09-OH-03

Committee: Occupational and Environmental Health

Title: Public Health Ascertainment and National Notification for Acute pesticide-related illness and injury

I. Statement of the Problem

CSTE position statement 07-EC-02 recognized the need to develop an official list of nationally notifiable conditions and a standardized definition for reporting each condition on the official list. The position statement also specified that each definition had to comply with American Health Information Community recommended standards to support "automated case reporting from electronic health records or other clinical care information systems." In July 2008, CSTE identified sixty-eight conditions warranting inclusion on the official list, each of which now requires a standardized reporting definition.

II. Background and Justification

Background[1]

Pesticides, by design, are toxic to certain life forms. Currently in the United States, there are over 20,000 registered pesticide products based on over 600 active ingredients. Domestic usage of pesticides is 2.3 billion pounds per year. Approximately 80 percent of all pesticide use involves the agricultural industry with the remainder used for home, garden, and structural pest control. The Environmental Protection Agency estimates that 10,000-20,000 physician-diagnosed pesticide poisonings occur each year among the approximately 3,380,000 U.S. agricultural workers. Annually, poison control centers receive over 100,000 calls involving acute exposure to pesticides. It is estimated that five-to-six percent of all reported poisonings are due to pesticides. In the United States, the agricultural industry has the highest rate of pesticide poisoning at 54 reported poisonings per 100,000 agricultural workers. Most of the reported pesticide morbidity results from exposure to insecticides, especially cholinesterase inhibitors. In Oregon and Washington, approximately half of the reported pesticide illnesses and injuries occur in non-occupational settings, e.g., residential pesticide applications, or drift from forestry or agricultural operations. Additional state-based surveillance programs in Arizona, California, Florida, Iowa, Louisiana, Michigan, New York, and Texas also gather data on pesticide poisonings.

Justification

Acute pesticide-related illness and injury meets the following criteria for a nationally and **routinely** notifiable condition, as specified in CSTE position statement 08-EC-02:

[1] Much of the material in the background is directly quoted from CSTE position statements 1996-15 and 1999-ENV, and CDC's Pesticide Illness & Injury Surveillance Website. See the References for further information on these sources.

- A majority of state and territorial jurisdictions—or jurisdictions comprising a majority of the US population—have laws or regulations requiring **routine** reporting of acute pesticide-related illness and injury to public health authorities
- CDC requests **routine** notification of acute pesticide-related illness and injury to NIOSH
- CDC has condition-specific policies and practices concerning the agency's response to, and use of, notifications.

III. Statement of the desired action(s) to be taken

CSTE requests that CDC adopt this standardized definition for acute pesticide-related illness and injury to facilitate more timely, complete, and standardized local and national ascertainment of this condition.

IV. Goals of Surveillance

To provide information on the temporal, geographic, and demographic occurrence of acute pesticide-related illness and injury to facilitate its prevention and control.

V. Methods for Surveillance

Surveillance for acute pesticide-related illness and injury should use the sources of data and the extent of coverage listed in Table V below.

Table V. Recommended sources of data and extent of coverage for ascertaining cases of acute pesticide-related illness and injury.

	Coverage	
Source of data for case ascertainment	Population-wide	Sentinel sites
clinician reporting	x	x
laboratory reporting	x	
reporting by other entities (e.g., hospitals, veterinarians, pharmacies, poison control centers)	x	
death certificates	x	
hospital discharge or outpatient records	x	
extracts from electronic medical records	x	
telephone survey		
school-based survey		
other — state worker compensation claim records, state departments of agriculture	x	

VI. Criteria for ascertaining cases of acute pesticide-related illness and injury

Reporting refers to the process of healthcare providers or institutions (e.g., clinicians, clinical laboratories, hospitals) submitting basic information to governmental public health agencies about cases of illness that meet certain reporting requirements or criteria. Cases of illness may also be ascertained by the secondary analysis of administrative health data or clinical data. The purpose of this section is to provide those criteria that should be used by humans and machines to determine whether a specific illness should be reported.[2]

A. Narrative description of criteria to determine how a case of acute pesticide-related illness and injury should be reported to, or ascertained by, public health authorities

Ascertain and submit any record, or report any illness or injury to public health authorities that meets *any* of the following criteria:

A person with documentation of new adverse health effects that are temporally-related to a documented pesticide exposure *and* one of the following:

- consistent evidence of a causal relationship between the pesticide and the health effects based on the known toxicology of the pesticide from commonly available toxicology texts, government publications, information supplied by the manufacturer, or two or more case series or positive epidemiologic investigations; *or*
- insufficient toxicologic information available to determine whether a causal relationship exists between the pesticide exposure and the health effects.

A person whose healthcare record contains a diagnosis of acute pesticide-related illness and injury.

A worker's compensation claim containing a diagnosis of acute pesticide-related illness and injury.

A person whose death certificate lists acute pesticide-related illness and injury as a cause of death or a significant condition contributing to death.

Health care professional's report of an individual diagnosed with acute pesticide-related illness and injury.

Other recommended procedures

- All cases of acute pesticide-related illness and injury should be submitted.

[2] "Human-based" criteria (described below under "A. Narrative") can be applied by medical care providers and laboratory staff based on clinical judgment and clinical diagnosis. Machine-based criteria (described below under "B. Table") can be applied using computerized algorithms that operate in electronic health record systems, including computerized records of laboratory test orders and laboratory test results; other clinical data systems (e.g., hospital discharge data systems serving multiple hospitals); or administrative data (e.g., healthcare provider billing data, vital records, and EMS data).

- Submission should be on-going and routine.
- Frequency of submission should follow the state health department's routine schedule.

B. Table of criteria to determine whether a case should be submitted to public health authorities

Table VI-B. Proposed Table of criteria to determine whether a case should be reported to public health authorities. Note: The following criteria are proposed for evaluation before general implementation. For purposes of currently implementing reporting the narrative description in VI-A, should be used.

Criterion	Reporting
healthcare record contains a diagnosis of acute pesticide-related illness or injury	S
compensation claim contains a diagnosis of acute pesticide-related illness or injury	S
death certificate lists acute pesticide-related illness or injury as a cause of death or a significant condition contributing to death	S
health care professional's report contains a diagnosis of acute pesticide-related illness or injury	S

Notes:
S = This criterion alone is sufficient to report a case.

C. Disease Specific Data Elements:

Disease specific data elements to be included in the initial report are listed below.

- Name of pesticide

- For individuals age 16 and older:
  - Current occupation job title
  - Current employer:
    - Name
    - Street address
    - Second address line
    - City
    - State
    - Zip code
    - Phone
    - Employer's industry type

VII. Case Definition for Case Classification

Narrative description of classification criteria

Clinical Description

This surveillance case definition refers to any acute adverse health effect resulting from exposure to a pesticide product (defined under the Federal Insecticide Fungicide and Rodenticide Act [FIFRA][3]) including health effects due to an unpleasant odor, injury from explosion of a product, inhalation of smoke from a burning product, and allergic reaction. Because public health agencies seek to limit all adverse effects from regulated pesticides, notification is needed even when the responsible ingredient is not the active ingredient.

A case is characterized by an acute onset of symptoms that are dependent on the formulation of the pesticide product and involve one or more of the following:

- Systemic signs or symptoms (including respiratory, gastrointestinal, allergic and neurological signs/symptoms)
- Dermatologic lesions
- Ocular lesions

This case definition and classification system is designed to be flexible permitting classification of pesticide-related illnesses from all classes of pesticides. Consensus case definitions for specific classes of chemicals may be developed in the future.

A case will be classified as occupational if exposure occurs while at work (this includes: working for compensation; working in a family business, including a family farm; working for pay at home; and, working as a volunteer Emergency Medical Technician (EMT), firefighter, or law enforcement officer). All other cases will be classified as non-occupational. All cases involving suicide or attempted suicide should be classified as non-occupational.

A case is notifiable to the national surveillance system when there is (see the Classification Criteria section for a more detailed description of these criteria):

- Documentation of new adverse health effects that are temporally-related to a documented pesticide exposure; AND
- Either of the following
    - Consistent evidence of a causal relationship between the pesticide and the health effects based on the known toxicology of the pesticide from commonly available toxicology texts, government publications, information supplied by the

[3] Pesticides are defined under the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) as any substance or mixture of substances intended to prevent, destroy, repel or mitigate insects, rodents, nematodes, fungi, weeds, microorganisms, or any other form of life declared to be a pest by the Administrator of the US EPA and any substance or mixture of substances intended for use as a plant regulator, defoliant, or desiccant. Pesticides include herbicides, insecticides, rodenticides, fungicides, disinfectants, wood treatment products, growth regulators, insect repellents, etc.

Please note that adverse health effects resulting from exposure to disinfectant products are not reportable in many states because the volume of reports could overwhelm the state=s surveillance system; therefore, these cases will not be routinely reported to the national surveillance system. However, states may collect data on health effects resulting from disinfectant exposure, and report relevant cases to the national surveillance system.

manufacturer, or two or more case series or positive epidemiologic investigations; OR

- Insufficient toxicologic information available to determine whether a causal relationship exists between the pesticide exposure and the health effects

Laboratory criteria for diagnosis

If available, the following laboratory data can confirm exposure to a pesticide:

- Biological tests for the presence of, or toxic response to, the pesticide and/or its metabolite (in blood, urine, etc.);
- Measurement of the pesticide and/or its metabolite(s) in the biological specimen
- Measurement of a biochemical response to the pesticide in a biological specimen (e.g., cholinesterase levels)
- Environmental tests for the pesticide (e.g., foliage residue, analysis of suspect liquid);
- Pesticide detection on clothing or equipment used by the case subject.

Classification Criteria

Reports received and investigated by state programs are scored on the three criteria provided below (criteria A, B, and C). Scores are either 1, 2, 3, or 4, and are assigned based on all available evidence. The classification matrix follows the criteria section (Table). The matrix provides the case classification categories and the criteria scores needed to place the case into a specific category. Definite, probable, possible, and suspicious cases (see the classification matrix) are notifiable to the national surveillance system. Additional classification categories are provided for states that choose to track reports that do not fit the criteria for national notification. (NIOSH Appendix 1 [see Section X References below] contains frequently asked questions (FAQs) that provide additional clarification on the classification criteria and use of the classification matrix. NIOSH Appendix 2 [see Section X References below] lists the characteristic signs and symptoms for several pesticide active ingredients and classes of pesticides.)

A. Documentation of Pesticide Exposure

1. Laboratory, clinical, or environmental evidence corroborates exposure (*at least one of the following must be satisfied to receive a score of "1"*):
   a. analytical results from foliage residue, clothing residue, air, soil, water or biologic samples;
   b. observation of residue and/or contamination (including damage to plant material from herbicides) by a trained professional
      [Note: a trained professional may be a plant pathologist, agricultural inspector, agricultural extension agent, industrial hygienist or any other licensed or academically trained specialist with expertise in plant pathology and/or environmental effects of pesticides. A licensed pesticide applicator not directly involved with the application may also be considered a trained professional.];
   c. biologic evidence of exposure (e.g., response to administration of an antidote such as 2-PAM, Vitamin K1, or repeated doses of atropine);

d. documentation by a licensed health care professional of a characteristic eye injury or dermatologic effects at the site of direct exposure to a pesticide product known to produce such effects (these findings must be sufficient to satisfy criteria B.1 under "documentation of adverse health effect");
e. clinical description by a licensed health care professional of two or more post-exposure health effects (at least one of which is a sign) characteristic for the pesticide as provided in NIOSH Appendix 2.

2. Evidence of exposure based solely upon written or verbal report (*at least one of the following must be satisfied to receive a score of "2"*):
   a. report by case;
   b. report by witness;
   c. written records of application;
   d. observation of residue and/or contamination (including damage to plant material from herbicides) by other than a trained professional;
   e. other evidence suggesting that an exposure occurred.

3. Strong evidence that no pesticide exposure occurred.

4. Insufficient data.

B. Documentation of Adverse Health Effect

1. Two or more new post-exposure abnormal signs and/or test/laboratory findings reported by a licensed health care professional.

2. At least one of the following must be satisfied to receive a score of "2":
   a. Two or more new post-exposure abnormal symptoms were reported. When new post-exposure signs and test/laboratory findings are insufficient to satisfy a B.1 score, they can be used in lieu of symptoms toward satisfying a B.2 score.
   b. Any new illness or exacerbation of pre-existing illness diagnosed by a licensed physician, but information on signs, symptoms and/or test findings are not available or insufficient for a B.1 or a B.2 score.

3. No new post-exposure abnormal signs, symptoms, or test/laboratory findings were reported.

4. Insufficient data (includes having only one new post-exposure abnormal sign, symptom, or test/laboratory finding).

C. Evidence Supporting a Causal Relationship Between Pesticide Exposure and Health Effects

1. Where the findings documented under the Health Effects criteria (criteria B) are:

   a. characteristic for the pesticide as provided in NIOSH Appendix 2, and the

temporal relationship between exposure and health effects is plausible (the pesticide refers to the one classified under criteria A), and/or;

b. consistent with an exposure-health effect relationship based upon the known toxicology (i.e. exposure dose, symptoms and temporal relationship) of the putative agent (i.e. the agent classified under criteria A) from commonly available toxicology texts, government publications, information supplied by the manufacturer, or two or more case series or positive epidemiologic studies published in the peer-reviewed literature;

2. Evidence of exposure-health effect relationship is not present. This may be because the exposure dose was insufficient to produce the observed health effects. Alternatively, a temporal relationship does not exist (i.e. health effects preceded the exposure, or occurred too long after exposure). Finally, it may be because the constellation of health effects are not consistent based upon the known toxicology of the putative agent from information in commonly available toxicology texts, government publications, information supplied by the manufacturer, or the peer-reviewed literature;

3. Definite evidence of non-pesticide causal agent;

4. Insufficient toxicologic information is available to determine causal relationship between exposure and health effects. (This includes circumstances where minimal human health effects data is available, or where there are less than two published case series or positive epidemiologic studies linking health effects to the particular pesticide product/ingredient or class of pesticides.)

Case Classification Matrix:

	CLASSIFICATION CATEGORIES[1]								
CLASSIFICATION CRITERIA	**Definite Case**	**Probable Case**		**Possible Case**	**Suspicious Case**	**Unlikely Case**	**Insufficient Information**		**Not** Asymptomatic[2]
A. Exposure	1	1	2	2	1 or 2	1 or 2	4	-	-
B. Health Effects	1	2	1	2	1 or 2	1 or 2	-	4	3
C. Causal Relationship	1	1	1	1	4	2	-	-	-

[1] Only cases meeting classifications of Definite, Probable, Possible and Suspicious are notifiable to the National Public Health Surveillance System. Additional classification categories are provided for states that choose to track the reports that do not fit the national notification criteria.

[2] The matrix does not indicate whether asymptomatic individuals were exposed to pesticides although some states may choose to track the level of evidence of exposure for asymptomatic individuals.

[3] Unrelated = Illness determined to be caused by a condition other than pesticide exposure, as indicated by a '3' in the evidence of 'Exposure' or 'Causal Relationship' classification criteria.

Classification Tables

Table VII-B lists the criteria that must be met for a case to be classified as confirmed (definite), probable (presumptive), or possible.

Table VII-B. Proposed table of criteria to determine whether a case is classified. Note: The following criteria are proposed for evaluation before general implementation. For purposes of current notification, the narrative description in VII-A, should be used.

	Case Definition			
Criterion	Definite	Probable		Possible
Evidence of Exposure				
positive laboratory test for pesticide in specimen from the case [A1a]*	O	O		
positive laboratory test for a characteristic effect of the pesticide (e.g., acetylcholinesterase depression) in specimen from the case [A1a]	O	O		
positive laboratory test for pesticide in the environment (e.g., foliage residue, clothing residue, air, soil, and water) [A1a]	O	O		
observation of pesticide residue or contamination (including damage to plant material from herbicides) by a trained professional [A1b]	O	O		
biologic evidence of effect of treatment for pesticide exposure (e.g., response to administration of an antidote such as 2-PAM, Vitamin K1, or repeated doses of atropine) [A1c]	O	O		
documentation by a licensed health care professional of a characteristic eye injury or dermatologic effects at the site of direct exposure to a pesticide product known to produce such effects [A1d]	O	O		
clinical description by a licensed health care professional of two or more post-exposure health effects (at least one of which is a sign) characteristic for the pesticide, as provided in NIOSH Appendix 2 [A1e]	O	O		
written or verbal report by a case-person of exposure to a pesticide [A2a]			O	O

Criterion	Case Definition			
	Definite	Probable		Possible
written or verbal report by a witness of exposure of the case-person to a pesticide [A2b]			O	O
written record of application of pesticide to place where the case-person was exposed [A2c]			O	O
observation of residue or contamination (including damage to plant material from herbicides) by other than a trained professional [A2d]			O	O
other evidence suggesting that an exposure occurred [A2e]			O	O
Health Effect				
two or more new post-exposure abnormal signs, diagnostic tests, or laboratory findings consistent with pesticide exposure (NIOSH Appendix 2), as reported by a licensed health care professional [B1]	N		N	
two or more new post-exposure abnormal symptoms (NIOSH Appendix 2) consistent with pesticide exposure [B2a]		O		O
new illness or exacerbation of pre-existing illness consistent with pesticide exposure (NIOSH Appendix 2), as diagnosed by a licensed physician [B2b]		O		O
Causal Relationship				
health effects are characteristic for the pesticide, as provided in NIOSH Appendix 2 [C1a]	N	N	N	N
health effects followed exposure to the pesticide and occurred within a timeframe consistent with the known health effects for the pesticide [C1a]	N	N	N	N
health effects are consistent with an exposure-health effect relationship based upon the known toxicology (i.e. exposure dose, symptoms, and temporal relationship) of the putative agent [C1b]				
Epidemiological risk factors				

	Case Definition			
Criterion	Definite	Probable		Possible
occupational exposure to pesticide	C	C	C	C
non-occupational exposure to pesticide	C	C	C	C

Notes:
N = All "N" criteria in the same column—in conjunction with at least one of any "O" criteria in each category (e.g., evidence of exposure and health effects) in the same column—are required to classify a case.
O = At least one of any "O" criteria in each category (e.g., evidence of exposure and health effects) in the same column is required to classify a case.
C = This finding corroborates (i.e., supports) the diagnosis of—or is associated with—acute pesticide-related illness and injury, but is not included in the case definition.
* The letters and number in square brackets refer to SectionVII A-C above ("Narrative description of classification criteria").

VIII. Period of Surveillance

Surveillance should be on-going.

IX. Data sharing/release and print criteria

- Notification to CDC/NIOSH of definite, probable, possible, and suspicious cases is recommended.
- Data will be analyzed and findings will be disseminated through peer-reviewed publications, MMWR articles, bi-annual SENSOR-Pesticides workshops and the NIOSH/CDC Web site. A national aggregated, de-identified dataset is prepared 18 months after the close of the calendar year (e.g. 2007 data will be available by July 2009) and disseminated to states that contributed data to the dataset.

- Analytic findings will be shared with participating states before the findings are submitted for peer review and before the findings are made publicly available.
- Limited data are available at the NIOSH/CDC Web site. Data are posted to the Web site after a lag of about 4 years to ensure that state and federal partners have sufficient time to asses the quality of the data. Cell sizes less than 5 are withheld from release.
- Requests for re-release of case data are referred to the SENSOR-Pesticides coordinator at NIOSH. Recipients of data are required to sign a data release agreement or request the data through FOIA. Released data is de-identified.

X. References

1. Council of State and Territorial Epidemiologists (CSTE). Adding acute pesticide poisoning/injuries (APP/I) as a condition reportable to the National Public Health

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3. Council of State and Territorial Epidemiologists (CSTE). CSTE official list of nationally notifiable conditions. CSTE position statement 07-EC-02. Atlanta: CSTE; June 2007. Available from: http://www.cste.org.

4. Council of State and Territorial Epidemiologists (CSTE). Criteria for inclusion of conditions on CSTE nationally notifiable condition list and for categorization as immediately or routinely notifiable. CSTE position statement 08-EC-02. Atlanta: CSTE; June 2008. Available from: http://www.cste.org.

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6. Council of State and Territorial Epidemiologists, Centers for Disease Control and Prevention. CDC-CSTE Intergovernmental Data Release Guidelines Working Group (DRGWG) Report: CDC-ATSDR Data Release Guidelines and Procedures for Re-release of State-Provided Data. Atlanta: CSTE; 2005. Available from: http://www.cste.org/pdffiles/2005/drgwgreport.pdf or http://www.cdc.gov/od/foia/policies/drgwg.pdf.

7. National Institute for Occupational Safety and Health (NIOSH) [Internet], Centers for Disease Control and Prevention, Department of Health and Human Services. Appendix 1: frequently asked questions about the case definition [for pesticide-related illness and injury cases reportable to the National Public Health Surveillance System]. Atlanta: CDC. Available from: http://www.cdc.gov/niosh/topics/pesticides/case/html. Revised: 2000 Jan 31. Accessed: 2008 Oct 28.

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http://www.cdc.gov/niosh/topics/pesticides/case/html. Revised: 2003 Jul 23; updated 2005 Apr 15. Accessed: 2008 Oct 28.

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