

Lesson Number 5

Title: Pesticides and Exposure

Purposes / Objectives

- To describe how people can be exposed to pesticides.
- To list the ways pesticides can enter the human body.
- To demonstrate how people can be exposed to pesticides.
- To discuss methods to reduce or eliminate pesticide exposure.
- To identify ways to manage pesticide risk.

Overview

In this activity, the students will perform normal pesticide handling operations with non-toxic materials to which a "dye" has been added. The instructor will tell the students to handle the material as they would a real pesticide...take it out of the original container, mix it, and prepare it for application (ex. put it into a sprayer.) The dye will show if, when and how the person handling the pesticide is exposed to it.

Introduction / Discussion

Even very careful workers may contaminate some part of their body, clothing, equipment or workspace when handling pesticides. This is especially true during a mixing-loading operation. This activity will reveal clear evidence of contamination if and when it happens.

This lesson helps to show when, where, and how pesticide exposure might occur. It also helps to show what pesticide handlers can do to reduce the chance of exposure.

People should never reuse pesticide containers. It is difficult or impossible to rinse all of the pesticide residue out of a container. If a pesticide container is re-used for drinking water or for preparing food, it might cause people who drink the water or eat the food to become ill -- or even die! In this lesson, set good example by using the empty pesticide bags and bottles you were given...OR make a 'fake pesticide' container + label and use it only for your lessons.

People should never measure pesticides with containers that may be used for food or drink. Be sure to use measuring containers that are for pesticides only in this lesson.

Please note that the colorant and the fluorescent materials used in these activities are non-toxic. They will not harm people or crops. Regular washing will remove them.

The blue dye will not show well on dark clothing or skin.

The fluorescent dye will not show well on some white clothing or surfaces.

Using the fluorescent dye for this activity is very effective. People cannot see it in regular light, so they are usually surprised and shocked to see how much they have on their body, clothing, and pesticide equipment. However, it is more trouble to use.

Here are some reasons:

- #1. You must be able to make the area dark and use the special (fluorescent) light to show the fluorescent dye. Here are some ways to do this:
 - Have the people go into a dark room and use the light there.
 - Work under a tree, and have many people gather around the work site to make it as dark as possible.
 - Do this activity late in the day. Ask the people to go inside a dark room to use the light. Come back to the work area later, after dark, and inspect the work area and the application equipment.
- #2. You must clean the materials you use to remove traces of the dye before you repeat this activity.
- #3. You must have batteries for the light.
- #4. You must use the dye sparingly. You do not have to use a great amount.

Materials

For liquid pesticide handling:

“Fake Pesticide” container
“Fake Pesticide” product with colorant added (water + dye.)
Measuring device (*Do not use kitchen or tableware!!*)
Water
Spray application equipment

For dry (wettable power) pesticide handling:

“Fake Pesticide” container
“Fake Pesticide” product with colorant added (flour + dye.)
Measuring device (*Do not use kitchen or tableware!!*)
Mixing bucket and something to stir the mixture
Water
Application equipment

For dry (dust) pesticide handling:

“Fake Pesticide” container
“Fake Pesticide” product with colorant added (flour + dye.)
Application equipment

Other Items:

Funnel

Paper

Pencil

Protective clothing

(You may wish to tell the growers to use gloves...or you may choose to wait and give them gloves only if they ask for them, or say they say they should have them. It may be best to encourage them to handle the pesticide as they normally do for this activity. This lesson will show them they need protective clothing. The next lesson will be about protective clothing.)

Fluorescent light ("blacklight") + batteries

(If you use the fluorescent powder, you will need to have this special light. If you use the blue dye, you will not.)

Tarp or ground cloth for the work area

Advance Planning

Gather all your materials.

Make your "fake pesticide" and put it into a "fake pesticide" container.

- Use one teaspoon of dye + four cups of powder (dry.)
- Use one teaspoon of dye + one quart (liquid.)

Plan ahead, so you know how and where you will show the dye residues to the students.

This is very important if you plan to use the fluorescent dye. You must have a "blacklight" with batteries and be able to display items in darkness.

Methods

1. Ask the students (farmers) which of these activities they think is the most dangerous:
 - mixing pesticides and putting them into a sprayer or applicator.
 - applying pesticides with a sprayer.
 - cleaning up after using pesticides.

As a rule, the most risky activity is mixing and loading. This is true because:

- the person must handle the pesticide, and
- the pesticide is in concentrated form.

(However, if a person does not have good and proper equipment, application can be very risky, too.)

2. Give the students the materials they need to mix the "fake pesticide" and prepare to apply it to a crop.
3. Ask them to apply the "fake pesticide" onto the crop, working as they would normally.

4. After they finish, lead a short discussion about pesticide exposure. Ask these questions:

How might a person be exposed to pesticides?

Here are some possible answers:

- spilling or splashing pesticides on skin, into eyes, into mouth;
- getting pesticides on the body during application;
- getting pesticides onto hands and not washing before eating, drinking, or smoking;
- reusing a pesticide container for food or drink;
- wearing clothing contaminated with pesticides due to a spill or leak;
- eating plants or animals that have pesticides on or in them.
- wearing contaminated clothing.
- cleaning pesticide equipment or containers near water supplies.
- storing pesticides or application equipment in an unlocked place near where people live and work.

How can pesticides enter the human body?

Here are some possible answers:

- through the skin.
- through the mouth
- by inhalation (breathing.)

(Also, it is possible to get pesticides into the eyes. Pesticides may enter the body this way, too.)

Do you think the students who handled the “fake pesticides” in this lesson might be exposed? If so, tell when and why you think this might have happened.

Possible answers will depend on many things -- how the students who handled the “fake pesticide” worked, and how carefully the others watched what they did.

Note that some of them may have “fake pesticide” on their hands...and may transfer it to other parts of their bodies or their clothing during the discussion.

5. Study the students and the work area for traces of contamination.

Use the fluorescent light if you used a fluorescent dye to make the “fake pesticide.” If a fluorescent indicator was used, the work area and materials must be darkened to check the worksite and the handlers for exposure and contamination.

If you used the blue marker dye, splashes and spills will be seen without a special light.

6. Do a short demonstration to show how pesticide residues can be transferred. Choose two or three people with clean hands. Ask one person to put some of the dry “fake pesticide” on his or her hands. Then, ask that person to shake hands with one of the others. Ask the second person to shake hands with the third. Ask each to scratch their shoulder or their chin. Use the blacklight to show how the “fake pesticide” transferred from place to place.

7. Discussion and Problem-Solving: Ask course participants these questions:

When, where and why did pesticide contamination happen?

Answers will depend on activity.

How can you prevent or reduce the chance of pesticide exposure?

If you handle pesticides, here are the ways to reduce or eliminate exposure:

#1. Work carefully!

#2. Use good equipment!

#3. Wear protective clothing. Be sure it is clean and in good condition.

When do you think a farmer is most likely to be exposed to pesticides when treating crops?

Possible answers are:

- Mixing and loading. Farmers must handle concentrated pesticides to measure the amount they need. Then they must dilute it and pour it into the application equipment.
- Using hand-held application equipment. Farmers must walk near spray mists and dusts. If they are treating a large area, they might walk through or very near an area they just treated. If they touch treated plant parts, some of the pesticide might transfer onto them or their clothing.
- Using equipment not designed for the job. Farmers who do not have sprayers might be exposed to pesticides when using the wrong kind of devices to apply pesticides to plants.

Would using a blue dye with all pesticide sprays help a farmer?

Advantages: Shows coverage and treated areas; shows exposure.

Disadvantage: Additional cost.

Describe how careless pesticide handling might harm a farmer.

The farmer may be exposed to pesticides. The farmer may become ill.

Describe how careless pesticide handling might harm a farmer's family.

Residues on the farmer's hands, feet, or clothes may transfer to family members' skin or clothes, into the home, or into food or water.

8. Summary: Ask course participants these questions:

Describe good ways to handle pesticides:

Answers will vary -- but should include:

- Be careful.
- Use good equipment to handle pesticides and direct it to the target plants.
- Wear clothing to protect yourself in case of an accident.

What should a person NOT do while handling pesticides?

Again, answers will vary, but may include:

- Do not rush. Do not work in a sloppy way. Do not splash or spill.
- Do not use equipment that splashes or leaks.
- Do not use pesticides when you cannot protect yourself from accidental exposure.

Why should pesticide handlers wear protective clothing?

- The best protections are careful work habits and using good equipment. However, protective clothing will shield you if you have an accident.

Discussion - FFS Leader

1. Review what growers learned in earlier lessons.

Ask growers to tell you what the words 'toxic' and 'toxicity' mean.

Toxic = poisonous.

Toxicity = a measure of how poisonous something is.

Ask growers to tell you what exposure means.

Exposure = coming into contact with a pesticide.

Ask growers to tell you what risk is.

Risk = the possibility of danger or harm; the chance of loss or injury.

Ask growers to tell you what causes pesticide risk.

Risk = Toxicity x Exposure

2. Tell the growers that they can reduce or eliminate their risk when handling pesticides by:

- reducing toxicity, and
- reducing exposure.

Ask them to tell you how to reduce pesticide toxicity (review of lesson #4):

- Avoid using pesticides if possible. When possible, reduce use.
- Choose low-toxicity pesticides. If and when they must use pesticides, use products that are not highly toxic to humans and to other animals.

Ask them to tell you how to reduce pesticide exposure (review of today's lesson):

- Work carefully!
- Use good equipment!
- Wear clean protective clothing in good condition!

3. Summarize and review the growers' responses. Ask if they have any questions. Be sure all the points they want to make and any questions they ask are recorded.
4. Tell the growers that the next lesson will be about protective clothing: what, when, why, and how. (We will also have a lesson about application equipment: what to use to protect yourself while applying pesticides to plants effectively.)
5. End the lesson by thanking them for their time and participation.

Notes

Pesticides and Exposure:

Chemicals can be absorbed through skin and into the blood stream. Once in the body, some chemicals cause harm.

Some chemicals may also cause reactions (such as irritation or a rash) on the skin surface.

Pesticides can cause bad effects if they touch the skin and if they enter the body.

All people do not react to pesticide exposure in the same way. For example, some individuals may be very sensitive to a substance and others may experience little or no effects from contact.

Many pesticides can be absorbed through the skin into the blood. Once inside, many pesticides can cause harmful effects. The amount of pesticide absorbed through the skin may be enough to produce illness or death. In addition, some pesticides injure the skin directly.

Once a pesticide enters the body, it is often absorbed into the bloodstream. Once in the blood, it can move throughout the body. A pesticide moving in the blood may cause harm far from the original exposure site. For example, a person who accidentally eats or drinks the pesticide paraquat will have damage to his or her lungs.

Once a chemical is absorbed into the bloodstream, it can have several different fates.

In some cases, the body cannot change it.

In other cases, the body can change it into a form that is less poisonous. However, sometimes the body changes it into a more toxic substance.

The body will get rid of many pesticides (through the urine or feces.) However, some are stored in the body and remain in a person for many years.

The fate of a pesticide in a person depends on the chemical. It also depends on the person. For example, the person's age, sex, size, diet, and previous exposures can affect how they react to a pesticide.

How much and how often a person is exposed is important.

In the case of a single exposure, the most important things are how poisonous and how much. The more toxic the pesticide and the more they are exposed to it, the worse the effect.

When a person is exposed over and over, many things affect the result: how toxic, how much, and how often. If a person is exposed repeatedly, the pesticide may get in faster than the body can change it and/or get rid of it. Toxic effects may not show up right away, but will make the person ill after a period of time.

Avoiding exposure will safeguard pesticide users from harm.