The CDC/NIOSH Sentinel Event Notification System for Occupational Risks (SENSOR) Pesticides Program

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Pesticide Program Dialogue Committee Meeting
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Session goal

1. Provide an overview of pesticide-related surveillance activities conducted at NIOSH
2. How the SENSOR-Pesticides program obtains data
3. How quality assurance and quality control are maintained
4. Present some results
Public health surveillance is

- The ongoing systematic collection,
- analysis, and interpretation of data,
- timely dissemination of data
- to prevent and control disease.

(Thacker and Berkelman, 1988)

Data for action

Why conduct pesticide poisoning surveillance?

- Ongoing concerns about pesticide toxicity
- Pre-market testing of pesticides is not comprehensive
- Useful for identifying emerging pesticide hazards
- Assess root causes of acute pesticide poisonings
  ➔ apply lessons learned to prevent future cases
SENSOR = **Sentinel** Event Notification System for Occupational Risk

- "**Sentinel**" acute pesticide poisoning case identification, follow-up, case report
- By identifying “sentinel” cases, public health authorities can
  - assess the root causes for those cases
  - apply lessons learned to prevent future cases
- One of the illnesses supported under SENSOR is **acute** occupational pesticide-related illness and injury
How the SENSOR-Pesticides program obtains data?
The SENSOR-Pesticides program

- Goal: protect workers from exposure to pesticides
  - Determine extent and root cause(s)
  - Use this knowledge to prevent these exposures
- A state-based surveillance program
- NIOSH: cooperative agreement funding + technical support
- EPA: uses data + technical support + funding

SENSOR is a partnership among state programs, NIOSH, and the EPA.
## States Participating in SENSOR-Pesticides

<table>
<thead>
<tr>
<th>Period</th>
<th>States Participating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1988-1997</td>
<td>California†, New York§, Oregon, Texas</td>
</tr>
</tbody>
</table>

*receives no federal support
† (88-92)
§ (93-97)
States that participate or have participated in SENSOR-Pesticides. FY 22-26 awardees shown in green.
Data sources

- Poison control centers
- Report or referral from governmental agency
- Physician and other health care professional reports
- Workers’ compensation
- Other reporting sources

State programs: case ascertainment using standardized procedures

Standardized Variables for State Surveillance of Pesticide-Related Illness and Injury

Welcome to SPIDER!
SENSOR Pesticide Incident Data Entry and Reporting
This is SPIDER Version 2.0k
How quality assurance and quality control are maintained?
State programs: Case ascertainment

NIOSH: QA/QC

SENSOR-Pesticides Coding Committee

Standardized Variables for State Surveillance of Pesticide-Related Illness and Injury

Welcome to SPIDER!
SENSOR Pesticide Incident Data Entry and Reporting
This is SPIDER Version 2.0k

Case coding exercises improve coding accuracy
Standardized Variables for State Surveillance of Pesticide-Related Illness and Injury

Developed through collaborations with federal agencies (NIOSH, US EPA, NCEH), non-federal agencies (CSTE, AOEC), and state health departments or their designees

1. Pesticide product information (EPA registration number, product name, active ingredients, ...)
2. Industry, occupation, exposure source, activity performed
3. Health effects and severity index
   - Flow diagram for assigning severity to cases
   - Table of signs and symptoms by severity category
4. Contributing factors (Prevention codes)
Case Definition for **Acute** Pesticide-Related Illness and Injury

- **Two new** acute adverse health effects resulting from exposure to a pesticide product
  - systemic signs or symptoms
  - dermatologic lesions
  - ocular lesions

Consists of three parts:
- Determination of pesticide **exposure**
- Determination of new **health effects**
- Evidence of **causal relationship** between pesticide exposure and observed health effects

https://www.cdc.gov/niosh/topics/pesticides/pdfs/casedef.pdf
## Classification Criteria

- **A. Documentation of Pesticide Exposure**: A1, A2, A3, A4
- **B. Documentation of Adverse Health Effect**: B1, B2, B3, B4
- **C. Evidence Supporting a Causal Relationship Between Pesticide Exposure and Health Effects**: C1, C2, C3, C4

<table>
<thead>
<tr>
<th>CLASSIFICATION CRITERIA</th>
<th>Definite Case</th>
<th>Probable Case</th>
<th>Possible Case</th>
<th>Suspicious Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Exposure</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>B. Health Effects</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>C. Causal Relationship</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
</tbody>
</table>
Severity index

Severity is coded only for cases that meet the case definition. State investigators follow a flow chart and table of signs and symptoms

- **Low**: resolves without treatment. Minimal lost time (<3 days) from work or normal activities.
- **Moderate**: treatment is provided. ≥3-5 days of time lost from work or normal activities. No residual impairment (but effects may be persistent).
- **High**: life threatening and typically requires treatment. Substantial loss of time (> 5 days) from regular work or normal activities. Permanent functional impairment may be present.
- **Death**: Human fatality.
Contributing factors (prevention codes) ➞ root causes

- Factors contributing to the exposure and may be useful for developing intervention strategies.

An example:

<table>
<thead>
<tr>
<th>Code</th>
<th>Code description</th>
<th>Instructions for coding and comment field</th>
<th>Examples of text for comment field</th>
</tr>
</thead>
</table>
| 04   | Early re-entry    | Include the REI or the re-entry statement on label. Indicate how early people entered the area. This applies to WPS/state/local/label requirements. | “REI was 4 hrs, workers report that they followed the spray rig along the row.”
“Label states “keep unprotected persons out of area until sprays are dry” but vegetation still wet when worker began pulling out the sprayed plants.” |
Some results:
How have these efforts made a difference?
Changes in Federal Regulations to Reduce Pesticide-related Health Risks

- In September 2015, the EPA announced final revised rules to the Worker Protection Standard (WPS)
- This was the first major WPS revision in 20 years
- SENSOR-Pesticides program findings were extensively cited in the revised rules.
Changes in Proposed Federal Regulations to Improve the Training and Certification of Pesticide Applicators

- In December 2016, EPA announced final revised regulations for certification and training of pesticide applicators to ensure the competent use of “restricted use” pesticides
- This was the first major revision to these regulations in 40 years
- Findings from SENSOR-Pesticides were extensively cited in the announcement
Safer Pest Control in Schools

- Article describing the national incidence of pesticide poisoning at schools
- Five states passed laws requiring schools to control pests using methods with the least possible health hazards
Guidance documents


- Free SPIDER (SENSOR-Pesticides Incident Data Entry and Reporting). Software for incident data entry and reporting.
https://www.cdc.gov/niosh/topics/pesticides

PESTICIDE ILLNESS & INJURY SURVEILLANCE

For more information, contact CDC
1-800-CDC-INFO (232-4636)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.
Severity

Figure - Flow diagram for assigning severity to cases of acute pesticide-related illness and injury

1. Was the illness or injury fatal? Yes → S-1 (Death) No
2. Was care sought from physician, clinic, ER, employee health center visit, or hospital admission? Yes → Are any of the signs* (or specified combinations of signs) included in the Table’s HIGH column? No
3. Table’s MODERATE column? Yes → S-2 High Severity No
4. S-2 High Severity
5. Was time lost from work** (or normal activities, if not employed)? Yes → Are any of the signs or symptoms* (or specified combinations of signs or symptoms) included in the Table’s MODERATE column? No
6. Yes → S-3 Moderate Severity No
7. Hospital stay > 72 hours or > 5 days lost time from work** (or normal activities, if not employed)? Yes → S-4 Low Severity No
8. Hospital stay > 24 hours, or ≥ 3 days lost time from work** (or normal activities if not employed)? Yes → S-4 Low Severity No

* Only consider signs or symptoms related to pesticide exposure when assigning severity.
** This can include assignment to light/limited work duties resulting from prolonged illness or injury related to pesticide exposure.
## TABLE: Signs and symptoms by severity category – an example

TABLE: Signs and symptoms by severity category (Modeled after Persson et. al., 1998 and includes SPIDER database elements)

<table>
<thead>
<tr>
<th>ORGAN SYSTEM</th>
<th>SEVERITY CATEGORY AND CODE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastrointestinal</td>
<td>FATAL</td>
</tr>
<tr>
<td></td>
<td>HIGH</td>
</tr>
<tr>
<td></td>
<td>MODERATE</td>
</tr>
<tr>
<td></td>
<td>LOW</td>
</tr>
<tr>
<td>Death</td>
<td>1</td>
</tr>
<tr>
<td>Severe or Life-threatening Signs</td>
<td>2</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>Massive hemorrhage/perforation of gut</td>
</tr>
<tr>
<td>System</td>
<td>Diarrhea (G14, sign only)</td>
</tr>
<tr>
<td></td>
<td>Melena (G17)</td>
</tr>
<tr>
<td></td>
<td>Vomiting (G16, sign only)</td>
</tr>
<tr>
<td>Respiratory System</td>
<td>Cyanosis (RESP 2) + Respiratory depression (RESP 7)</td>
</tr>
<tr>
<td></td>
<td>Pulmonary edema (RESP6)</td>
</tr>
<tr>
<td></td>
<td>Respiratory arrest</td>
</tr>
<tr>
<td></td>
<td>Abnormal pulmonary x-ray</td>
</tr>
<tr>
<td></td>
<td>Pleuritic chest pain/pain on deep breathing (RESP8)</td>
</tr>
<tr>
<td></td>
<td>Respiratory depression (RESP7)</td>
</tr>
<tr>
<td></td>
<td>Wheezing (RESP9)</td>
</tr>
<tr>
<td></td>
<td>Dyspnea, shortness of breath (RESP4, sign only)</td>
</tr>
<tr>
<td></td>
<td>Cough (RESP1)</td>
</tr>
<tr>
<td></td>
<td>Upper respiratory pain, irritation (RESP3)</td>
</tr>
<tr>
<td></td>
<td>Dyspnea, shortness of breath (RESP4, symptom)</td>
</tr>
</tbody>
</table>