Case Definition for Acute Pesticide-Related Illness and Injury Cases Reportable to the National Public Health Surveillance System

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) with the exception that disinfectants are excluded[1]) including health effects due to an unpleasant odor, injury from explosion of the 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 reportable to the national surveillance system when there is (see the Classification Criteria section for a more detailed description of these criteria):

- Documentation of two or more new adverse health effects that are temporally-related to a documented pesticide exposure; AND
- 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 casual relationship exists between the pesticide exposure and the health effects

Laboratory criteria for diagnosis

If available, the following laboratory data may confirm the diagnosis of acute pesticide-related illness or injury:

- 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. Scores are either 1, 2, 3, or 4, and are assigned based on all available evidence. The classification matrix follows the criteria section. 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 reportable 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 reporting. (Appendix 1 contains frequently asked questions (FAQs) that provide additional clarification on the classification criteria and use of the classification matrix. Appendix 2 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 corroborate 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 K_1, 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;
   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 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. Two or more new post-exposure abnormal symptoms were reported. When new post-exposure signs and test/laboratory findings are insufficient to satisfy a B1 score, they can be used in lieu of symptoms

toward satisfying a B2 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 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.)

Table 1 ~ Case Classification Matrix:

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

[1] Only reports meeting case classifications of Definite, Probable, Possible and Suspicious are reportable 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 reporting 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.

Comment

For information regarding acute occupational pesticide-related illness and injury, contact the National

Institute for Occupational Safety and Health at 1-800-35-NIOSH. For information about acute non-occupational pesticide-related illness and injury, contact the National Center for Environmental Health (NCEH) 404-639-2530. For information concerning regulation and use of pesticides, contact the Office of Pesticide Programs, US EPA, at 703-305-5336. The National Pesticide Telecommunications Network (1-800-858-7378) provides information about pesticides, acute pesticide-related illness and injury, and the toxicology and environmental chemistry of pesticides.

For more information about this case definition contact Geoffrey M. Calvert, MD, MPH at NIOSH, telephone 513-841-4448, email: jac6@cdc.gov; or Kim M. Blindauer, DVM, MPH, at NCEH, telephone 404-639-2576, email: kfb7@cdc.gov.

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1. 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. Certain states may collect data on health effects resulting from a few selected disinfectants (e.g. glutaraldehyde). These may be reported to the national system as a special project if it is determined that a need exists.

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TABLE 2. Number and percentage of persons with mosquito-control insecticide–related illnesses, by type of insecticide exposure, age group, and severity* of illness — nine states†, 1999–2002

Characteristic	High		Moderate		Low		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Insecticide								
Malathion	0		18	(40.0)	46	(52.9)	**64**	**(48.1)**
Malathion + pyrethrin	0		0		2	(2.3)	**2**	**(1.5)**
Malathion + pyrethroid	0		1	(2.2)	1	(1.2)	**2**	**(1.5)**
Naled	0		4	(8.9)	19	(21.8)	**23**	**(17.3)**
Sumithrin	1	(100.0)	18	(40.0)	5	(5.8)	**24**	**(18.1)**
Resmethrin	0		4	(8.9)	6	(6.9)	**10**	**(7.5)**
Fenthion	0		0		2	(2.3)	**2**	**(1.5)**
Other§	0		0		6	(6.9)	**6**	**(4.5)**
Age group (yrs)								
0–5	0		1	(2.2)	0		**1**	**(0.8)**
6–19	0		7	(15.6)	22	(25.3)	**29**	**(21.8)**
20–39	0		13	(28.9)	21	(24.1)	**34**	**(25.6)**
40–59	1	(100.0)	22	(48.9)	33	(37.9)	**56**	**(42.1)**
≥60	0		2	(4.4)	6	(6.9)	**8**	**(6.0)**
Unknown	0		0		5	(5.8)	**5**	**(3.8)**
Total	**1**	**(0.8)**	**45**	**(33.8)**	**87**	**(65.4)**	**133**	**(100.0)**

*Defined by using the Severity Index for Use in State-Based Surveillance of Acute Pesticide-Related Illness and Injury (*4*).
†Arizona, California, Florida, Louisiana, Michigan, New York, Oregon, Texas, and Washington.
§Chlorpyrifos (n = one), permethrin (n = one), petroleum hydrocarbons (n = two), pyrethrins (n = one), and temephos (n = one).

mosquito control and benefit the public by controlling populations of mosquitoes that transmit diseases that affect humans. Reported symptoms associated with these insecticides were temporary and included dermal, ocular, and upper and lower respiratory tract irritation and exacerbation of conditions such as asthma. These health effects might represent irritant or allergic responses, to either the insecticide or its carrier (*5,7,8*). Anxiety about insecticide use for mosquito control also might have been responsible for symptoms in some persons.

The findings in this report are subject to at least three limitations. First, the number of reported cases is probably an underestimate of the true magnitude of illnesses associated with mosquito-control efforts. Affected persons who did not seek medical care or whose symptoms were not reported to a surveillance system could not be identified; even if these persons had sought medical care, their illness might not have been recognized as insecticide-related, and even if they had received a proper diagnosis, their cases might not have been reported. Second, only nine states have pesticide poisoning surveillance systems, and the data in this report might not be representative of the 41 states without such surveillance systems. Finally, although all cases were consistent with case definition criteria, the possibility of false positives cannot be excluded. Because clinical findings of pesticide poisoning are nonspecific, especially when of mild severity, and no standard diagnostic test exists, some illnesses related temporally to insecticide exposures might be coincidental and not caused by the exposures.

To reduce potential risks from insecticide exposure, CDC recommends the use of integrated pest management strategies for mosquito-control programs that emphasize mosquito larval control, reduction of breeding sites (e.g., human-made collections of stagnant water such as unchlorinated swimming pools, discarded tires or other containers, and bird baths), and judicious use of insecticides to control adult mosquito populations when quantitative measures suggest an elevated risk for human infection or in community settings when extensive immature mosquito larval habitats cannot be controlled (*9,10*). When insecticides are used, public health agencies should inform the public when and where spraying will occur and communicate how to reduce the likelihood of exposure. To avoid direct exposure from passing spray trucks, public health agencies should ensure that visible and audible warnings are made before spraying. Persons with exposure-related health concerns should consult their health-care providers. To prevent exposures from improper application methods, insecticide handlers and applicators should be trained in proper insecticide handling and application methods and in the use of appropriate personal protective equipment.

References

1. U.S. Environmental Protection Agency and CDC. Joint statement on mosquito control in the United States from the U.S. Environmental Protection Agency (EPA) and the U.S. Centers for Disease Control and Prevention (CDC). Available at http://www.epa.gov/pesticides/factsheets/mosquitojoint.htm.
2. CDC. Case definition for acute pesticide-related illness and injury cases reportable to the National Public Health Surveillance System. Available at http://www.cdc.gov/niosh/pestsurv/pdfs/pest-casdef2000.pdf.