

Pesticide-Related Illness and Injury

PROTOCOL CHECKLIST

- Incident report received and logged ([page 7](#))
- Client interviewed
- Begin collecting information for the Pesticide Incident Monitoring/Reporting Form ([page 8](#))
- Conduct enhanced surveillance for additional cases
- Notify the Bureau of Epidemiology (BOE) to coordinate notification of regulatory agencies and other appropriate partners ([page 12](#))
- Medical record received
- Laboratory report received
- Field investigation report received
- Case investigation completed
- Case classified according to the surveillance case definition ([page 3](#))
- Case entered into Merlin ([page 10](#))
- Feedback provided ([page 12](#))
 - Investigation partners
 - Exposed person(s)/proxy(ies)
- Investigation closed

Pesticide-related illness and injury

1. DISEASE REPORTING

A. Purpose of reporting and surveillance

1. To identify high-risk pesticides and use practices.
2. To identify targets for intervention and prevention activities.
3. To provide education and support for physicians and other health care providers.

B. Legal reporting requirements

1. Laboratories, physicians, and emergency responders are required to report pesticide poisonings to the county health department (CHD) within one working day of identification/diagnosis.

C. County health department investigation responsibilities

1. Begin investigation on the same day as notification.
2. All persons reported with pesticide-related illness or injury should be entered into Merlin reporting system.
3. Utilize the phone numbers below for further information:
 - 1-800-222-1222 (Florida Poison Control Center, available 24/7)
 - 1-800-606-5810 (DOH pesticide hotline, Mon-Fri 8 AM to 5 PM EST)

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic agents

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 U.S. Environmental Protection Agency (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 Florida.

Common pesticides affecting human health are:

- **Organophosphate and carbamate poisonings:** affects cholinesterase level (acetylcholinesterase), which inactivates acetylcholine and results in pesticide-poisoning symptoms such as fatigue, lightheadedness, nausea, vomiting, headaches, and seizures.
- **Paraquat and diquat poisoning:** Contact with paraquat via inhalation, ingestion, ocular, or skin routes of exposure can cause severe health effects including pulmonary fibrosis, pulmonary edema, erythema, dermatitis, ulceration of the mouth, and brain damage. Exposure to diquat causes corrosive effects to tissue, including the skin and gastrointestinal tract. Systemic toxicity, including kidney failure and central nervous system toxicity, is usually associated with diquat ingestion. Unlike paraquat, diquat is not selectively concentrated in the lung and is not known to directly cause pulmonary fibrosis.

B. Identification

Pesticide related illnesses often have clinical manifestations similar to a wide range of other common medical conditions (influenza, cold). Pesticide exposure produces health effects in humans that depend on the agent, the exposure scenario, and individual susceptibility. Please see the National Institute for Occupational Safety and Health (NIOSH) list of signs and symptoms for several pesticides at www.cdc.gov/niosh/topics/pesticides/pdfs/pest-cd2app2v2.pdf

An exposure and occupational history is critical for diagnostic, therapeutic, rehabilitative, and public health reasons. An adequate history is needed to determine an environmental or occupational exposure that could cause the illness or exacerbate an existing medical condition. It is also very important to obtain information on pesticide products to which the patient may have been exposed. It is also recommended that the following be obtained:

- Pesticide labels are required by the Environmental Protection Agency. The label provides the Registration Number that is very helpful when contacting the Florida Poison Information Center Network (FPICN) (1-800-222-1222) or the National Pesticide Information Center hotline (1-800-858-7378) for assistance.
- Safety Data Sheet (SDS): all manufacturers are required to provide SDS for any chemicals they produce or import. Employers are required to keep copies of SDS. These will contain material identification, ingredients, occupational exposure limits, and data on the following characteristics: physical fire and explosion, reactivity, health hazards, and special protection, as well as spill, leak, and disposal procedures, special precautions, and comments.

D. Pesticide-related illness in Florida

NIOSH has been collecting standardized information about acute occupational pesticide exposure from selected states since 1998 under the Sentinel Event Notification System for Occupational Risk (SENSOR) program. The Florida Department of Health (DOH) annually reports aggregated data (without case identifiers) to the SENSOR program. From 2002 through 2016, 3,464 cases of pesticide-related illnesses and injuries were reported in Florida, and 481 were identified as work-related.

3. CASE DEFINITIONS

A. Clinical description

Any acute adverse health effect resulting from exposure to a pesticide product (defined under FIFRA¹ with the exception that disinfectants are excluded) including health effects due to an unpleasant odor, injury from explosion of a product, inhalation of smoke from a burning product, and allergic reaction. Symptoms typically involve one or more of the following:

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

B. 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.), which may include;

- Measurement of the pesticide and/or metabolite(s) in the biological specimen
- Measurement of a biochemical response to 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.

C. Case classification criteria

Reports received and investigated are scored using three criteria (criteria A, B, and C). Scores are either 1 or 2, and are assigned based on all available evidence. The classification matrix follows the criteria section ([Table 1](#)). The matrix provides the case classification categories and the criteria scores needed to place the case into a specific category.

Confirmed and probable cases (see the classification matrix) are reportable. Suspect (i.e. possible and suspicious) cases are reportable for only occupationally exposed or cluster (two or more related cases) associated cases.

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.

D. Criteria 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 A1*):
 - Analytical results from foliage residue, clothing residue, air, soil, water, or biologic samples;
 - Observation of residue and/or contamination (including damage to plant material from herbicides) by a trained professional;²
 - Biologic evidence of exposure (e.g., response to administration of an antidote such as 2-PAM, Vitamin K, or repeated doses of atropine);
 - Documentation by a licensed health care professional of a characteristic eye injury or dermatological effects at the site of direct exposure to pesticide product;
 - 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.
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 A2*):
 - Report by case;
 - Report by witness;
 - Written records of application;
 - Observation of residue and/or contamination (including damage to plant material from herbicides) by other than a trained professional;
 - Other evidence suggesting that exposure occurred.

E. Criteria 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 (*this is B1 score*).
2. At least one of the following must be satisfied (*to receive a score of B2*):
 - Two or more new post-exposure abnormal symptoms 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 towards satisfying a B2 score);
 - 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 B.2.a score.

F. Criteria C: Evidence supporting a causal relationship between pesticide exposure and health effects

1. Causal relationship between pesticide exposure and health effects exists (*at least one of the following must be satisfied to receive a score of C1*):
 - Health effects (in criteria B) are characteristic for the pesticide and the temporal relationship between exposure and health effects is plausible;
 - Health effects (in criteria B) 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 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-review literature
2. Insufficient toxicological information is available to determine causal relationship between exposure and health effects. This includes circumstances where minimal human health effects data are available, or where there are less than two published case series or positive epidemiologic studies linking health effects to exposure to the particular pesticide product/ingredient or class of pesticides (*this is C2 score*).

Table 1 - Case Classification Matrix*

CLASSIFICATION CATEGORIES					
CLASSIFICATION CRITERIA	Confirmed Case		Probable Case	Suspect Case	
				Possible Case	Suspicious Case
A. Exposure	1	1	2	2	1 or 2
B. Health Effects	1	2	1	2	1 or 2
C. Causal Relationship	1	1	1	1	2

*Suspect (i.e., possible and suspicious) cases which are not part of a cluster (two or more related cases) or occupationally related pesticide exposures no longer need to be reported (typically limited household exposures).

Comment

The Florida Poison Information Center Network (1-800-222-1222) can provide emergency information to physicians and the public. For information regarding pesticide product registration, labeling, and distribution, contact the Florida Department of Agriculture and Consumer Services, Bureau of Licensing and Enforcement, at 850-617-7997. For information regarding this case definition, contact the Florida Department of Health, Bureau of Epidemiology, Pesticide Poisoning Surveillance Program at 850-245-4401.

For information concerning regulation and use of pesticides, contact the U.S. EPA's Office of Pesticide Programs at 703-305-5336. For information concerning technical services related to pesticides and farm worker protection, contact the Florida Department of Agriculture and Consumer Services, Bureau of Scientific Evaluation and Technical Assistance, at 850-617-7917.

¹ Pesticides are defined under 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 USEPA and any substance or mixture of substance 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.

² 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 may also be considered a trained professional.

4. LABORATORY TESTING

The presence of the pesticide or pesticide metabolites in the biological specimen (blood, urine, etc.) is usually indicative of pesticide poisoning. Some commercial laboratories have the capability to test for certain pesticides or pesticide metabolites.

Note: There are specific laboratory tests done depending on the chemical class of the pesticide. See the EPA book on Recognition and Management of Pesticide Poisonings (Sixth Edition); section II to IV for more details (www2.epa.gov/pesticide-worker-safety/recognition-and-management-pesticide-poisonings).

Cholinesterase test results

Depression in cholinesterase levels may be indicative of poisonings due to exposures to organophosphate and carbamate insecticides. The cholinesterase test measures the biological response to pesticide exposure.

1. Upon receiving cholinesterase test results from the laboratory, review the test result and determine if there is a depression in the cholinesterase level of the patient.

A. With baseline test results for comparison

Note: the baseline cholinesterase level can be taken at pre-exposure or 60-90 days post exposure.

There is a depression in the cholinesterase level if:

For red blood cells (RBC), the test result is $\geq 30\%$ below the baseline test result.
For plasma, the test result is $\geq 40\%$ below the baseline test result.
For DOH reporting, cholinesterase level $\geq 20\%$ below the baseline test result is considered as depression.

B. Without baseline test result for comparison:

There is a depression in the cholinesterase level if the test result (RBC or plasma) is $\geq 15\%$ below the laboratory normal (reference) range. The laboratory normal range is usually found on the report to the right of the test result. If not, contact the laboratory reporting the test result to find out the normal range for the different test specimens. (i.e., RBC and plasma)

2. If the cholinesterase level indicates a depression, contact the physician who ordered the test to determine if the test was done to confirm pesticide poisoning.
3. If the test was done to confirm pesticide poisoning, request the medical records. Review the exposure history in the medical records for details about the poisoning event. If the exposure history is absent from the medical records, inform the physician that you will be contacting the patient to find out more information about his/her exposure.
4. Interview the patient for additional information about the exposure and resulting illness or injury. Use the [Pesticide Incident Monitoring \(PIM\)](#) reporting form as a guide when conducting the interview.
5. If the test was done for purposes other than pesticide poisoning confirmation, no further action is required.
6. Follow step-wise procedure below for investigating a case of pesticide exposure.

5. ROUTINE CASE INVESTIGATION

A. Case Investigation

1. Receive report

The process starts with a report about a possible pesticide exposure incident and pesticide-related illness and injury. Pesticide exposure incident reports are collected from the Florida Poison Information Center Network (FPICN), hospital emergency department (ED), and urgent care center chief complaints from participating facilities. These two data sources are captured in the DOH syndromic surveillance system ESSENCE-FL (Electronic Surveillance System for Early Notification of Community-based Epidemics). Other reporting sources include self-reporting from exposed persons, the public, media, and other non-traditional sources like farmworker advocacy groups and the Department of Agriculture and Consumer Services (DACS).

- Log all pesticide-related incidents (as per witness/self-report, health care provider, lab, media, etc.).
- Record the date and time of the report.
- Ask questions about the exposure incident (e.g., when, where, and how). Refer to [step 4](#) below.

Criteria for high priority incidents

High priority pesticide incidents are those that meet one or more of the following criteria:

- a. Incidents that result in a hospitalization or death, or;
- b. Incidents that involve four or more ill individuals, or;
- c. Incidents that occur despite following pesticide label instructions, or;
- d. Incidents that indicate the presence of a recurrent problem at a particular workplace and/or employer.

Note: these criteria should also be used to determine which incidents require a field investigation and post an EpiCom.

Anonymous reports are accepted, but it is essential that a telephone number of a proxy or contact person is available for follow up with the affected person(s). Interviews may be conducted over the phone or in person.

2. Review other available reports (e.g. media reports, exposed individuals, FPICN) (i.e., determine if the incident is related to pesticide exposure)

- Check for key words or statements that may indicate pesticide exposure such as pesticide spray, drift, spill, etc.
- Check for occupation type (e.g., farm worker, pesticide applicator, etc.)
- Check for length of time between exposure and health effects.

3. Review of suspected pesticide exposures

The information received should be reviewed to ensure that the exposure incident meets the surveillance requirements.

The investigator should ensure that:

- The report indicates a pesticide-related illness and injury as defined by the surveillance program (see [Case Definition](#)).
- There is a temporal relationship between the exposure and the health effects (i.e., the exposure must precede symptoms). Illness onset is within 30 days after exposure.

4. Record information pertinent to the case

Fill out a [Pesticide Incident Monitoring \(PIM\)/reporting form](#):

If the report is received by telephone or when you speak to the exposed or their proxy, ask the caller additional questions that could be useful for the investigation, such as:

- Number of persons who were exposed.
- Were persons decontaminated?
- How many persons were ill or hospitalized?
- Were children involved in the exposure incident?

Note: Ensure that information for all persons who were exposed is recorded. A separate PIM form should be completed for each person exposed and, if possible, a separate interview should also be conducted (helpful if there is a cluster of exposed persons). If the exposed person is a minor (≤ 17 years old), interview the parent or guardian. Do not interview the minor without consent of the parent or guardian. Please document consent in the Merlin case notes.

If self-reported, skip **step 5** and proceed to [step 6](#).

5. Verify report and update the initial incident/case report

(i.e., if evidence received is not substantial for illness/injury determination)

If the alleged exposed person cannot be contacted or the exposure cannot be verified, **STOP** and file report as “**insufficient information.**”

6. Determine investigation pathway

- If the illness is related to an acute pesticide exposure, then go on to [step 7](#).
- If the illness is related to a chronic pesticide exposure (e.g. birth defects, cancer cluster, mold remediation, etc.), **STOP**, record relevant information, and refer case to correct Department of Health (DOH) program coordinator who will assist in investigations on pesticide related issues.
- If the illness is not related to a pesticide exposure, **STOP**, refer report to the correct DOH program or state agency, and file as “**not a case.**”
- If the illness is non-occupational, non-cluster related, and limited (recovered without any medical advice or treatment), **STOP**, as these cases do not match case classification for definite and probable cases ([see case definition](#)).
- For special situations see [section 6A](#).

7. Request supporting documents, e.g., pesticide label, medical records, and investigation reports, from other agencies (if missing from the initial incident report)

8. Assess case to determine if further investigation is needed

Consult with health department staff: supervisor (CHD) and/or Chemical Disease Surveillance Program (CDSP) Coordinator (state office).

9. Classify cases

Note: See [case definition](#) section for more complete definition of cases.

Record findings and actions taken. Log all investigation time. Proceed to [step 11](#).

Note: For clusters or outbreaks, a more detailed investigation may be required. If this situation occurs then proceed to [step 10](#).

10. Detailed investigation of clusters or outbreaks

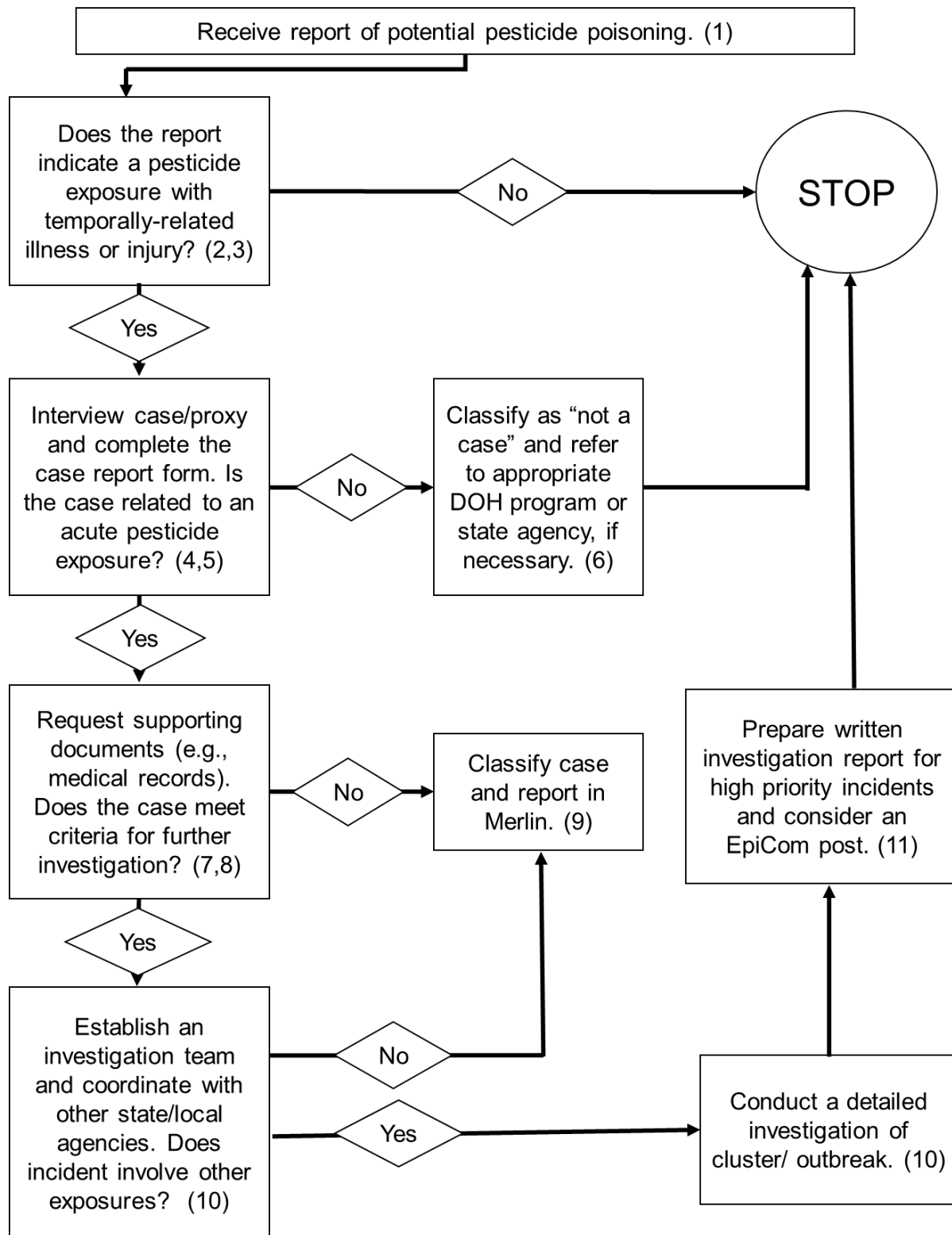
- Determine if a cluster of cases exist (two or more related cases).
- If not a cluster, proceed to [step 11](#).
- Broaden investigation to include all cases.
- Examine all possible sources of exposure.
- Analyze data, and present findings.

Note: When investigating a cluster of illnesses at a fixed worksite, school, residential institution, or a situation involving an exposed group of agricultural field workers, interview as many of the exposed persons as feasible. This will help to determine the range of symptoms, circumstances associated with symptoms, and circumstances that may have protected asymptomatic persons. If exposed persons received emergency decontamination or were transported to an emergency care facility, the investigator should also determine whether any of the emergency care providers were exposed and became symptomatic. If so, these persons should be included in case follow-up.

11. Complete final report and enter data in Merlin

- Report all cases of pesticide illness/injuries with definite and probable case classification (see [case definition](#)) in Merlin. Suspect (i.e., possible and suspicious) cases are reportable for only occupationally (work-related) exposed or cluster (two or more related cases) associated cases. Attach complete Pesticide Incidence Monitoring/Reporting Form along with other important documents (e.g., laboratory test reports, field investigation reports, pesticide label, SDS).
- Submit all other information on the case(s) to the CDSP at the state office by fax or mail.
- Prepare a detailed investigation report for high priority incidents and consider an EpiCom post. See “criteria for high priority incidents” on page eight (A1).

Pesticide-Related Illness and Injury Case Investigation Flow Chart:



Note: Numbers shows steps described under case investigations (see pages 7-10)

6. MANAGING SPECIAL SITUATIONS

A. Coordinating the investigation process outside DOH

When a referral is made to an external agency, do not release any personal identifier (i.e. name, address) of the exposed person unless he/she has agreed to the release of the information and agreed that the regulatory or enforcement agency may be contacted. Please document consent to release personal identifiers in Merlin case notes. The exposed person should also be told that he/she can contact the enforcement agency directly. An Enforcement Referral Form (contact the CDSP program for form) should be completed and sent to the agency indicating that verbal permission was given. A written release may be required for legally sensitive cases. The exposed person(s) must be informed about their rights to confidentiality and that the enforcement agency may not be able to protect their confidential information.

DOH/CDSP shall initiate an investigation and a response, without permission, if the exposure incident has serious public health implications. This is based on the perceived risk to other individuals, the nature of the exposure, and the severity of the illness or injury.

The following referral guideline should be adhered to for the incidents that involve Department of Agriculture and Consumer Services (DACCS):

- i. For cases that relate to agricultural workers or are due to misuse of pesticides according to label requirements, contact the Bureau of Licensing and Enforcement at 850-617-7997; or
- ii. For cases concerning consumer protection, worker safety and protection, and monitoring of pesticide applications to prevent the spread of mosquito borne diseases, contact the Division of Agriculture Environmental Services at 850-617-7900.

If the exposure incident falls outside the scope of DACCS, contact the responsible state agency:

- Department of Environmental Protection should be contacted for non-agricultural related environmental issues. www.dep.state.fl.us/
- Occupational Safety & Health Association (OSHA) area office in Fort Lauderdale, Tampa, or Jacksonville should be contacted for occupational exposures that do not involve farm workers. www.osha.gov/oshdir/fl.html
- Department of Business and Professional Regulations (DBPR) should be contacted for incidents involving patrons at a restaurant. www.myfloridalicense.com/dbpr/

Other state/local agencies and community organizations should be contacted for incidents that are not related to the aforementioned situations.

Note: All health-related issues should be investigated by DOH through the CDSP program and the CHDs.

Cases that require interagency investigations should be prioritized based on the sensitivity of the case and/or the national surveillance deadline for submitting cases to the aggregate

database. This priority list should be communicated to the external agency to allow consistency in meeting the time frame for completion of investigation and case closure.

The CDSP Coordinator should keep the external agency updated on the investigation.

B. Coordinating the investigation process inside DOH

For incidents that involve non-regulatory and other environmental issues (e.g., indoor air quality, water contamination, migrant and seasonal workers, group care facilities, etc.), contact the Bureau of Environmental Health within the Division of Disease Control and Health Protection for guidance. www.floridahealth.gov/environmental-health/index.html

7. ROUTINE PREVENTION

Prevention tips for pesticide poisoning:

A. When using pesticides:

- Always read the label first.
- Strictly follow the directions.

B. Use pesticides safely:

- Do not use products for pests that are not indicated on the label.
- Do not use more pesticide than directed by the label.
- Do not think that twice the amount will do twice the job.

C. Use protective measures when handling pesticides as directed by the label:

- Wear impermeable gloves, long pants, and a long-sleeve shirt.
- Change clothes after applying pesticides.
- Wash your hands immediately after applying pesticides.

D. Before applying a pesticide (indoors or outdoors):

- Remove children, their toys, and pets from the area to be sprayed.
- Do not put items back until the pesticide has dried or as specified by label instructions.

8. RESOURCES

A. Go to pesticide poisoning surveillance web page for most recent information and additional details: www.floridahealth.gov/healthy-environments/pesticide-poisoning/index.html

B. EPA book on Recognition and Management of Pesticide Poisonings (Sixth Edition): www2.epa.gov/pesticide-worker-safety/recognition-and-management-pesticide-poisonings