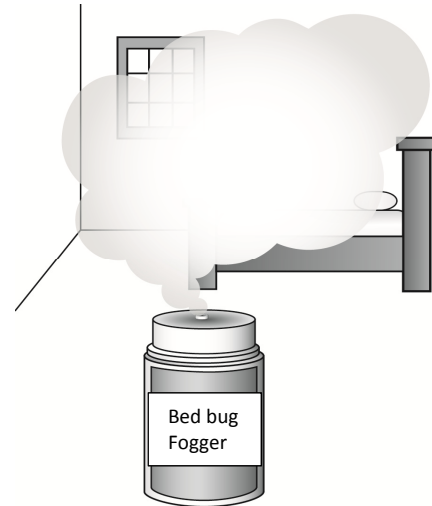


# A Case of Pesticide Poisoning

## Part I: A Case of Bed bugs

Samantha noticed bug bites on her legs. She also found bug bites on her baby Carly's arms and neck. A few days later she discovered spots of blood and tiny dead bed bugs on her bed and in Carly's crib.

She bought bed bug foggers and cans of bed bug spray. That evening, she set up the foggers in her bedroom and Carly's bedroom. She had heard bed bugs are very hard to get rid of so she sprayed all of the sheets and mattresses with the bed bug spray.



The next morning Samantha felt like she was coming down with the flu. Her face tingled and felt numb and warm. She had a cough, stuffy nose, headache, and mild nausea. Carly had the same symptoms and her asthma seemed worse. Samantha also needed to take her dog and cat to the vet because they were vomiting and drooling.

1. List two things that you think might be causing Samantha's, Carly's, or their pets' symptoms.

- \_\_\_\_\_
- \_\_\_\_\_

## Part 2: What the Labels Say

Samantha took her dog and cat to the vet because she was worried that they had a disease carried by bed bugs. The vet reassured her that bed bugs do not carry cat, dog or human diseases. However, he explained that the pesticides often used to get rid of bed bugs are even more toxic for cats and dogs than they are for humans because their livers do not remove the pesticides quickly.

When Samantha told the vet that she had used bed bug foggers and sprays, he was concerned about not just the pets but also about Samantha and Carly. The vet told Samantha that it was important to go to the hospital emergency room because she and Carly might have pesticide poisoning too. He was most worried about Carly because a young child's liver is not as efficient at removing pesticides as an adult's liver.

When they got to the emergency room, Samantha told the doctors she and Carly might have been poisoned by bed bug pesticides. Luckily, Samantha had thought to bring the empty pesticide fogger and spray cans with her.

Use the information on the bed bug fogger and bed bug spray labels to answer questions 1–4.

1. Do the bedbug spray and bed bug fogger both contain pyrethroids? \_\_\_\_\_
  
2. Do the labels describe the symptoms of pyrethroid poisoning? \_\_\_\_\_
  
3. Samantha admitted that she had not read the entire label before using the pesticide. List at least six things that Samantha might have done wrong when she used the fogger and spray.
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
  
4. List two ways the fogger and spray labels could be improved to increase the likelihood that people read and understand the instructions on the labels.
  - \_\_\_\_\_
  - \_\_\_\_\_

### Part 3: Testing for Pyrethroid Metabolites

Pyrethroids may act as skin and respiratory allergens. Other symptoms include sneezing, nasal stuffiness, headache, nausea, incoordination, tremors, convulsions, facial flushing and swelling, and burning and itching sensations. Young children may have higher concentrations of pyrethroids because they are more likely to put contaminated hands and objects in their mouths.

The emergency room doctor explained that pyrethroids in the pesticide Samantha had used could enter the body by absorption through the skin, by inhalation, or by eating contaminated food. The doctor ordered medical tests to determine the concentration of pesticide metabolites in Samantha's and Carly's urine.

1. You will test urine samples from Samantha and Carly for the presence of pesticide metabolites. Pesticide metabolites are chemicals produced by the partial breakdown of pesticides.
  - a) Add 2 drops of Pyrethroid Test Solution to both circles of the plastic **Pyrethroid Metabolite Test Sheet**.
  - b) Add 2 drops of Samantha's urine the left circle of the Pyrethroid Metabolite Test Sheet.
  - c) Add 2 drops of Carly's urine to right circle of the Pyrethroid Metabolite Test Sheet.
  - d) Determine the concentration of pyrethroid metabolites in each of the samples by comparing the color of the samples on the test sheets to the color on the **Pyrethroid Test Color Chart**.

2. What conclusions can you draw from the test of Samantha's urine?

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3. What conclusions can you draw from the test of Carly's urine?

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4. Give two possible explanations for why Carly's urine might have more pyrethroid metabolites than Samantha's.

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- \_\_\_\_\_

## Part 4: Pesticides Made From Flowers

### Pyrethrin pesticides are derived from flowers, but are they safe?

Pyrethrins are natural insecticides that are harvested from chrysanthemum flowers. Pyrethroids are synthetic chemicals manufactured by changing the structure of the pyrethrin molecules to make them more stable in sunlight and more toxic for insects.



For at least a decade, pyrethrins and pyrethroids have been the insecticides of choice for consumers because they are safer for humans and the environment than previous pesticides such as DDT. Pyrethrins and pyrethroids are found in more than 3,500 pesticide products used to kill insects inside homes and on crops, yards, and gardens.

Both natural pyrethrins and synthetic pyrethroids paralyze and kill insects by interfering with nerve cell function. Insects are highly susceptible to these pesticides. Birds and mammals are less susceptible because they can break these chemicals down into less toxic substances.

Chemicals derived from flowers may sound safe. However, scientific research is needed to determine if pyrethrins and pyrethroids pose human health and ecological risks.

Base your answers to questions 1 through 3 in the information in the box above.

1. State two ways in which pyrethrin and pyrethroids are similar.

- \_\_\_\_\_
- \_\_\_\_\_

2. State two ways in which pyrethrins and pyrethroids are different.

- \_\_\_\_\_
- \_\_\_\_\_

3. In insects, what body system is most affected by pyrethroids?

\_\_\_\_\_

### Pyrethroid Effects on Human Health

Pyrethroids enter humans when they inhale pesticides that linger in homes and yards or when they eat vegetable, fruit and grain crops sprayed with pyrethroids. Research has shown that 75 percent of urine samples from U.S. adults and children contained low levels of pyrethroid metabolites. The concentrations of pyrethroid metabolites in children were more than 50 percent higher than the amounts found in adolescents and adults

Laboratory studies with mammals, such as mice and rats, have linked low levels of pyrethroid exposure to damage to the nervous system, endocrine system, excretory system, immune system, and reproductive system. Because humans are mammals, scientists are concerned pyrethroids may cause similar damage to these human systems.

Very little research has been done to evaluate the health effects of pyrethroids on human health. Since people are frequently exposed to low levels of these chemicals, it is critical that research be done to determine the health effects of pyrethroids on human body systems.

4. Even people who do not use pesticides have pyrethroid metabolites in their urine. State one way this could be explained.

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5. List four body systems that are harmed when laboratory mammals are exposed to low levels of pyrethroids.

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- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

6. Explain why scientists are concerned that exposure to low levels of pyrethroids may be harmful to humans.

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## Part 5: Pyrethroids and Your Environment

### **Pyrethroids and Biodiversity**

Pyrethroids are broad spectrum insecticides that kill most insects and spiders that come in contact with them. This includes not only pests such as ants, roaches, stinging insects, and bed bugs, but also beneficial insects. Pyrethroids kill honeybees and other insect pollinators that are essential for producing plant crops that are a food source for animals and humans. Pyrethroids also kill beneficial predators such as spiders that prey on crop eating pests and keep their population levels low.

1. Explain what it means when people say that pyrethroids are “broad spectrum insecticides.”

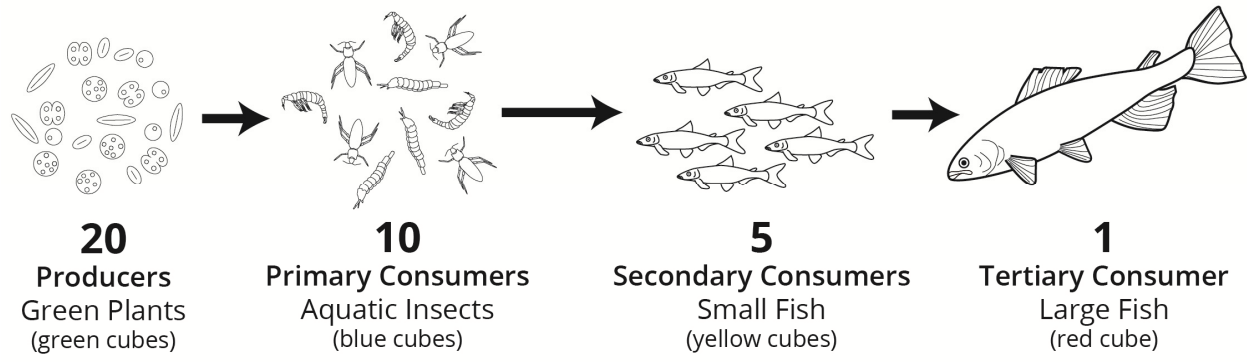
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2. Explain two ways that pyrethroids sprayed on gardens and farm fields may decrease the production of plant crops.

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## Pyrethroids and Aquatic Ecosystems

Pyrethroids sprayed on lawns, gardens, and fields may be washed into aquatic ecosystems (streams and lakes). Even low levels of pyrethroids are toxic to insects that serve as a food source for fish. The diagram below illustrates a simple food chain in an aquatic ecosystem.



3. Use the information the diagram above and the colored cubes in your lab kit. Stack the colored cubes to make a pyramid model of the food chain in the ecosystem. Remember that the tertiary consumers should be at the top of food pyramid.
4. Draw and label your pyramid model in the space below.

5. Even low levels of pyrethroids are toxic to insects that serve as a food source for fish. Remove the blue cubes from your model to represent the aquatic insects that die from pyrethroid poisoning.
6. Change your model to illustrate how death of the aquatic insects will affect the ecosystem. Remember that organisms cannot survive unless the food they eat is present. Draw and label your model in the space below.

7. Explain how the death of aquatic insects affects the populations of secondary consumers (small fish) and tertiary consumers (large fish).

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8. Explain why lakes and rivers with high concentrations of pyrethroids might have more green plants than similar waterways with low concentrations of pyrethroids.

*Hint: Aquatic insects often feed on aquatic plants.*

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