



Case study title:	Pesticides
Target group:	Clinicians, Public health professionals, general target group
Linked to modules:	Pesticides
Source of case study:	Environmental Health in Family Medicine – original author Margaret Sanborn Dept. of Family Medicine McMaster University
Case handling:	Use powerpoint presentation and/or handouts based on the case description. Stepwise approach.

Introduction

A four-year-old girl is brought in to an emergency department of a hospital in a rural area. It is a warm summer. She presents the following symptoms:

Rash on face and extremities for **half a day** (the symptoms started 1 hour after playing outside)

She had vague abdominal discomfort and vomiting for 2-3 hours.

She showed three brief (few seconds) episodes of shaking. She presented staring and verbal unresponsiveness over past hour, with no change in level of consciousness or incontinence.

Examination:

She is afebrile, her heart rate is 120/min, the blood pressure is **80/60, and her** respiratory rate 26 minute. Ear, nose, throat examination is normal.

The girl is awake but not talking spontaneously. Neurologic exam otherwise normal.

Chest and abdominal exams normal.

A fine maculopapular rash on face, neck, arms, and very faint rash on lower legs can be seen.

After arriving in emergency, the child has a further episode of shaking and verbal unresponsiveness.

QUESTION 1: What is your diagnosis? Is there any relevant differential diagnosis?

QUESTION 2: What are the possible triggers for this episode of illness? What else do you want to know about the medical or family history, or personal exposure history, to investigate this? Make sure you include environmental exposures that might be triggers, using the paediatric environmental history from this training module. Consider items on: Community, Housing/Hobbies, Occupation, Personal exposure.



NEW INFORMATION

Community:

Parents reported that the lawns on both sides had been sprayed with pesticides early that morning. The child played outside about three hours after the spraying. The rash started one hour later, and the other symptoms followed about 2-3 hours after playing outside.

Home / Hobbies:

No access to drugs, alcohol, or other toxins in the house.

No hobbies involving chemicals or solvents taking place in the house.

Occupation:

Father is a office clerk and mother works part-time as an accountant. No work-related exposures are evident.

Personal:

She is receiving no medications or alternative medicines. Neither parent smokes.

Other history: The child has no previous history of seizures. There is no family history of seizures or metabolic disorders. The child is Caucasian.

QUESTION 3: Does anything in the exposure history fit with this child's presenting illness?



Answer 3. The child in this case had clinical findings in three systems which can be affected by pesticides: a rash, GI effects, and CNS effects. Symptom onset occurred after playing outside, which is suggestive of a pesticide exposure. Recent spraying of the two closest lawns was reported in the history.

Question 4. What investigations would you order for this child?



Answer 4. Poison control incorrectly advised the treating emergency physician that there was no risk of the unknown pesticides producing such symptoms. No cholinesterase levels or other tests directed at finding a pesticide exposure were done. The child had extensive other investigations including drug and alcohol levels, venous gases, Complete Blood Count, electrolytes, urine, and a CT head scan, which were all normal.

Question 5. Who would you consult for advice if needed?
--



Answer 5. Information on the specific pesticides sprayed is important in treating this child. In some municipalities, the lawn care company would be required to post a sign on the area sprayed naming the chemicals used. Otherwise, the parents should be asked to obtain this information from the lawn care company, specifically requesting Material Safety Data Sheets (MSDS Form) for all pesticides applied, while treatment of the child proceeds.

Exposure to the herbicide 2,4-D may cause a dermatitis, as the acid causes skin irritation especially in combination with heat exposure. If the history suggests significant dermal exposure, a urine sample should be taken acutely and refrigerated for subsequent analysis of pesticide level. If further history revealed that insecticides had been sprayed adjacent to the child's play area, the appropriate diagnostic test for this child is a blood and serum cholinesterase. A depressed initial value is diagnostic; but the test is useful even if the initial value is normal. The RBC cholinesterase activity may take several days to reach its minimum, and 1-3 months to recover. Because serum cholinesterase has a wide normal range, follow-up testing in several weeks will often show a rebound increase of 25% or more, which is diagnostic of pesticide toxicity. If the child had symptoms suggestive of a cholinergic poisoning, eg. salivation, lacrimation, urination, diarrhea, or a productive cough, the probability of organophosphate poisoning is increased, and immediate atropine therapy is indicated. This poisoning could also show miosis on physical exam.

Case Outcome: Because the child had on observation no fever and no further seizures she was released from the emergency department without appropriate diagnostic tests or treatment for pesticide exposure.

There are several mnemonics for remembering clinical effects of organophosphate poisoning.

One is "MUDDLES": Miosis, Urination, Diarrhea, Diaphoresis, Lacrimation, Excitation of central nervous system, Salivation

Another is "SLUD": Salivation, Lacrimation, Urination, Diarrhea.



Additional information

Treatment of Acute Pesticide Poisoning

Health-care workers are at risk of significant exposure when treating pesticide poisonings. Rubber (not latex or vinyl) gloves should be worn when doing decontamination or handling body fluids.

1. Treatment must proceed based on exposure history and clinical findings, rather than awaiting confirmation by lab analysis.

2. Decontamination and resuscitation

Airway protection, and decontamination measures including removal of clothing and vigorous repeated washing of skin, hair and nails with soap and water is indicated for exposure to all classes of pesticides. In general, gastric lavage, inducing emesis, and catharsis are not useful. Activated charcoal may be useful within 60 minutes of ingestion.

If organophosphate or carbamate exposure is suspected, the cholinesterase inhibition should be treated. If cholinergic symptoms and signs are present, an organophosphate or N-methyl carbamate poisoning should be suspected and treated while confirmatory lab tests are in progress:

3. Atropine

This child may have benefited from treatment with atropine (0.05-0.1 mg/kg IV every 15 minutes) given after starting 100% oxygen, on admission. Atropine is especially helpful in reversing CNS effects such as coma, and the transient improvement in symptoms after atropine helps confirm that the clinical symptoms are related to poisoning with a cholinesterase-inhibiting insecticide. It can be given IM or via ET tube if necessary.

4. More severe insecticide poisonings, usually with organophosphates, may also require use of the specific antidote pralidoxime chloride (PAM or 2-PAM), a selective antagonist which allows reactivation of cholinesterase by competing with the poison. Cholinesterase levels should be drawn prior to giving this drug. The dose for children under 12 years is 20-50 mg/kg IV, mixed in 100 cc of normal saline, infused slowly over at least 30 minutes. A repeat dose in 1-2 hours is usually required. Blood pressure monitoring is required as the drug may cause hypertension.

5. Benzodiazepines should be used to control seizures:

Children: Diazepam 0.2-0.5 mg/kg IV every 5 minutes

Under age 5: max. dose 5 mg., over age 5 max. dose 10 mg.

OR Lorazepam 0.05-0.10 mg/kg IV over 2-5 minutes

Prevention Messages

1. Cosmetic spraying of lawns and gardens may pose health risks, especially for young children, and should be avoided. While insecticides (eg. malathion) are most toxic, herbicides and fungicides also have subtle neurobehavioral and CNS effects(9), and non-specific effects such as fatigue, nausea, and diarrhea.

2. Young children receive some of their most severe pesticide exposures from indoor spraying of flea and tick pesticides (3,4). This can be avoided by the use of other flea control products, such as injections or pills, on house pets.

Exposure to insecticides sprayed indoors should be avoided by pregnant women because of potential fetal effects(1).

Removal of children from living quarters for an extended period may be necessary for safe fumigation of an infested building.

3. Insect repellants (active ingredient DEET) should not be used on children under age two. In older children, use on clothing or exposed skin- do not cover with clothing as this enhances systemic absorption.



4. Essential spraying in agricultural settings should be done with adequate protection for the applicator (respirator, overalls and gloves), and spray clothes should be laundered separately.

Pesticides are readily absorbed through the skin, and should be washed off with soap or shampoo and warm water within 30 minutes to prevent absorption.

5. Agricultural spraying should be done with adequate warning to minimize incidental exposure of pregnant women and children.

6. Because of apparent paternal pesticide effects on pregnancy outcomes such as miscarriage and preterm delivery, it may be prudent to advise men with heavy seasonal pesticide exposures not to attempt to produce pregnancies during times of heavy exposure and for three months after (10).

References

1. Infante-Rivard, C et al Risk of childhood leukemia associated with exposure to pesticides and with gene polymorphisms. *Epidemiology* 10(5): 481 -87, 1999.
2. Kristensen P et al Cancer in offspring of parents engaged in agricultural activities in Norway: Incidence and risk factors in the farm environment. *Int J Cancer* 65, 39-50, 1996.
3. Daniels, J L Olshan A F Savitz D A Pesticides and childhood cancers. *Env Health Perspectives* 105 (10) 1069-77, 1997.
4. Pogoda J M and Preston-Martin, S Household pesticides and the risk of pediatric brain tumors. *env. Health Perspectives* 105(11), 1214-20, 1997.
5. Bradman, M A, et al Pesticide exposures to children from California's central valley: results of a pilot study. *J Exp Anal Env Epi* 7(2): 21 7-34, 1997.
6. Zweiner R J and Ginsburg, C M . Organophosphate and carbamate poisoning in infants and children. *Pediatrics* 81 :121-6, 1988.
7. Sofer S Tal A Shahak E Carbamate and organophosphate poisoning in early childhood. *Pediatr Emerg Care* 5(4), 222-5, 1989.
8. Klein-Schwartz W and Smith G S Agricultural and horticultural chemical poisonings: Mortality and morbidity in the United States *Ann Emerg Med* 29(2) 232-38, 1997.
9. Guillet E et al An anthropological approach to the evaluation of preschool children exposed to pesticides in Mexico. *Env. Health Perspect* 106: 347-53, 1998.
10. Savitz, D A et al Male pesticide exposure and pregnancy outcome. *Am J Epi* 146(12):1025-36, 1997.

This report was produced by a contractor for Health & Consumer Protection Directorate General and represents the views of the contractor or author. These views have not been adopted or in any way approved by the Commission and do not necessarily represent the view of the Commission or the Directorate General for Health and Consumer Protection. The European Commission does not guarantee the accuracy of the data included in this study, nor does it accept responsibility for any use made thereof.