

• Interview patient to determine
  – pesticide product (if available)
  – how exposure occurred
  – contributing factors (to aid investigating agencies)
  – onset/ duration of symptoms

• Case criteria for APII is:
  – one dermal symptom; one ocular symptom; OR
  – two systemic symptoms (e.g. respiratory, GI);
  – a referral from PARC
Public Health Case Follow-up

• PEST follows CDC’s case classification system used by 11 other states

• Cases included in national policy-making

• Identify “causal pathway”
  – Link between symptoms, nature of exposure and toxicology of pesticide

No resources to identify “unknown” pesticides nor conduct field investigations
Communication Pathways for Multi-Household Events

- **PARC**
  - Inform Proactively
  - Inform on Request

- **Public Health Division**
  - Case Reporting
  - HAN Alert
  - Inform Proactively
  - Respond to Citizen Inquiries
  - Support as Requested

- **Healthcare Providers**
  - Information Provided Proactively (e.g. via media)
  - Clinical Visit

- **Local Public Health**
  - Information Provided Proactively (e.g. via media)
  - Respond to Citizen Inquiries

- **Public**
Public Health Outreach

• Education for people reporting exposure
  – If concerned about your health, advised to contact health care provider or call Oregon Poison Center

  1-800-222-1222 (24/7 & free)

  – For non-urgent questions about specific pesticides, try National Pesticide Information Center (NPIC)

    NPIC is a great source of science-base info on pesticides. Google “NPIC Oregon,” read online, & contact them with your questions by phone or email

  – Oregon Public Health Division toxicologist can assist, as needed
Questions?

Pesticide Exposure Safety & Tracking (PEST) Program
Oregon Public Health Division
971-673-0400
pesticides.health@state.or.us

Contact the PEST Program staff for information about pesticides and public health in Oregon. You can find pesticide safety brochures and information on Oregon’s reported pesticide poisonings at http://healthoregon.org/pesticide