An American Farm Tale. Chronic Organophosphate Exposure and Treatment: The Rea Farm Case Study
AN AMERICAN FARM TALE.
CHRONIC ORGANOPHOSPHATE EXPOSURE AND TREATMENT:
THE REA FARM CASE STUDY

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PURPOSE

This facilitator’s guide to “An American Farm Tale. Chronic Organophosphate Exposure and Treatment: The Rea Farm Case Study” is designed to reinforce and enhance concepts introduced in the companion video, through facilitator-guided discussion. The Facilitator Guide was created to provide you, the facilitator, with background information about the Reas, pesticide poisoning, methods of preventing pesticide poisoning, information farmers should tell their doctors about the pesticides they use, and resources for more information.

PROGRAM DESIGN

The program is segmented into a core session and optional discussion sessions. The 50-minute core session includes a 10-minute icebreaker activity, watching a 20-minute video, and a 20-minute core discussion session focused on the main topics addressed in the video. Additional discussion sessions are optional. Additional 10-minute discussion sessions provide in depth discussion of specific topics. You have the freedom to choose the additional topics you want to discuss, according to your training objectives, and program timeframe.

CREDITS AND CERTIFICATION

The New Jersey Department of Environmental Protection grants participants one CORE credit towards pesticide applicator certification, per 20 minutes of program participation. This may differ between states and sponsoring organizations. You will need to adjust the program length according to your State’s requirements and how many credits your program will award. For example, if you were to conduct an 80-minute program, you would allot 50 minutes for the core program, and choose three 10-minute segments (e.g. “Population at Risk”, “Signs and Symptoms of Pesticide Poisoning” & “Labels & MSDS”) for further discussion.
DESCRIPTION OF THE PROGRAM

The core discussion session and each additional discussion session contains the following elements:

- Activity at-a-glance,
- Learning objectives,
- An estimate of how much time is needed to conduct each session,
- The vocabulary words covered in the session,
- Materials that will be needed,
- A list of suggested supplemental and evaluation materials to hand out during the session,
- Suggestions for preparation for facilitators,
- Suggested presentation, and
- Directions for session evaluation.

CORE SESSION

[50 minutes: 10 minutes for the icebreaker activity, 20 minutes to show the video, and 20 minutes for discussion]

Participants will watch the companion video on the Rea Farm case study and discuss the main ideas presented. Topics for discussion include persons at risk for pesticide exposure, routes of pesticide exposure, signs and symptoms of pesticide poisoning, safety precautions before and after pesticide application, safe handling and use of personal safety equipment, labels and Material Safety Data Sheets, safe application of pesticides, safe pesticide storage and transport, and talking with your doctor about pesticides.

ADDITIONAL DISCUSSION SESSIONS [10 minutes each]

After conducting the core session, you have the option of continuing the group discussion focused on specific topics introduced in the video and briefly discussed in the core program. There are nine additional discussion segments that you may choose from, that further explore:

1) Populations at risk for pesticide poisoning,
2) Routes of exposure,
3) Signs and symptoms of pesticide poisoning,
4) Safety precautions before and after pesticide application,
5) Safe handling of pesticides and use of personal safety equipment,
6) Label and material safety data sheets,
7) Safe spraying of pesticides,
8) Safe pesticide transport and storage, and
9) Talking to farmer’s personal physicians about pesticide poisoning.
DESCRIPTION OF ADDITIONAL 10-MINUTE DISCUSSION SESSIONS

Populations at Risk
Participants will discuss populations at risk for pesticide exposure and pesticide poisoning, assess their personal risk to pesticide poisoning, and identify actions to reduce those risks.

Routes of Exposure & Acute vs. Chronic Exposure
Participants will discuss the routes of exposure for pesticide poisoning, define acute and chronic exposures, identify actions to reduce the risk for pesticide exposures, and discuss the expected benefits of those actions to health and well-being.

Signs and Symptoms of Pesticide Poisoning
Participants will discuss the signs and symptoms of pesticide poisoning, identify actions to take when they experience these signs and symptoms, and discuss the expected benefits of those actions to health and well-being.

Safety Precautions Before and After Pesticide Application
Participants will discuss safety precautions that should be taken before and after pesticide application, assess current safety procedures in place on their own farms, and identify additional safety strategies they can implement.

Safe Handling and Use of Personal Protective Equipment
Participants will discuss safe handling procedures and use of personal protective equipment (PPE), obstacles that prevent the use of PPE, actions to overcome those barriers and the health benefits of proper handling and use of PPE.

Pesticide Labels and Material Safety Data Sheets (MSDS)
Participants will discuss the importance of reading pesticide labels and Material Safety Data Sheets (MSDS), identifying key information printed on pesticide labels, and identifying key information listed in MSDS.

Safe Application of Pesticides
Participants will discuss common methods of pesticide application, assess the spraying methods currently employed on their own farms, and evaluate their personal risk to pesticide poisoning.

Pesticide Storage and Transport
Participants will discuss the methods safe pesticide storage and transport, assess pesticide storage and transport on their own farms, identify obstacles that prevent implementation of safe storage and transport strategies, describe actions to overcome those barriers, and discuss resources for more information.

Talking with Your Doctor
Participants will discuss issues regarding discussing their occupational history with their personal physicians, describe barriers that prevent farmers from speaking with their physicians about pesticide poisoning, and identify actions to overcome those barriers.
SUPPLEMENTAL RESOURCES FOR FACILITATORS

An article discusses the efficacy of pesticide training programs. This section also includes tips for advanced planning, preparing the day of the program, enhancing the educational impact of the program, as well as things facilitators can do to optimize groups discussion.

HANDOUTS

This section contains supplemental information for both facilitators and program participants. Contents of this section can be photocopied and used as handouts at training sessions. This section contains: 1) materials that provide background information on pesticide poisoning, the Rea Farm case study, and personal protective equipment, 2) interactive checklists and worksheets for use during the program, and 3) a copy of the discussion questions used during the core discussion session and additional discussion sessions.

EVALUATION MATERIALS

Evaluation materials provided in this section include 1) a survey to assess whether the learning objectives of the program were met, 2) an answer key to that survey, as well as 3) respective process evaluation sheets for participants and facilitators.

RESOURCES FOR FURTHER INQUIRY

This Facilitator Guide only provides an introductory overview of pesticide poisoning among farmers and their families. This section provides a list of contacts for more information on any of the topics discussed in this program. These resources include federal agencies, state health departments, medical consultation resources, occupational and environmental health clinics, certified regional poison control centers, and state cooperative extension contacts.
ACTIVITY AT A GLANCE
Participants will watch the video, “An American Farm Tale. Chronic Organophosphate Exposure and Treatment: The Rea Farm Case Study”. Participants will discuss the major points conveyed in the video, including: who is at risk for pesticide poisoning, routes of pesticide exposure, safety procedures before and during pesticide application, pesticide labels, safe pesticide transport and storage, as well as talking to their doctor about pesticides use.

LEARNING OBJECTIVES
Upon completion of this session, participants will be able to:
• Identify populations at risk for pesticide poisoning
• Describe how farmers and their families are exposed to pesticides
• Identify three routes of exposure to pesticides
• Identify at least three signs and symptoms of pesticide poisoning
• Describe three forms of personal protective equipment, how and when PPE should be used
• Describe safe pesticide management techniques and the benefits to personal health and well-being
• Describe three things farmers should make their personal physician aware of regarding their occupation

TIME
50 minutes: 10 minutes for the icebreaker, 20 minutes to show the video and 20 minutes for discussion

VOCABULARY
Dermal absorption, exposure, ingestion, inhalation, organophosphate, personal protective equipment (PPE), routes of exposure, sign, symptom

SUGGESTED MATERIALS:
Handouts
• Pesticide Poisoning in the United States
• The Rea Farm Case Study
• Signs and Symptoms of Pesticide Poisoning
• Routes of Exposure
• Personal Protective Equipment
• Safe Handling of Pesticides
• Vocabulary
• Answer sheet to Outcome Evaluation
Checklists and Worksheets
• Checklist for Preventing Pesticide Accidents
Evaluation
• Evaluation Survey Form
• Participant Program Evaluation Form
• Facilitator Program Notes Form
Other
- Chalkboard, flipchart, dry erase board or other means to record and post group responses.

ADVANCED PREPARATION:
- Read the synopsis of Rea Farm case study, planning your program and tips for facilitating discussion.
- Read all suggested handouts for background information and review the suggested checklists.
- Review the vocabulary used in the program.
- Select and photocopy supplemental materials to hand out to program participants.
- Select and photocopy evaluation materials.

SUGGESTED PRESENTATION

1. **Introduction**
   Introduce yourself, your organization and that you will be facilitating today’s session.
   - Today we will explore the health risks associated with the use of pesticides on a farm, and what you can do to reduce those risks.

2. **Icebreaker - 10 minutes**
   - Ask how many participants in the audience already know about pesticide poisoning by a show of hands. If hands rise, ask them to share a little about what they know about pesticide poisoning and where they obtained their information.
   - Distribute the Checklist for Preventing Pesticide Poisoning Accidents worksheet. Have audience members complete the worksheet. Tell them the worksheet is a tool for them to assess current pesticide practices used on their own farms. This checklist is for their benefit, and will not be shared with the group.

   - We will begin by watching a video of a case study of pesticide poisoning as experienced by a real farm family from Cape May, New Jersey. This case study illustrates the dangers of pesticide poisoning, specifically organophosphate poisoning.

   - This video was created through a joint effort by Rutgers Cooperative Extension (RCE) and the Environmental and Occupational Health Sciences Institute (EOHSI), and was funded by the United States Environmental Protection Agency.

3. **Play Video - 20 Minutes**
   - After you show the video, reiterate that the case study video based on the experiences of a real farm family in Cape May, New Jersey.

4. **Discuss:**

   a) **Who, according to the video, is at risk for organophosphate poisoning?**
   - Anyone who comes in contact with pesticides.
   - Refer to, or distribute Pesticide Poisoning in the United States handout.

   b) **How are farmers (and their families) exposed to pesticides on, and around the farm?**
   - Through pesticide application, handling, improper storage, through their clothes, etc.
c) What are the routes of exposure to pesticide poisoning?
   • Ingestion, inhalation and dermal absorption.
   • Refer to, or distribute Routes of Exposure handout.

d) What are the signs and symptoms of pesticide poisoning?
   • Symptoms include, but are not limited to, dizziness, nausea, headaches, fatigue, slurred speech, convulsions, etc. Make sure you review the Signs and Symptoms of Pesticide Poisoning handout before facilitating this presentation.
   • Ask participants to describe Leslie Rea’s symptoms. Explain that these symptoms are related to the type of pesticide – organophosphate pesticides – and amount of exposure.
   • Distribute Signs and Symptoms of Pesticide Poisoning handout.

e) What safety precautions did Leslie Rea implement on his farm after he was diagnosed with organophosphate poisoning?
   • Leslie Rea implemented daily and regular use of PPE on his farm. He constructed a separate storage area for the pesticides he used and a separate wash area where he can get cleaned up after a day’s work, before he goes home to Diane.
   • Refer to, or distribute The Rea Farm Case Study handout.

f) What personal protective equipment should be used when handling and applying pesticides?
   • Chemically resistant gloves, respirators, coveralls, masks, goggles, boots, etc.
   • Refer to, or distribute Personal Protective Equipment, and Itemized Cost for PPE handouts.

g) Why should farmers who use pesticides read the pesticide label before use?
   • The label includes important information as how to safely handle and store the substance, and any hazardous effects that it may have on personal health.

h) What application methods did Leslie Rea employ on his farm to reduce exposure? How did these methods reduce his risk of exposure?
   • He used a directed boom sprayer and sprayed up-wind. These methods reduce exposure by directing the pesticides to go in a pre-determined direction, placing Leslie opposite of where the pesticides are being sprayed.
   • Refer to, or distribute Safe Handling of Pesticides handout.

i) What does the video suggest that farmers tell their family physician when discussing their personal health and the health of other members of their family?
   • Farmers should make their personal physicians aware that they are farmers, that they use pesticides on their farm, what kind of pesticides are used, how often they are used, and how long they have been using those pesticides. Farmers should also bring their physician a copy of the MSDS for each chemical used on the farm. This is to assist the physician’s understanding of the substance used, as well as provide information to assist in diagnosis and treatment.

5. Summarize the major points:
   • Anyone who comes in contact with pesticides is at risk for pesticide exposure and poisoning
   • Routes of exposure include inhalation, ingestion and dermal contact.
   • Use of PPE is a simple, quick and cost-effective way to protect you from exposure to pesticides.
   • Safe handling, application and storage of pesticides are an effective way of decreasing your risk of pesticide exposure and poisoning.
• Anyone who uses pesticides should read the label before use.
• You should tell your doctor that you are a farmer and that you use pesticides on your farm. You may also want to bring your doctor MSDS of the pesticides you use.

6. Optional Discussion

If you would like to tailor your discussion around a particular topic, you may elect to choose additional segments discussing the one or more of the following:

- Population at Risk
- Routes of Exposure/ Acute vs. Chronic Exposure
- Signs and Symptoms of Pesticide Poisoning
- Safety Precautions – Before and During Pesticide Application
- Handling Pesticides Safely & Personal Protective Equipment
- Pesticide Labels & Material Safety Data Sheets (MSDS)
- Safe Application of Pesticides
- Pesticide Storage and Transport
- Talking to Your Doctor

EVALUATION

After your discussion, pass out the Evaluation Survey and/or the Participant Program Evaluation form to assess your program objectives. You may choose to complete the Facilitator Program Evaluation form for future program planning. Evaluation forms are located in section V of this guide.
ACTIVITY AT A GLANCE
Participants will discuss populations at risk for pesticide exposure and poisoning, assess their individual risk to pesticide poisoning, and identify actions to reduce those risks.

LEARNING OBJECTIVES
Upon completion of this session, participants will be able to:
• Identify populations at risk for pesticide poisoning
• Identify actions to reduce the risk of pesticide exposure and poisoning

SUGGESTED MATERIALS
• Chalkboard, flipchart, dry erase board or other means to record and post group responses.

PRESENTATION:
1. Introduction
We will now further discuss who is at risk for pesticide poisoning and what we can do to reduce those risks.

2. Discuss:
   a) According to the video, who is at-risk for pesticide poisoning?
   • Allow them to brainstorm aloud. You may choose to record participant responses onto a flip chart or chalkboard. Before moving on to the next question, make sure to emphasize that anyone exposed to pesticides is at risk for pesticide poisoning, especially farmers, farm workers, farm families, and neighbors, if it is not explicitly stated.

   b) Do you agree with this? Why? Why not?

   c) What daily farming activities can put you at risk for pesticide exposure? Activities throughout the planting season?
   • Record participant responses on a flip board or chalkboard. Discuss how each activity can place farmers at risk.

   d) How at-risk do you personally feel to pesticide poisoning? How at-risk to pesticide exposure do you feel your family is?
   • Review participant responses. State the Reas did not think much about their exposure to pesticides until Leslie began to suffer health problems. They then suspected chronic exposure to the pesticides he used.
   • Point out that chronic pesticide poisoning does not have immediate health effects so farmers and their families may not necessarily think about pesticide poisoning until their health has already been compromised.

   e) Approximate how much time in a single week you come in contact with pesticides.
   • Record participant responses on one side of the flip board or chalkboard.
f) Estimate how much direct exposure to pesticides you experience, through handling, application, and spraying, in a single week?
   - Record participant responses on the flip board or chalkboard along side the responses from the previous question. Discuss how each activity can place farmers at risk, and help them assess their personal risks.

gh) Estimate your pesticide exposure through indirect contact with pesticides, through contact with already sprayed crops, contact with clothes/equipment soiled with pesticides, or pesticide residue?
   - Discuss how the amounts of exposure to pesticide affect personal risk to pesticide poisoning - greater exposure increases the risk of pesticide poisoning. Other determinants of pesticide poisoning include time and concentration of the pesticide used. Risk of pesticide poisoning increases with prolonged exposure to pesticide. Greater concentrations of pesticides increase risk for pesticide poisoning.

h) Identify scenarios where your family members may come in contact with the pesticides on your farm.
   - Record participant responses on a flip board or chalkboard.
   - To facilitate this activity, refer back to the daily farming activities participants identified as putting them at risk for pesticide exposure.

i) What actions can you take to reduce your risk to pesticide exposure?
   - Wear Personal Protective Equipment any time you may come in contact with pesticides, store and transport pesticides in a separate storage container, change and wash clothes after any possible contact or exposure to pesticides

3. Summarize the major points:
   - Anyone who comes in contact with pesticides is at risk for pesticide exposure and poisoning
   - Use of PPE is a simple, quick, and cost-effective way to protect you from exposure and poisoning to pesticides.
ACTIVITY AT A GLANCE
Participants will discuss the routes of exposure to pesticide poisoning, define acute and chronic exposures, identify actions to reduce those risks and the expected benefits of those actions to health and well-being.

LEARNING
Upon completion of this session, participants will be able to:
• Identify three routes of exposure to pesticide poisoning
• Discuss the difference between acute and chronic exposures
• Identify actions to reduce the risk of exposure to pesticides
• Discuss health benefits of preventing pesticide exposures

VOCABULARY
Chronic exposure, dose, exposure, toxicity

SUGGESTED MATERIALS:
Handouts
• Safe Handling of Pesticides

SUGGESTED PRESENTATION
1. Introduction
Today we will explore the routes of exposure of pesticide poisoning, discuss acute and chronic exposures and what we can do to reduce those risks.

2. Discuss:
   a) How are farmers exposed to pesticides on the farm?
   • Handling, application, and transport of pesticides as well as exposure to residue in air, on crops, machinery and clothing from past applications

   b) How do pesticides enter our bodies?
   • The three main routes of exposure to pesticides are dermal absorption, inhalation and ingestion.

   c) How much pesticide exposure is necessary to affect your health?
   • This depends on the type of chemical you are using, its toxicity, the length of use of this pesticide, and amount of pesticide that is used. For highly toxic pesticides, it only takes a small amount to cause health effects - even though it is a one-time exposure. Small pesticide exposures that happen over time may also cause health effects. It is important that you consult the chemical label and MSDS for information on the health effects of the chemicals used on your farm, and what you can do to reduce your risk of exposure.
d) What is the difference between acute exposure and chronic exposure?
   - Acute exposures are large, one-time doses of a pesticide that cause immediate, and often severe, health effects – within 6-12 hours of exposure. Chronic exposures are small, non-lethal exposures to pesticides over time.

e) What is an example of how acute exposures can occur on the farm? What is an example of how chronic exposures can occur on the farm?
   - Have farmers brainstorm. Record participant responses on the flip chart or chalkboard. For each example, have the respondent specify whether the exposure is acute or chronic, and the route(s) of exposure.

f) How can these exposures occur outside the farm setting?
   - Examples include potential exposure to the family by wearing soiled work clothes into the home, spraying pesticide in the direction of residence, etc.

g) What actions can you take to reduce the risk for acute exposure? Chronic exposure?
   - Wear PPE, read the label, and store clearly labeled pesticides in a separate area to contain potential contamination

h) How would those changes benefit your health?
   - Reduces exposure results in reduced risk for developing acute of chronic pesticide poisoning. You would remain healthy and well.

3. Summarize the major points:
   - Routes of exposure to pesticide poisoning include inhalation, ingestion and dermal absorption.
   - Acute exposure is a large one-time exposure. Chronic exposures involve small exposures to pesticides over time.
   - Use of PPE is a simple way to protect you from exposure to pesticides.
   - Implementing these few simple actions benefit your personal health and the health of your family.
ACTIVITY AT A GLANCE
Participants will discuss the signs and symptoms of pesticide poisoning; identify actions to take when experiencing these signs and symptoms, and the expected benefits of those actions to health and well being.

LEARNING OBJECTIVES
Upon completion of this session, participants will be able to:
• Identify three signs and symptoms of pesticide poisoning
• Discuss the difference between acute and chronic poisoning
• Identify actions to take when experiencing these signs and symptoms

SUGGESTED MATERIALS
Handouts
• Organophosphate Poisoning

SUGGESTED PRESENTATION
1. Introduction
We will discuss the signs and symptoms of pesticide poisoning, acute and chronic pesticide poisonings and what we can do if we experience these signs and symptoms.

2. Discuss:
   a) Let us review the signs and symptoms of organophosphate pesticide poisoning.
      • Allow participants to recite the signs and symptoms they remember from memory.
      • Review the Signs and Symptoms of Pesticide Poisoning handout with participants, identifying other signs and symptoms they may have missed.

   b) How would experiencing these signs and symptoms impact on your everyday life?
      • You would feel miserable; depending on the severity of your condition, you wouldn’t be able to work, drive (if you can’t see straight or are dizzy), you would not be as productive, potentially accumulate many medical expenses, and become burdensome to your family.

   c) What other conditions can bring about these signs and symptoms?
      • These signs and symptoms can also be brought on by the flu, food poisoning, a heart condition, and other medical conditions. Your awareness that pesticide poisoning also may cause the same signs and symptoms should prompt you to seek medical attention once you experience these signs and symptoms.
      • Heat exhaustion can also bring about some of these signs and symptoms. Distribute the Organophosphate Poisoning handout and review the signs and symptoms of each, noting the differences between the two conditions.
      • Emphasize the importance of seeking medical attention when experiencing symptoms that indicate either heat exhaustion or organophosphate pesticide poisoning.
d) What is the difference between acute poisoning and chronic pesticide poisoning?
• Acute pesticide poisoning occurs from a large dose, often one-time, exposure to a pesticide. Chronic pesticide poisoning is a result of small non-lethal exposures to pesticides over a prolonged period of time.

e) What actions should you take when experiencing these symptoms? What did the Reas do in response to Leslie’s signs and symptoms?
• The Reas sought medical attention and the help of their local Agricultural Agent. You can do a number of things if you experience signs and symptoms of pesticide poisoning. You should:
  1. See your doctor
  2. Refer to the pesticide label or MSDS
  3. Contact your local County Agricultural Agent for more information
  4. Call a pesticide poisoning hotline

f) How would those actions benefit your health?
• Seeking medical attention once you suspect pesticide poisoning is essential for early diagnosis and treatment, and reducing the risk for long-term or disabling health effects. Once you confirm that pesticides are the cause for your ill health, you can review your farming practices, identify how you are being exposed, and take actions to reduce or eliminate pesticide exposure all together.

3. Summarize the major points:
• Pesticide poisoning is preventable. The signs and symptoms of pesticide poisoning can mirror other medical conditions - do not be quick to dismiss these signs and symptoms because doing so may damage your health.
• Acute pesticide poisoning results from a large one-time exposure. Chronic pesticide poisoning results from small exposures to pesticides over time.
• Use of PPE is one simple way to protect prevent pesticide poisoning.
• If you suspect you may have pesticide poisoning, seek immediate medical attention.
• Early diagnosis and treatment of pesticide poisoning can prevent further damage to your health.
ACTIVITY AT A GLANCE
Participants will discuss safety precautions that should be taken before and after pesticide application, assess the safety procedures on their own farms, identify safety precautions they can implement that are relevant to their own farms.

LEARNING OBJECTIVES
Upon completion of this session, participants will be able to:
• Identify at least one safety precaution that should be taken before pesticide application
• Identify at least one safety precaution that should be taken after pesticide application
• Discuss at least one action they can implement on their own farms to reduce risk of pesticide exposure

SUGGESTED MATERIALS
Handouts
• The Rea Farm Case Study
Worksheets
• Pesticide Record Form
Other
• Chalkboard, flipchart, dry erase board or other means to record and post group responses.

SUGGESTED PRESENTATION
1. Introduction
We will discuss safety precautions that should be taken before and after pesticide application.

2. Discuss:
   a) What pre-application safety precautions did Leslie Rea implement on his farm? How did these changes impact his exposure to the pesticides used?
      • Leslie wore PPE – gloves, a respirator, coveralls, and boots when handling and applying pesticides. He also stored the pesticides in a separate area to prevent accidental exposures. MSDS was also kept nearby for quick reference and in case of an emergency.

   b) Are these changes relevant to your own farm? What pre-application safety precautions could you implement that would be relevant to your own farm?
      • Have participants brainstorm. Record these responses on flip chart or black board.
      • Keeping good records of pesticide use on the farm may reduce the risk of accidental pesticide poisoning. Refer to or distribute the Pesticide Record Form.
      • Employing integrated pesticide management techniques is good practice when trying to reduce use of pesticide on the farm. Integrated pest management involves checking your crop periodically to count the number of pests present. You may find you don’t need to use pesticides after all – reducing your risk of pesticide exposure.
c) Leslie Rea farmed lima beans. Seed treatment is necessary for most bean crops. Leslie treated his own seed. What else could he have done to reduce his pesticide exposure?
• Leslie could have also purchased pre-treated seed, which is a little more expensive.
• Brainstorm other strategies Leslie could have applied. Record responses on the flip chart or black board.

d) Are these changes relevant to your crop(s)? What pre-application safety precautions could you implement that would be relevant to your own crop(s)?
• Have participants brainstorm. Record responses on the flip chart or black board.

e) What safety precautions did Leslie Rea implement on his farm after the application process? How did these changes impact his exposure to the pesticides used?
• Leslie used installed a wash shed where he could shower and launder his work clothes before returning home. This greatly reduced his risk for further exposure by through dermal absorption.

f) Are the changes the Reas employed feasible to implement on your farm?

g) What safety precautions could you take to reduce your risk of pesticide poisoning after pesticide application?
• Address the issue of cost and time as a perceived and actual barrier to implementing most of these safety procedures. It is not necessary for every farm to install a separate wash shed. Simply washing after any contact with pesticides will greatly reduce your risk for accidental exposures. Other techniques include changing out of your work clothes after pesticide application and showering as soon as possible after pesticide. Storing and washing those contaminated work garments separately from the family’s regular laundry will further protect you and your family from accidental pesticide exposure.
• The total cost of the changes the Reas made on their farm in 1995 is approximately $7,000.00. These expenditures’ include purchase of:
  • Washer - $350.00 to $500.00
  • Dryer - $350.00 to $500.00
  • Hot water heater - $300.00 to $500.00 plus installation
  • Shower - $300.00 to $600.00 plus installation
  • Tractor spray cab - $5,000.00 to $15,000.00

3. Summarize the major points:
• Pesticide exposures and poisonings are preventable with the use of PPE.
• Keeping good records of pesticide use on the farm can reduce risk of accidental pesticide poisoning.
• Use of Integrate Pest Management techniques may reduce the need for pesticide application.

3 Prices are approximate. These prices may not reflect the actual costs incurred on the Rea Farm.
ACTIVITY AT A GLANCE
Participants will discuss safety handling procedures and the use of personal protective equipment (PPE), perceptions that get in the way of using PPE, actions to overcome those barriers and the health benefits of PPE use and proper handling.

LEARNING OBJECTIVES
Upon completion of this session, participants will be able to:
• Identify three items of PPE that should be used when handling pesticides
• Identify at least one barrier to PPE use and one action to overcome it
• Discuss how PPE reduces the risk of pesticide poisoning

SUGGESTED MATERIALS
Handouts
• Itemized Costs of Personal Protective Equipment

SUGGESTED PRESENTATION
1. Introduction
Today we will discuss safe handling precautions and the use of personal protective equipment (PPE).

2. Discuss
a) What personal protective equipment (PPE) should be used when handling pesticide?
• Gloves, mask/respirator, coveralls, boots, goggles, etc. Review PPE hand out for more detailed information.

b) What are the perceptions that get in the way of using PPE?
• The cost of PPE, the additional time needed to use PPE, not knowing how to properly select and use PPE are obstacles in the use of PPE. Improper fit testing may cause discomfort in the use of PPE, particularly for protective respiratory equipment.

c) What can you do to overcome those obstacles to using PPE?
  ➢ TIME: Use of PPE is not time-consuming. It only takes minutes to put them on and take it off. Incorporate the use of PPE into your daily routine.
  ➢ COST: Use of PPE needn’t be costly. PPE comes in a range of prices, and cost can vary according to your individual needs. Purchase re-useable PPE when possible. Refer to and distribute the Itemized Costs of Personal Protective Equipment handout.
 KNOWLEDGE: Read the pesticide label or MSDS sheet for the pesticides you use. It will tell you what PPE you will need to protect yourself and how to handle the pesticide safely. You can also contact your local Cooperative Extension Office for information.

d) What did Leslie Rea do, in terms of changing the way he handled pesticides on his farm? Are the changes that Leslie Rea implemented in handling the pesticides practical?
• He used PPE, a practical action in pesticide poisoning prevention.

e) Are those changes you could make on your farm, if not already in place?

f) How would those changes reduce your risk of exposure to pesticide poisoning?
• PPE acts as a barrier between you and the pesticide. Proper use of PPE will prevent inhalation, ingestion, and dermal contact with pesticides.

g) How would your health benefit from such changes?
• Preventing exposure to pesticides prevents developing health problems associated with pesticide poisoning.

3. Summarize the major points:
• Pesticide exposures and poisonings are preventable.
• Use of PPE is a quick and inexpensive way to protect and prevent pesticide exposure.
ACTIVITY AT A GLANCE
Participants will discuss the importance of reading pesticide labels and Material Safety Data Sheets (MSDS) prior to using pesticides.

LEARNING OBJECTIVES
Upon completion of this session, participants will be able to:
• Identify two pieces of information printed on pesticide labels
• Identify two pieces of information contained in MSDS
• Discuss the importance of reading pesticide labels and MSDS

VOCABULARY
MSDS, toxicity

SUGGESTED PRESENTATION
1. Introduction
We will discuss the importance of reading pesticide labels and Material Safety Data Sheets (MSDS).

2. Discuss:
   a) Why does the video stress that farmers who use pesticides should read the label before use?
      • Labels contain important warnings regarding chemical toxicity, instructions on how to handle the pesticide and what to do in case of accidental exposure.

   b) What information does the label contain?
      • Chemical name, instructions for safe handling, toxicity, instructions for what to do for accidental exposures, and an emergency phone number.

   c) What information do Material Safety Data Sheets (MSDS) contain?
      • MSDS sheets contain more detailed information about pesticides than the pesticide label. MSDS lists:
        1) The chemical brand name, chemical name, synonym names, manufacturer name, address and emergency phone number,
        2) The chemical composition, ingredients, and physical characteristics such as appearance, flash point and freezing point,
        3) Potential health effects,
        4) First aid measures,
        5) Fire fighting measures (if applicable),
6) Accidental release measures, 
7) Handling and storage instructions, 
8) Exposure control, and 
9) Personal protection information.

d) **How is this information important to your health and the health of your family?**
   - Pesticide labels and MSDS inform you how to handle the material safely, what PPE to use, as well as what to do and who to contact in case of an accidental exposure.

e) **How many farmers do you estimate read the label before using pesticides? Keep MSDS easily accessible and close-by to where pesticides are stored?**
   - Allow participants to brainstorm. Record participant responses on a chalkboard or flip chart.

f) **Why is it important to keep MSDS sheets on hand?**
   - MSDS serves as a complete reference for the handling, storage and use of pesticides. They also function as a quick resource in case of accidental exposure.

g) **What is the difference between the signal words “DANGER”, “WARNING” and “CAUTION”?**
   - **DANGER** identifies any product that is highly toxic via oral, dermal or inhalation exposure, or causes severe eye or skin burns. These materials may also carry the word POISON printed in red and the skull and cross bones symbol. As little as a teaspoon taken by mouth of materials labeled “DANGER” could kill an average sized adult. Typical DANGER statements include, “fatal if swallowed”, “poisonous if inhaled”, “Extremely hazardous by skin contact – rapidly absorbed through skin”, or “corrosive – causes eye damage and severe skin burns”.
   - **WARNING** distinguishes products that are moderately toxic via oral, dermal, or inhalation exposures, or cause moderate eye or skin irritation. A teaspoon to a tablespoon of this material by mouth could kill an average-sized adult. Typical WARNING statements include, “harmful or fatal if swallowed”, “harmful or fatal if absorbed through the skin”, or “causes skin or eye irritation”.
   - **CAUTION** describes products that are slightly toxic to relatively non-toxic via oral, dermal, and inhalation exposures, or causes slight eye and skin irritation. An ounce to more than a pint of this material could kill the average adult. Typical CAUTION statements include, “harmful if swallowed”, “may be harmful if inhaled”, or “may irritate eyes, nose, throat, and skin”.

h) **How do the different signal words affect your health, or the health of your family?**
   - These words represent degrees of pesticide toxicity. They indicate how dangerous each pesticide may be if inhaled, ingested or absorbed. These words are important reminders for persons who handle pesticides.
   - These signal words are also helpful key words to tell your doctor in case of accidental exposure.

3. **Summarize the major point:**
   - Reading the pesticide label and MSDS, and keeping them accessible, are important steps in pesticide poisoning prevention.
Application of Pesticides

ACTIVITY AT A GLANCE
Participants will discuss safe pesticide spraying methods, assess the spraying methods used on their own farms, and identify their personal risk of pesticide exposure.

LEARNING OBJECTIVES
Upon completion of this session, participants will be able to:
• Identify at least one technique to spray pesticides safely
• Identify at least one factor important to consider when choosing a spraying method

SUGGESTED PRESENTATION
1. Introduction
We will discuss safe pesticide spraying methods, and ways to reduce pesticide exposure during pesticide application.

2. Discuss
a) What application methods did Leslie Rea employ on his farm to reduce pesticide exposure? How did this method reduce risk of pesticide exposure?
• Leslie used a boom sprayer to spray away from him, the house and the neighbors. By spraying pesticides away from you, you reduce the risk of direct contact with the pesticide, therefore reducing your risk of dermal exposure and accidental pesticide inhalation and ingestion.

b) Are the methods Leslie Rea employed relevant to your farming operation? What would you do differently? What would you do the same? Why?
• Some barriers that may come up include time, cost of implementing changes, or lack of knowledge to implement prescribed changes. Address these barriers by stating:
  ➢ **TIME**: Actual installation of safety equipment is often a singular time investment. Safe application of pesticides is not a time consuming activity, once the proper equipment is in place and safe procedures are incorporated into the daily farming routine.
  ➢ **COST**: The Reas purchased a tractor spray cab to improve pesticide application safety on their farm. Refer to or distribute the Rea Farm Case Study handout. In 2000, tractor spray cabs range in price from $5,000.00 to $15,000.00.
    Personal protection during pesticide application also involves the use of PPE. Use of PPE needn’t be costly. PPE comes in a range of prices, and cost can vary according to your individual needs. Purchase re-useable PPE when possible. Refer to the Itemized Cost of PPE handout.
  ➢ **KNOWLEDGE**: Read the pesticide label or MSDS sheet for the pesticides you use. It will tell you what PPE you will need to protect yourself and how to handle the pesticide safely. You can also contact your local Extension Office for information.
c) How often do you apply pesticides on your farm? How do you think that affects your potential exposure to pesticide poisoning?
   - Discuss how the amounts of exposure to pesticide affect personal risk to pesticide poisoning – more exposure increases the risk of pesticide poisoning.

d) What factors must you consider when choosing your method of pesticide application?
   - These factors include the type of crop you have, the type of pests you want to control, the toxicity of the pesticide, the direction of the wind (you do not want to spray against the wind), and the area that needs to be sprayed.

e) How do these decisions impact how much pesticide you can potentially come in contact with? How could this affect your health or the health of your family?
   - The pesticide spraying method may increase or decrease the amount of pesticide in the air that surrounds you. The amount of pesticide residue in the form of dust will determine the extent of potential exposure.

3. Summarize the major point:
   - Your spraying technique can minimize potential exposure to pesticides on your farm.
ACTIVITY AT A GLANCE
Participants will discuss safe pesticide storage and transport.

LEARNING OBJECTIVES
Upon completion of this session, participants will be able to:
- Identify at least one safe method of storing pesticides
- Identify at least one safe method of transporting pesticides

SUGGESTED PRESENTATION
1. Introduction
We will discuss methods of safe pesticide storage and transport.

2. Discussion:
   a) What changes did Leslie Rea implement to reduce his exposure to pesticides, specifically in how he stored and transported his pesticides?
      - STORAGE: Leslie constructed a separate storage area to contain the pesticides he uses and prevent accidental exposures.
      - TRANSPORT: Leslie installed a sealed cab onto the back of his truck to contain pesticide during transport to and from the field. This also served to prevent accidental exposures.
   b) Are these changes difficult to make?
   c) Are these actions you would be able to perform on your farm?
   d) How would these actions benefit your health, or the health, or the health of your family?
      - Preventing exposures to prevents accidental injury and disability that may result from pesticide poisoning.
   e) What are the obstacles that may get in the way of other farmers making the same changes on their own farms?
      - Obstacles include concern for the monetary cost and lack of knowledge of how to implement these safety measures.
f) How could you overcome those obstacles?

- **KNOWLEDGE:** Contact your local Extension office for information on how to implement safer storage and transport practices, tailored to your farm.

- **COST:** You don’t have to spend a lot of money to store and transport pesticides you use in a safer manner. The Reas chose to construct a separate shed for their pesticides. Refer to the Rea Farm Case Study handout. Look at your own farm and the extent of pesticide that you use. Improving your current methods need not be as elaborate as the Reas. Pesticides should remain contained and properly labeled, and kept separate from clean PPE.

g) What argument would you make to fellow farmers to advocate for the changes Leslie Rea implemented on the Rea Farm?

- The benefits to personal health and well being by implementing safe pesticide poisoning prevention strategies, including safe storage and transport techniques outweigh the monetary costs to put these measures into place. It takes minimal effort to protect yourself from potentially disabling health effects.

3. **Summarize the major points:**

- Safe pesticide storage and transportation measures will decrease your risk of being exposed to pesticides.
- Safe storage and transport methods need not be expensive to be affective.
- Contact your local Agricultural Agent for more information, and to implement safe storage and transport strategies that are tailored to your farming operation.
ACTIVITY AT A GLANCE
Participants will discuss issues regarding discussing their occupational history with their personal physicians, describe barriers that prevent farmers from speaking with their physicians about pesticide poisoning, and identify actions to overcome those barriers.

LEARNING OBJECTIVES
Upon completion of this session, participants will be able to:
• Identify three key pieces of information their physician should know about their occupation and pesticide use.

VOCABULARY
Toxicity, cardiovascular system, respiratory system, gastrointestinal tract

SUGGESTED PRESENTATION
1. Introduction
We will discuss the issue of talking to our doctors about our occupations as farmers and the pesticides we use.

2. Discuss:
   a) How many of you have ever suspected you (or know of someone who) had signs or symptoms of pesticide poisoning?
      • Show of hands
   b) How many of you actually went to the doctor (or know someone who went to the doctor) as a result of this suspicion?
      • Show of hands
   c) Have you considered talking to your doctor about your occupation and use of pesticides?
   d) What barriers do you think keep farmers from talking with their doctors about their occupation and pesticide poisoning?
      • Doctors are unaware of pesticide poisoning; physicians dismiss pesticides as possible cause of ill health, misdiagnosis of problem, etc.
e) What actions can you take to overcome these barriers?

- Tell the doctor that you are a farmer, and you use pesticides on your farm. Specify the kinds of pesticides you use, how long you have used them, and how often they are used. Bring MSDS for the pesticides you use, to help educate your doctor to the health effects of pesticides. You may choose to seek a referral to an environmental and occupational health specialist, or seek evaluation and treatment at an environmental health clinic. Refer to the list of Occupational and Environmental Health Clinics, included in section VI if this guide, for local clinics.

f) How would these actions benefit your health or the health of your family?

- Your physician will be more attuned to the potential adverse health effects as a result of your exposure to pesticides. In the event of accidental pesticide exposure and poisoning, your physician can then take steps to properly diagnose and treat your condition.

3. Summarize the major points:

- It is important to communicate your use of pesticides on the farm
- Tell your doctor about the pesticides you use, how long you have used the pesticide, and how often you use the pesticide.
- Help educate your doctor - bring your doctor MSDS for the pesticides you use.
- Contact your local Extension office for more information, or the nearest Occupational and Environmental Health Clinic for evaluation or treatment.
Anyone who puts his time and resources into safety programs must ask himself, on occasion, "Are our safety efforts worthwhile?" Recently, all serious pesticide accidents in Florida agriculture for the three-year period 1987-1989 were researched. You may find the results interesting.

During this three-year period, there was a total of 117 serious injuries or illnesses classified as occupational diseases and poisonings. Of these, 82 cases were related to pesticides; these poisonings were about equally divided between internal and external injuries and illnesses. The 117 occupational diseases and poisonings account for only 1.34 percent of the 8,715 serious injuries or illnesses, which occurred during the three years, and pesticide poisonings, were less than one percent of the total!

Are pesticide safety programs successful? Yes, they are, and there are several reasons for this success. Pesticides are safer. Some extremely hazardous pesticides have been removed from the market; others have been reformulated into safer products. Containers are safer and less likely to break or leak. They are easier to handle. Others have closed-transfer systems that reduce workers' exposure. Equipment, including personal protective equipment, is safer and more readily available. Regulations have placed more mandates and responsibility on employers and employees to use pesticides safely. This includes the licensing of pesticide applicators and training of workers. There is both a "fear of" and "respect for" pesticides. Therefore, individuals who work with pesticides are receptive to training and to following safety practices.

However, just because we have an excellent safety program with pesticides, we must not become lax and think the problems are solved. We must continue to provide training and develop new and safer methods of handling and applying pesticides. We particularly need to protect our environment, especially our fragile water resources, and keep individuals who work with or around pesticides safe from exposure. We must never have another mistake like we had in 1989, which caused over eighty workers to be treated for pesticide exposure in one accident. Indeed, we need to strive for no pesticide exposure to anyone at any time. We need to maintain and improve upon the excellent programs we have for pesticide safety.

http://www.cdc.gov/niosh/nasd/docs2/as01900.html
Planning Your Program

Advance Planning
1. Reserve a room to conduct the program. Provide pleasant surroundings for learners. Be sure that the room is clean, comfortable, well maintained, aesthetically pleasing, acoustically sound, safe, accessible, and conveniently located.
2. Reserve adequate viewing monitors for audience size (generally one 25-inch monitor for 25 participants; larger projection screens are useful for groups of 50+).
3. Make arrangements for pesticide certification, or re-certification credits.
4. Advertise the program, through fliers, press releases, etc. using Department of Environmental Protection pesticide applicator mailing lists, etc.
5. Order refreshments
6. Send out reminders to registrants two weeks prior to the program. Reminders should include the date, time, and place of the program, as well as the name and telephone number of the contact person.

Enhance the Educational Impact
1. Know your audience. Important questions to consider include:
   - How many will be in attendance?
   - What is the range of experience that participants have?
   - What kind of crop(s) do they grow?
   - What kind(s) of pesticides do they use?
   - Are there risk behaviors common to this group?
   - Why are they attending this program (licensure, negative personal experience with pesticides, mandatory re-training for misuse of pesticide)?
   - Was there a recent event that would make this topic particularly relevant (ex. accidental death from acute pesticide exposure)?
   - What are the language(s) of the participants?
   - Are there any participants that need special accommodations (wheelchair-accessible, hard of hearing, etc.)?

2. Review all materials in advance of the program, including contents of handout items and how concepts are related.

3. Be clear on the overall learning objectives for the program.

4. Review program structure:
   - Use of the Rea Farm case study as a model
   - Discussion of the severity of pesticide poisoning
   - Discussion of the audience’s perceived susceptibility to pesticide poisoning
   - Discussion of barriers and benefits to implementing changes on their farm and of making physicians aware of their occupation and pesticide use.
   - Use support materials including handouts, checklists, worksheet and flip charts.
Day of the Program

1. Arrive early on the day of the program to assure everything is ready.
2. Provide adequate, comfortable seating and tables arranged to facilitate the learning experience.
3. Maintain comfortable room temperature with good ventilation.
4. Monitor room lighting to accommodate television viewing.
5. Place monitors six feet away from the floor and 12 to 48 feet away from the audience for optimal viewing.
6. Minimize distracting noises/activities in or near the learning environment.
7. Confirm audio levels for the monitors, conferencing system, podium, etc. are adequate and functioning.
Tips for Facilitating Discussion

- Elicit and encourage audience participation.
- Be adaptable to audience needs.
- Be non-judgmental.
- Assess the nature of participant questions to make appropriate responses.
- Seek accurate answers to all questions asked of you, and provide information in a timely manner.

Most importantly,

Be well informed and comfortable in talking about pesticides and pesticide poisoning. As the facilitator, your job is to enhance the video’s ability to:

- Raise awareness.
- Increase knowledge.
- Refute myths and misconceptions with facts.
- Influence attitudes and social norms.
- Reinforce safety knowledge, attitudes, and behaviors.
- Suggest action.
- Show the benefits of appropriate handing and use of pesticides.
- Coalesce relationships with your participants.
It is estimated there are over 10,000 cases of organophosphate pesticide poisoning annually in the United States\(^1\). An estimated 2.5 million seasonal and migrant farm workers, farm families including children, veterinary workers, gardeners, commercial pest-control operators and residents were exposed in 1995\(^1\). Farmers who use pesticides and their families are at elevated risk to pesticide exposure.

Pesticides enter the body through three main routes of exposure including inhalation, ingestion and dermal absorption. Signs and symptoms of pesticide poisoning may include, but are not limited to, blurred vision, headaches, nausea, fatigue, and in severe cases, convulsions or even death.

Pesticide poisoning is highly preventable through the use of personal protective equipment (PPE) and proper handling and spraying techniques.

The Rea Farm Case Study

The Rea farm, located in Cape May County, New Jersey, is owned and operated by Leslie Rea and his wife Diane. The main crop raised on the farm is processed lima beans – over 500 acres per year. Leslie Rea has been farming all his life. Activities on the farm and the types of pesticides used had remained the same, for the most part, for twenty years.

Leslie had noticed blurred vision and concentration problems. He experienced headaches and dizziness while on the farm. The Reas had questions regarding the health problems Leslie was experiencing, and the relationship of those problems to their farm operation. They suspected an interaction between the medications he was taking with the pesticides that were used on the farm. Diane was very persistent in trying to find a reason for Leslie’s health problems. In 1993, Diane and Leslie contacted their local County Agricultural Agent to discuss these issues.

The Cape May County Agricultural Agent referred the Reas to Dr. George Hamilton, an Extension Pesticide Specialist at Rutgers, the State University of New Jersey. George worked with Dr. Mark Robson of the Environmental and Occupational Health Sciences Institute (EOHSI) to examine the possibility of interaction between Leslie’s pesticide and medication use. Occupational health physicians at the EOHSI clinic took Leslie’s medical history and conducted a complete physical examination. Leslie, Diane and the EOHSI staff looked at Leslie’s pesticide use patterns, farming history and other issues unique to the Rea Farm. They concluded that Leslie had sustained heavy and chronic exposure to the organophosphate pesticide (Diazinon). Pesticide management specialists from EOHSI helped Leslie evaluate his farming practices and identify strategies to limit potential harmful pesticide exposures in the course of typical day-to-day farm practices.

Leslie Rea did almost all of the work on the farm himself, with very little outside help. He made successive plantings of lima beans from May through July, and maintained a pesticide spray schedule from planting through harvest. Diazinon is used at planting in the Gandy boxes. Regular applications of Cygon, Procap, and Lannate are made throughout the growing season.

In 1995, the Reas implemented some changes on their farm as suggested by EOHSI staff. They constructed a separate pesticide storage area. They also built a separate wash facility complete with a shower and washer where Leslie could bathe, and launder his work clothes at the end of each day. Leslie wore clean overalls each morning and used personal protective equipment (PPE) for pre-planting work, herbicide incorporation, as well as during planting for filling Gandy boxes. Leslie also used separate seed treatment equipment on the truck for filling planter boxes and wore a dust mask for handling fertilizer. A special trailer for pesticide transport was used in the field, and drift control devices were employed for both pre-plant spraying and seasonal insect control. Diane put together a collection of Material Safety Data Sheets (MSDS), fact sheets, and health information on all the pesticides used on the farm. Everyone on the farm has his or her own PPE. Spare equipment, replacements, and repair materials are stored in the wash facility and on the truck and used on the field. The sealed containers helped prevent any contamination or damage to the equipment.

Leslie’s health greatly improved within one growing season of implementing these changes. He no longer experienced blurred vision, nausea, and problems concentrating. Leslie’s health improvement was so dramatic because the Reas implemented many good pesticide practices at once, doing everything by the book and with all the proper equipment. The changes were an investment in time and money for the Reas. It took a lot of effort and discipline for Leslie to follow this schedule throughout the year, but it paid off. Leslie looked and felt better than he had in years.
All pesticide poisoning is not the same. Each chemical family (organophosphates, carbamates, chlorinated hydrocarbons, etc.) affects the human body in a different way. However, you should be aware of the general signs and symptoms of pesticide poisoning.

### Central Nervous System
- Salivation
- Convulsions
- Headache
- Dizziness
- Nausea
- Difficulty concentrating and thinking, poor memory
- Irritability
- Drowsiness
- Restlessness/ anxiety

### Vision
- Miosis (contraction of the pupils)
- Blurred Vision
- Increased Tearing

### Musculoskeletal System
- General malaise/ fatigue
- Sweating
- Weakness
- Uncoordination
- Nervousness/ shaking
- Cold sweat

### Gastrointestinal System
- Loss of appetite
- Diarrhea
- Vomiting
- Abdominal Cramps

### Respiratory Tract
- Shortness of breath
- Rhinorrhea (discharge through nose)
- Pulmonary edema (excess fluid in the lung tissue)
- Bronchorrhea (abnormal discharge from Bronchial tubes)
- Chest Tightness/ chest Pain
- Respiratory paralysis

### Cardiovascular System
- Bradychardia (slow heart beat)
- Tachycardia (fast heart beat)
- Hypertension (high blood pressure)
Organophosphate Poisoning

Organophosphate insecticides are the most widely used class of insecticides today. More than 40 of them are currently registered for use, and all pose the risk of acute toxicity. Examples of commonly used organophosphates include chlorpyrifos, diazinon, malathion and methyl parathion. According to the American Association of Poison Control Centers, organophosphates are the most commonly implicated class of all pesticides in symptomatic illnesses (Table 1). All apparently share a common mechanism of cholinesterase inhibition and can cause similar symptoms. Because of this shared mechanism, exposure to the same organophosphate by multiple routes or to multiple organophosphates by multiple routes can lead to serious additive toxicity.

Routes of Exposure
It is important to understand that there is a wide range of toxicity in organophosphates and wide variation in their absorption capacities. Exposure by inhalation results in the fastest appearance of toxic symptoms, followed by the gastrointestinal route and finally the dermal route.

Signs and Symptoms
The most commonly reported early symptoms include headache, nausea, dizziness, and increased secretions, such as sweating, salivation, tearing, and respiratory secretions. Progressive symptoms include muscle twitching, weakness, tremor, uncoordination, vomiting, abdominal cramps and diarrhea. Some victims may have altered vision, such as blurred or dark vision. Some symptoms of pesticide poisoning can be mistaken for symptoms of other illnesses, such as the flu. When pesticide handlers become ill from working with organophosphate insecticides in warm and hot environments, it is sometimes hard to tell whether the person is suffering from heat exhaustion or pesticide poisoning (Table 2).

First Aid
Persons attending a victim should avoid direct contact with contaminated clothing and wear chemical-resistant gloves while washing the pesticide from the victim's skin and hair. Antidotes are available for treating organophosphate exposure, most notably atropine sulfate. In all cases, antidotes should be administered by a health professional.

Organophosphate poisoning diagnosis and management
Blood tests can be used to determine whether organophosphates have accumulated in a person's body. One such test uses cholinesterase, an enzyme that occurs naturally in the blood at levels that vary from one person to another. "Baseline" levels of cholinesterase for an individual can be determined at a time of the year when pesticide handling is minimal. The baseline helps determine the normal level of cholinesterase in the body. Other tests throughout the year indicate if there is a reduction in the baseline level. If a reduction has occurred, the individual should not apply organophosphate insecticides. The body normally produces new cholinesterase continuously, and levels return to normal after several weeks.

For information on how to handle a pesticide poisoning, call the National Pesticide Telecommunications Network at 1-800-858-7378 (toll-free to any caller in the United States, Puerto Rico, or the Virgin Islands).

Table 1. Organophosphates are most often implicated in symptomatic illnesses due to pesticide use, 1996.¹

<table>
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<tr>
<th>Rank</th>
<th>Pesticide or pesticide class</th>
<th>Number of cases</th>
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<td></td>
<td></td>
<td>Children less than 6 years old</td>
<td>Adults and older children</td>
<td>Total¹</td>
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<td>1</td>
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<td>Pyrethrins and pyrethroids²</td>
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<td>Pine oil disinfectants</td>
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<td>903</td>
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<td>10</td>
<td>Anticoagulant rodenticides</td>
<td>176</td>
<td>33</td>
<td>209</td>
<td></td>
<td></td>
</tr>
<tr>
<td>All other pesticides</td>
<td>954</td>
<td>3,604</td>
<td>4,623</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total all pesticides and disinfectants</td>
<td>7,279</td>
<td>15,015</td>
<td>22,433</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Totals include a small number of cases with unknown age.
² Rough estimates: includes some veterinary products not classified by chemical type.


Table 2. Symptoms of heat exhaustion vs. organophosphate poisoning

<table>
<thead>
<tr>
<th>Symptoms of Heat Exhaustion</th>
<th>Symptoms of Organophosphate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweating</td>
<td>Sweating</td>
</tr>
<tr>
<td>Headache</td>
<td>Headache</td>
</tr>
<tr>
<td>Fatigue</td>
<td>Fatigue</td>
</tr>
<tr>
<td>Dry membranes</td>
<td>Moist membranes</td>
</tr>
<tr>
<td>Dry mouth</td>
<td>Salivation</td>
</tr>
<tr>
<td>No tears</td>
<td>Tears</td>
</tr>
<tr>
<td>No spit present</td>
<td>Spit present in mouth</td>
</tr>
<tr>
<td>Fast pulse (slow if person has fainted)</td>
<td>Slow pulse</td>
</tr>
<tr>
<td>Nausea</td>
<td>Nausea and diarrhea</td>
</tr>
<tr>
<td>Dilated pupils</td>
<td>Possible small pupils</td>
</tr>
<tr>
<td>Central nervous system depression</td>
<td>Central nervous system depression</td>
</tr>
<tr>
<td>Loss of coordination</td>
<td>Loss of coordination</td>
</tr>
<tr>
<td>Confusion</td>
<td>Confusion</td>
</tr>
<tr>
<td>Fainting (prompt recovery)</td>
<td>Coma (can't waken)</td>
</tr>
</tbody>
</table>
Routes of Exposure

Routes of exposure are the ways through which hazardous chemicals, such as pesticides, enter the body. The most common routes of exposure are dermal absorption, inhalation, and ingestion. Another route of exposure is injection, which is an extremely rare route for pesticide poisoning. With each route of exposure, the likelihood of injury depends on the toxicity of the chemical involved, the concentration of the material, and the duration of contact.

**Dermal Absorption** occurs when pesticides are taken into the body through the skin or eyes through contact with solids, liquids, or gases. Dermal absorption can occur through pesticide-soaked clothes, or by allowing pesticides to directly contact onto the skin while mixing or spraying. Pesticides pass through some areas of the skin more quickly than others. For example, the wrists and back of the hands absorb pesticides more quickly than the palms do.

**Ingestion** of a pesticide occurs when the substance is taken into the body by mouth and absorbed through the gastrointestinal (GI) tract. Pesticides may also be ingested accidentally while eating or smoking on the job site, or when improperly stored in food containers.

**Inhalation** of a pesticide happens when the substance is taken into the body by breathing them in, in the form of finely divided mists, aerosols, or dusts. This is the most common route of exposure. Larger air particles are often inhaled into the upper airways and exhaled, while smaller particles penetrate and deposit deeper into the lungs. Inhaled substances can be absorbed into the circulatory system, causing injury to various organs or organ systems.

**Injection** involves introduction of a substance directly into the body via a sharp object such as a needle or syringe. Health care workers are at particular risk to this route of exposure. Farmers and their families are generally not exposed to pesticides through this route. However, care should be taken to avoid puncture wounds while working with hazardous substances such as pesticides.

Personal Protective Equipment

Personal protective equipment (PPE) is clothing and devices that protect the body from contact with chemicals such as pesticides. **Read the pesticide label;** it provides information on the correct PPE to be used for that specific chemical. Reading and following the directions on the pesticide label will help protect the user and derive the most benefit from the selected pesticide.

**Body Protection**

Wear long-sleeved shirts and long pants. Fasten the collar to protect the lower neck. Wear coveralls over the shirt and pants. The coveralls should fit loosely, which creates an air barrier that reduces direct contact with the pesticide. When wearing two-piece coveralls, leave the top outside and extended below the waist. Coveralls should protect everything except the feet, hands, neck and head and should be chemical-resistant.

Chemical-resistant coveralls can be very hot to wear. Use the following precautions to reduce the probability of heat stress:

- select the coolest PPE appropriate for the task and chemical protection needed
- schedule work at the coolest time of the day, if possible
- increase the amount of water intake to compensate for water lost to perspiration
- stop working immediately if you stop perspiring

Handle clothes worn during pesticide application as if they were contaminated. Handle all contaminated clothing with gloves. Wash the clothing daily and separately from the family wash. Pre-rinse or pre-soak the contaminated clothing using hot water. Use heavy-duty liquid detergent, washing only a few items at a time with the highest water level and the longest wash time. Line-dry the clothing. After washing, run the washer through a complete wash cycle with detergent.

**Hand and Foot Protection**

Hands and forearms receive the most pesticidal exposure. Eighty-five percent of dermal exposure occurs on the hands and forearms. This exposure can be reduced to 3 percent with the use of unlined, chemical resistant gloves. The use of lined gloves increase absorption of pesticides on the inside surface of the glove next to the skin. Wear chemical-resistant gloves when using any kind of pesticide. Refer to pesticide labels for appropriate pesticide-specific chemically resistant types of glove materials. Wear gloves with gauntlets that reach at least halfway to the elbow. This will keep pesticides from running down the sleeves and into the gloves. Put sleeves over the gloves and fasten the cuff, unless working overhead. If applying pesticides over head, fold the glove to make a cuff.

Leave the gloves on when adjusting equipment or opening pesticide containers. Do not touch unprotected areas like your face with potentially contaminated gloves. Leave the gloves on until the entire task is complete. Removing the gloves increases the likelihood of contamination. After completing the task, wash your hands with the gloves on, remove the gloves, and thoroughly wash and dry your hands.

To decrease exposure levels in the leg area, wear pant legs outside the boots or fasten shoe covers tightly to the pant leg. This keeps pesticides from running down the pant leg and collecting in boots or shoes. Canvas, cloth, and leather are difficult or impossible to clean adequately, and should not be worn as foot protection. Spills often occur when handling pesticides. Such spills are likely to land on or near the feet. Wear chemical-resistant footwear for spill protection, which can be shoes, shoe covers or boots. Remember to clean the footwear before removal to reduce contamination from pesticides.
Gloves or footwear made of polyvinyl chloride (PVC) or rubber (butyl, nitrile, neoprene, or natural rubber) must be at least 14 mils thick. If gloves or footwear are exposed previously to agricultural chemicals and irritation of the skin occurs when they are put on, wash the affected area immediately for at least 15 minutes and dry. Discard the old PPE and replace the footwear or gloves with clean sets. Keep several pairs of gloves and footwear available to change whenever necessary.

**Head and Neck Protection**

To protect the head and neck from exposure to pesticides, wear a chemical-resistant, wide-brimmed hat or hood. Plastic "safari" hats, with a plastic sweatband, are a good choice and are relatively cool. Some chemical-resistant jackets or coveralls have an attached protective hood. If the hood is not used, tuck the hood inside the neckline to keep it from collecting pesticides.

**Protective Eye Wear**

Eyes are very sensitive to pesticides. Wear protective eyewear when handling pesticides. The different types of protective eyewear are shielded safety glasses, face shields and goggles. Shielded safety glasses must have brow and side shields. They do not cause fogging or sweating and give eye protection in many situations. Face shields provide protection to the entire face. Face shields that are cupped inward toward the throat give better protection than straight face shields.

Wear goggles when riding in an open cab during an air blast application, flagging under an aerial application, applying mists, fogs or aerosols indoors or working in similar situations. Goggles provide better protection than shielded safety glasses or face shields for these situations. Goggles should fit tightly against the face. A full-face respirator also protects the applicator in these situations. If worn with a half mask respirator select styles that fit comfortably with the respirator.

For more information contact your local Cooperative Extension County Agent.

Many times, the costs incurred by implementing safe farming practices are the greatest barrier to making those changes happen. Implementing such changes need not cost you your farm. Personal Protective Equipment (PPE) ranges in prices. The total cost expended by purchasing PPE for use on your farm will depend on your pesticide handling and application methods, and the type and amount of pesticide you use. The changes you make on your farm may not need to be as extensive as on the Rea Farm.

Listed below is a sample list of PPE and associated costs. Evaluate your own farm practices. Identify the PPE best suited to your farming operation and estimate how much it will cost to implement use of it. Remember, whatever that total, it is worth your personal health and the health of your family.

*Please note that the products or brands named here are used only as examples. No endorsement or discrimination is implied or intended.

**Chemical-resistant gloves**
- 13”, 15-mil Nitrile Gloves: $2.39/pr (1-24 pr) $2.15/pr (25-71 pr) $1.84/pr (72+ pr)
- 18” Heavy Rubber Gloves: $11.95/pr (1-11 pr) $10.95/pr (12+ pr)
- Dozen-pack Heavy Duty Industrial Rubber Gloves: $22.90/doz (1-5 doz) $20.61/doz (6+doz)

**Coveralls**
- DuPont Tyvek Protective Wear, white basic coverall with zipper front
  - Unhooded: $4.76/ea (1-24) $4.31/ea (25-124) $3.86/ea (125+)
- Blue Denim Tyvek Overalls: $6.95/ea (1-24) $6.31/ea (25+)
- Water resistant Pro/ Shield 2 garments
  - Shirt: $4.25/ea (1-24) $3.83/ea (25-49) $3.45/ea (50+)
  - Pants: $3.70/ea (1-24) $3.33/ea (25-49) $2.98/ea (50+)
- Basic Coveralls: $5.50/ea (1-24) $4.90/ea (25+)
- Hooded Coverall: $6.50/ea (1-24) $5.90/ea (25+)
- Hooded Coverall with Booties: $6.75/ea (1-24) $6.10/ea (25+)

**Respirators**
- Moldex 2200 N95 Dust/ Mist Respirator (box of 20)
  - (10+boxes): $19.50/box (1-9 boxes) $17.55/box
- 3M Disposable Dual Cartridge Pesticide Respirator
  - (1-4): $19.95/ea (1-9) $17.50/ea (5+)
- 3M Full Face Respirators
  - $209.00/ea
- KASCO K 80S-T8 Battery-powered Pesticide Helmet
  - $607.95/e (1-2) $547.15/ea (3+)
Goggles
Fog-free chemical splash goggle $5.50/ pr (1-25) $4.96/ pr (26-75)
$4.47/ pr (76+)
US Safety Chemical Splash Goggles
Clear Goggle $6.95/ pr (1-11) $6.50/ pr (12+)
Tinted Goggle $7.25/ pr (1-11) $6.95/ pr (12+)
Replacement Clear Lens $4.50/ pr (1-11) $4.05/ pr (12+)
Replacement Tinted Lens $4.50/ pr (1-11) $4.05/ pr (12+)

Chemical-resistant footwear
Yellow stretch Latex Over-the-shoe Booties $5.95/ pr (1-11) $5.50/ pr (12-49) $4.95/ pr (50+)
Excellent for hazardous materials or clean up work. Reusable – they fold up into a ball.
LeCrosse RESISTOR 16” Plain Toe Boots $23.50/ pr (1-11) $21.15/ pr (25+)
Excellent resistance to chemicals, oils, greases and manure. Ideal for agricultural operations that handle both pesticides and manure.

HZT 15” Steel Toe Chemical Safety Boots $57.50/ pr (1-5) $51.75/ pr (6+)
Proven by HazMat teams these will stand up to pesticides, manure, fuels and just about any ag/ hort chemicals. Meets NFPA 1991 requirements.

Acute exposure – An exposure to a chemical for a duration of 14 days or less. Exposure to the chemical may be brief, but the chemical concentration may be high. Health effects resulting from acute exposures are often immediate, but can be delayed up to 12 hours after exposure.

Carbamates - Carbamates are a class of pesticide that slowly poisons by attacking an essential body chemical called “cholinesterase” that is required for the proper transmission of nerve pulses. Many carbamates are only moderately or slightly toxic. However, some carbamates are highly toxic via oral, dermal or inhalation exposure. These include Temik, Furadan, Zectran, Carzol SP and Lannate.

Cardiovascular system - A system of the body consisting of the heart and blood vessels.

Central nervous system - A system of the body consisting of the brain, spinal cord and nerves.

Chlorinated hydrocarbons - Most chlorinated hydrocarbons are considered hazardous because they persist in the environment. Some are highly toxic via dermal and oral exposure. These include Pentac, Thiodan, lindane and methoxychlor.

Chronic exposure – Long term repeated exposures to small, non-lethal doses of a chemical that often produces health effects that differ in type or degree from the effects of acute (short term) exposure. Chronic exposure to pesticides may lead to permanent health effects or death.

Dermal absorption – Pesticides are taken into the body through the skin or eyes through contact with solids, liquids, or gases. Dermal absorption can occur through clothes wet through with pesticides, or by allowing pesticides to fall directly onto the skin while mixing or spraying. Pesticides pass through some areas of the skin more quickly than others. For example, the wrists and back of the hands absorb pesticides more quickly than the palms.

Dose – The amount of a substance that enters a person’s body. The dose is related to the exposure, concentration, duration, and amount of substance that was taken in.

Exposure - A condition involving the contact of an agent or pesticide with the visible exterior of a person, such as the skin, mouth, or nose.

Gastrointestinal tract - A system of the body consisting of the mouth, esophagus, stomach, and intestines.

Hazard - Hazard is the risk of danger. It is the risk that danger or harm will come to anyone who comes in contact with the substance.

Health risk assessment - Estimation of adverse effects from a chemical exposure. This assessment depends on the intrinsic toxic potential of the chemical, its concentration, the duration of exposure, and the health status of the person or population exposed.
**Ingestion** - Process by which pesticides are taken into the body by mouth and absorbed through the gastrointestinal (GI) tract. Pesticides may be ingested accidentally while eating or smoking on the job site, or when improperly stored in food containers.

**Inhalation** - Process by which pesticides are taken into the body by breathing them in, in the form of finely divided mists, aerosols, or dusts. This is the most common route of exposure. Larger air particles are often inhaled into the upper airways and exhaled. But smaller particles penetrate deeper into the lungs. Inhaled substances can be absorbed into the circulatory system, causing injury to various organs or organ systems.

**MSDS** - Material Safety Data Sheets contain information on chemicals including the chemical name, formula, physical properties (boiling point, freezing point vapor pressure), manufacturer name and address, as well as what to do in case of an emergency.

**Organophosphate** - Organophosphates are a class of chemical that slowly poisons by attacking an essential body chemical called “cholinesterase”, that is essential for the proper transmission of nerve pulses. Many organophosphates are highly toxic via oral, dermal and inhalation exposure. Organophosphate insecticides include: Diazinon, parathion, TEPP, Guthion, Thimet, Systox, Di-Syston, phosphamidon and Monitor.

**Personal protective equipment (PPE)** - Items worn to reduce exposure to hazardous substances. PPE include respirators, gloves, safety glasses, overalls, etc.

**Respiratory tract** - A system of the body that includes the mouth, nose, trachea (windpipe), bronchi, and lungs.

**Routes of exposure** - The ways through which hazardous chemicals such as pesticides can enter the body. The most common routes of exposure are inhalation, ingestion, and dermal absorption. With each route of exposure, the likelihood of injury depends on the toxicity of the chemical involved, the concentration of the material, and the duration of contact.

**Sign** - Physical manifestation of illness, such as vomiting or convulsions.

**Symptom** - Internal manifestations of illness that people feel when suffering from a health problem, such as pain, nausea, and blurred vision.

**Toxicity** - Toxicity refers to how poisonous a substance is. Toxicity is measured in more than one way. Acute toxicity refers to how poisonous the pesticide is to animal or man after a single exposure. Chronic toxicity refers to how poisonous a pesticide is to animal or man after small, repeated doses over a period of time.
Checklist for Preventing Pesticide Accidents

Everyone can improve their methods for safe handling of pesticides. Experienced pesticide applicators may become so familiar with equipment and materials used that they become careless or take shortcuts. Then an accident can happen.

The following checklist of questions is drawn from data showing the common causes of pesticide accidents. Check it against you pesticide handing practices and see how many accidents are waiting to happen to you. Just one “No” may be then one that gets you in trouble!

YES  NO

Store your pesticides safely!

_____ ____ Do you have a separate space to store pesticides?

_____ ____ Do you keep it locked and are the windows tight, barred or boarded over?

_____ ____ Do you keep all your pesticides in this storage area rather than in garage, feed room, basement, porch, kitchen, or refrigerator?

_____ ____ Do you store herbicides separately from other pesticides?

_____ ____ Are there signs on your storage so firemen and others are warned?

_____ ____ Do you check periodically for leaking containers?

Keep in the original container so the original label is there!

_____ ____ Do you always keep pesticides in the original container instead of old “Coke” bottles, milk cartons, or other food containers?

_____ ____ When people ask you for a little spray mix out of your tank, do you refuse?

_____ ____ Do you always remember what is in an unlabeled container?

_____ ____ Do you always remember the safety precautions, antidotes and directions for use, even though the container is not labeled?

_____ ____ Do you safely dispose of unlabeled pesticides, rather than take a chance with your memory?

Use the recommended clothing and protective equipment!

_____ ____ Do you read the label to see what protective equipment you should use?

_____ ____ Do you start each spraying day with clean clothing or protective apparel?
<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Do you check the label for signal words and precautions to see what protective equipment is necessary?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you wear protective equipment recommended on the label?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you clean and maintain your protective equipment regularly and often?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you throw away rubber gloves that have only tiny holes in them?</td>
</tr>
</tbody>
</table>

**Spills and splashes of concentrated pesticides can be very hazardous!**

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Do you know what to do if you spill a pesticide on yourself while mixing?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you wear adequate footwear with your pant cuffs on the outside so pesticides don’t run into your footwear?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you have sawdust, vermiculite, kitty litter, or some other absorbent on hand to soak up spills?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you always watch your sprayer tank when filling so it won’t run over and spill on the ground?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you have a check valve or other device on your equipment to prevent back siphoning into the water supply?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Is your application equipment well maintained so it doesn’t leak and leave toxic puddles or piles of pesticides on the ground?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you avoid draining leftover spray mix on the ground?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you discard old high pressure hoses instead of patching them and hoping no one will be nearby when they burst?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you clean the nozzles of application equipment with a brush, by rinsing it, etc. instead of blowing them out with your mouth?</td>
</tr>
</tbody>
</table>

**Poor container disposal may cause bad accidents!**

<table>
<thead>
<tr>
<th>YES</th>
<th>NO</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Do you rinse each “empty” liquid container at least three times and dump the rinsate into the tank?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you keep used pesticide containers in your storage area until disposed?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you remove every container for disposal before leaving the field instead of leaving them in the field or at your tank filling station?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you puncture, break, crush or empty pesticide containers so they can’t be reused?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Do you keep or return to the manufacturer 30- and 55-gallon pesticide drums, rather than giving them away for floats, trash barrels, etc.?</td>
</tr>
<tr>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----</td>
<td></td>
</tr>
<tr>
<td><strong>Attractive nuisances can result in lawsuits!</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>----</td>
<td>Do you keep your spray equipment where children cannot play on it?</td>
</tr>
<tr>
<td>----</td>
<td>****</td>
<td>Do you keep your spray equipment clean so that those touching it will not be contaminated?</td>
</tr>
<tr>
<td>----</td>
<td>****</td>
<td>Do you always release pressure on your equipment so spray guns won’t be accidentally triggered?</td>
</tr>
<tr>
<td><strong>Care in application prevents accidents!</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>----</td>
<td>****</td>
<td>Do you check the wind direction and the area downwind before applying pesticides?</td>
</tr>
<tr>
<td>----</td>
<td>****</td>
<td>Do you consider substituting a less environmentally toxic pesticide if you are spraying near a sensitive area?</td>
</tr>
<tr>
<td>----</td>
<td>****</td>
<td>Do you check for the possibility of showers and damaging runoff before applying pesticides?</td>
</tr>
<tr>
<td>----</td>
<td>****</td>
<td>Do you plan your pesticide application so it will have little or no effect on bees, birds, fish, or other wildlife?</td>
</tr>
<tr>
<td>----</td>
<td>****</td>
<td>Do you remove, turn over, or cover up pet dishes, sand boxes, plastic pools, etc. before spraying?</td>
</tr>
<tr>
<td>----</td>
<td>****</td>
<td>Do you make sure that children and pets are out of the area and stay out until the spray dries?</td>
</tr>
</tbody>
</table>

Agricultural chemicals have helped provide an abundance of high quality but relatively low-cost food products. But they must be applied with informed care and concern for the safety of users and consumers, and to protect the environment. Without fail, read and heed label directions to assure proper and safe use and storage. Make certain all your workers understand and follow label directions.

- Do not risk your health. Always use appropriate protective equipment as required by the label.
- Mix pesticides carefully and accurately, using only the recommended amount. Wear gloves, splash-proof goggles or face-shield, a rubber or neoprene apron, and other personal protective clothing.
- Install an approved anti-siphoning device to prevent back siphoning into your water supply. An air gap between the source and the spray tank should be maintained.
-Whenever you transport, store, mix, load, or apply pesticides, keep all unauthorized persons away, especially children.
- Triple-rinse all empty containers. Put the rinsate into a tank for use on labeled crops.
- Clean up all spills and leaks immediately. Keep clean-up supplies such as containment drums, kitty litter, a shovel, a broom and dustpan in your storage facility and ready to use.
- Set application equipment for correct delivery rate and operate at recommended speed for proper coverage. Do not apply on windy days or when heavy rain is expected.
- Post treated areas and also verbally warn others to stay out until it is safe to re-enter area.
- Clean all equipment and protective garb when finished. Do not eat or smoke until you have washed and changed.
- Safely dispose of empty containers and excess chemicals as suggested by the manufacturer, dealer or agricultural authority. Never dump containers and/or chemicals. They could pollute groundwater, wells or streams or be a hazard to people and animals.

### Farmworker Safety Pesticide Record Form

<table>
<thead>
<tr>
<th>Date &amp; Time Applied</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dia De La Aplicacion</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Crop</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Coshecha</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Field Treated</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sitio De La Aplicacion</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name of Pesticide</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Nombre De La Pesticida</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Amount Used and Rate</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Candtidad Usada</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Date &amp; Time of Reentry</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dia Tiempo De Reentrada</td>
<td></td>
</tr>
</tbody>
</table>

Adapted from a form developed by: Jack Rabin and George C. Hamilton, Ph.D.
Discussion Questions: Core Session

- Who, according to the video, is at risk for organophosphate poisoning?
- How are farmers (and their families) exposed to pesticides on, and around the farm?
- What are the routes of exposure to pesticide poisoning?
- What are the signs and symptoms of pesticide poisoning?
- What safety precautions did Leslie Rea implement on his farm after he was diagnosed with organophosphate poisoning?
- What personal protective equipment should be used when handling and applying pesticides?
- Why should farmers who use pesticides read the pesticide label before use?
- What application methods did Leslie Rea employ on his farm to reduce exposure? How did these methods reduce his risk of exposure?
- What does the video suggest that farmers tell their family physician when discussing their personal health and the health of other members of their family?
Discussion Questions: Population at Risk

- According to the video, who is at-risk for pesticide poisoning? Do you agree? Why? Why not?
- What daily farming activities can put you at risk for pesticide exposure? Activities throughout the planting season?
- How at-risk do you personally feel to pesticide poisoning? How at-risk to pesticide exposure do you feel your family is?
- Approximate how much time in a single week you come in contact with pesticides.
- Estimate how much direct exposure to pesticides you experience, through handling, application, and spraying, in a single week?
- Estimate your pesticide exposure through indirect contact with pesticides, through contact with already sprayed crops, contact with clothes/equipment soiled with pesticides, or pesticide residue?
- Identify scenarios where your family members may come in contact with the pesticides on your farm.
- What actions can you take to reduce your risk to pesticide exposure?
Discussion Questions: Routes of Exposure/ Acute vs. Chronic Exposure

- How are farmers exposed to pesticides on the farm?
- How do pesticides enter our bodies?
- How much pesticide exposure is necessary to affect your health?
- What is the difference between acute exposure and chronic exposure?
- What is an example of how acute exposures can occur on the farm? What is an example of how chronic exposures can occur on the farm?
- How can these exposures occur outside the farm setting?
- What actions can you take to reduce the risk for acute exposure? Chronic exposure?
- How would those changes benefit your health?
Discussion Questions: Signs and Symptoms of Pesticide Poisoning

• Review the signs and symptoms of organophosphate pesticide poisoning.
• How would experiencing these signs and symptoms impact on your everyday life?
• What other conditions can bring about these signs and symptoms?
• What is the difference between acute poisoning and chronic pesticide poisoning?
• What actions should you take when experiencing these symptoms? What did the Reas do in response to Leslie’s signs and symptoms?
• How would those actions benefit your health?
Discussion Questions: Safety Precautions

- What pre-application safety precautions did Leslie Rea implement on his farm? How did these changes impact his exposure to the pesticides used?

- Are these changes relevant to your own farm? What pre-application safety precautions could you implement that would be relevant to your own farm?

- Leslie Rea farmed lima beans. Seed treatment is necessary for most bean crops. Leslie treated his own seed. What else could he have done to reduce his pesticide exposure?

- Are these changes relevant to your crop(s)? What pre-application safety precautions could you implement that would be relevant to your own crop(s)?

- What safety precautions did Leslie Rea implement on his farm after the application process? How did these changes impact his exposure to the pesticides used?

- Are the changes the Reas employed feasible to implement on your farm?

- What safety precautions could you take to reduce your risk of pesticide poisoning after pesticide application?
Discussion Questions: Safe Handling and Use of Personal Protective Equipment

• What personal protective equipment (PPE) should be used when handling pesticide?
• What are the perceptions that get in the way of using PPE?
• What can you do to overcome those obstacles to using PPE?
• What did Leslie Rea do, in terms of changing the way he handled pesticides on his farm? Are the changes that Leslie Rea implemented in handling the pesticides practical?
• Are those changes you could make on your farm, if not already in place?
• How would those changes reduce your risk of exposure to pesticide poisoning?
• How would your health benefit from such changes?
Discussion Questions: Pesticide Labels and MSDS

- Why does the video stress that farmers who use pesticides should read the label before use?
- What information does the label contain?
- What information do Material Safety Data Sheets (MSDS) contain?
- How is this information important to your health and the health of your family?
- How many farmers do you estimate read the label before using pesticides? Keep MSDS easily accessible and close-by to where pesticides are stored?
- Why is it important to keep MSDS sheets on hand?
- What is the difference between the signal words “DANGER”, “WARNING” and “CAUTION”?
- How do the different signal words affect your health, or the health of your family?
Discussion Questions: Application of Pesticides

- What application methods did Leslie Rea employ on his farm to reduce pesticide exposure? How did this method reduce risk of pesticide exposure?

- Are the methods Leslie Rea employed relevant to your farming operation? What would you do differently? What would you do the same? Why?

- How often do you apply pesticides on your farm? How do you think that affects your potential exposure to pesticide poisoning?

- What factors must you consider when choosing your method of pesticide application?

- How do these decisions impact how much pesticide you can potentially come in contact with? How could this affect your health or the health of your family?
Discussion Questions: Pesticide Storage and Transport

- What changes did Leslie Rea implement to reduce his exposure to pesticides, specifically in how he stored and transported his pesticides?

- Are these changes difficult to make?

- Are these actions you would be able to perform on your farm?

- How would these actions benefit your health, or the health, or the health of your family?

- What are the obstacles that may get in the way of other farmers making the same changes on their own farms?

- How could you overcome those obstacles?

- What argument would you make to fellow farmers to advocate for the changes Leslie Rea implemented on the Rea Farm?
Discussion Questions: Talking with Your Doctor

- How many of you have ever suspected you (or know of someone who) had signs or symptoms of pesticide poisoning?

- How many of you actually went to the doctor (or know someone who went to the doctor) as a result of this suspicion?

- Have you considered talking to your doctor about your occupation and use of pesticides?

- What barriers do you think keep farmers from talking with their doctors about their occupation and pesticide poisoning?

- What actions can you take to overcome these barriers?

- How would these actions benefit your health or the health of your family?
Participant Program Evaluation

We would like you to assess the program you attended today. Please fill out this questionnaire as completely, carefully, and honestly as possible.

1. How would you rate the overall quality of the program you attended today?
   1  2  3  4
   excellent  good  fair  poor

2. Was material presented today interesting to you?
   1  2  3  4
   yes, definitely  no, not at all

3. Was the material relevant to your needs?
   1  2  3  4
   yes, very  no, not at all

4. Did the presenter(s) stimulate your interest in the material?
   1  2  3  4
   yes, definitely  no, not at all

5. Did the discussion facilitate your understanding of the material?
   1  2  3  4
   yes, definitely  no, not at all

6. How useful would you say the material in the program will be to you?
   1  2  3  4
   very useful  not useful at all

7. How likely are you to implement a change on your farm as a result of this program?
   1  2  3  4
   very likely  not likely at all

8. The thing I liked best about this program is:

9. The aspect of the program most in need of improvement is:

10. Comments
Facilitator Program Notes

<table>
<thead>
<tr>
<th>Program Date:</th>
<th>Sponsoring agency:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>Sponsoring Agency Contact Phone:</td>
</tr>
<tr>
<td>Site Contact Phone:</td>
<td>Facilitator:</td>
</tr>
</tbody>
</table>

1. How could the training have been improved?

2. How many people were trained?

3. Common group characteristics (pesticides used, crop, reason for attending workshop)

4. Which discussion questions were used?

5. Which discussion sections did the group appear to really like? What seemed to really work for this group?

6. Which discussion sections did the group appear to dislike? How could the questions have been improved?

7. Which materials were used? Did the audience appear to like them? How could the materials, or use of the materials be improved?

8. What information was too easy or too difficult for the group?

9. Were the facilities and audiovisual set-up adequate?
1. Describe who is at risk for organophosphate poisoning.

2. Identify the ways organophosphates enter the human body (routes of exposure).

3. Identify three (3) signs and symptoms of organophosphate poisoning.

4. Identify one obstacle to preventing exposure to pesticides on your farm. How you could overcome it?

5. Discuss three (3) actions that can be done to prevent organophosphate poisoning.

6. List two places to go for information about organophosphate handling, safety and poisoning.

7. List two (2) things you should tell your doctor when discussing your health or that of a family member.
1. Describe who is at risk for organophosphate poisoning.
   • Any one who comes into contact with organophosphate pesticides (farmers, farm workers, family members, neighbors, etc.).

2. Identify the ways organophosphates enter the human body (routes of exposure).
   • Inhalation (lungs)
   • Absorption (skin)
   • Ingestion (Gastrointestinal tract)

3. Identify three (3) signs and symptoms of organophosphate poisoning.
   • Salivation
   • Convulsions
   • Headache
   • Dizziness
   • Nausea
   • Miosis (contraction of the pupils)
   • Blurred vision
   • Increased tearing
   • General malaise/ fatigue
   • Sweating
   • Weakness,
   • Uncoordination
   • Nervousness/ shaking
   • Could sweat
   • Loss of appetite
   • Diarrhea
   • Vomiting
   • Abdominal cramps
   • Bradycardia (slow heart beat)
   • Tachycardia (fast heart beat)
   • Hypertension (high blood pressure)
   • Difficulty concentrating memory and thinking
   • Irritability
   • Drowsiness
   • Restlessness/ anxiety
   • Chest tightness/ chest pain
   • Respiratory paralysis
   • Shortness of breath
   • Rhinorrhea (watery discharge through nose)
   • Pulmonary edema (excess fluid in the lung tissue)
   • Bronchorhea (abnormal discharge from the Bronchial tubes)

4. Identify one obstacle to preventing exposure on your farm. How you could overcome it?
   (Answers are not exhaustive)
   • Cost - the initial investment will ultimately improve farmer’s health, eliminate the need for pesticide poisoning-related medical care and expense, as well as improve productivity.
   • Time - Make all necessary person protective equipment easily accessible by making placing them near machinery before use of pesticide, and designating a location to quickly decontaminate (change and wash) after pesticide application.
   • Lack of knowledge- post a map of locations where organophosphate pesticides are being applied; post hazard signs where organophosphate pesticides are stored and used; have MSDS information readily accessible; call your local Cooperative Extension office for information.
   • Not want to change- think about the effects on your personal health and your family’s health.
5. Discuss three (3) actions that can be done to prevent organophosphate poisoning.

a) Wear Personal Protective Equipment (PPE):
   • Coveralls – protects from dermal absorption
   • Gloves – protects from dermal absorption
   • Mask (respirator) – prevents inhalation and ingestion
   • Goggles – protects from chemical absorption

b) Implement a safe planting system:
   • Seed treating equipment, use of gandy box
   • Wear gloves, respirator and goggles

c) Employ safer spraying techniques that promote drift control:
   • Boom sprayer, panels or blaster sprayer
   • Cannon

d) Implement safe storage and transport techniques
   • Pesticide storage trailer, to keep them contained
   • Stored under lock and key

e) Construct a wash Area
   • Wash hands
   • Take shower after working in the field, before go into home
   • Wash work clothes in separate wash; limit contamination to family
   • Ventilate dryers to outside
   • Install washer, dryer & shower in shed, on site near storage area
   • Pesticides remove easily with warm water and soap.

f) Prominently display:
   • EPA safety poster
   • Local emergency numbers
   • Map of farm identifying areas of farm where pesticides used

6. List two places to go for information about organophosphate handling, safety and poisoning.

• National Pesticide Telecommunications Network
  For consumer and medical information on pesticides
  800 858 7378

• Pesticide Accident Hotline (CHEMTREC)
  For help with spills and leaks
  800 424 9300

• Local county extension office or cooperative extension office
7. **List two (2) things you should tell your doctor when discussing your health or that of a family member**
   - You’re a farmer
   - Where you work
   - How long you work
   - Other work practices
   - Identify the chemicals you use on your farm
   - Bring labels
   - Bring MSDS sheets (educates physician about pesticide toxicity)
Federal and National Resources

Chemical Emergencies
Chemical Spills Emergency Hotline
(800) 535-0202

USEPA Hazardous Waste Hotline
(800) 535-0202

Hazardous Waste
Emergency Planning & Community Right-to-Know Hotline (EPA)
Developing chemical contingency plans, gathering site-specific information, list of more than 400 acutely toxic chemicals
(800) 535-0202

Integrated Risk Information System (IRIS)
Hazardous chemical information, including health effects
(202) 475-6743

IRIS User Support
(513) 569-7254

Lung Disease
Lungline/ National Jewish Hospital
Information on lung disease from chemical exposure
(800) 222-5864

Occupational Health
NIOSH
Information and publications on health effects of occupational exposures (800) 356-4674

Medical Section/ Diagnosis and Treatment
(513) 841-4386

Industrial Hygiene
(513) 841-4374

OSHA (Occupational Safety & Health Administration)
Regulations for toxic & hazardous substances in the workplace (202) 523-7111

Pesticides
National Pesticide Hotline
(800) 535-PEST

National Pesticide Telecommunications Network
(800) 858-7378
National Pesticides Information Retrieval System (NPIRS)
Help number for searching NPIRS database to get fact sheets on pesticides, insecticides, fungicides, and state & federally registered chemicals
(317) 494-6614

Superfund Records of Decision
Accord of remedy selection for hazardous waste sites being remediated under EPA’s Superfund Program
(703) 920-9810

Toxic Substances
Toxicology Information Response Center (Oak Ridge)
General toxic information, searches on chemicals (615) 567-1743 or (615) 567-1750

Agency for Toxic Substances & Disease Registry (ATSDR)
Toxicological profiles in draft (Final profiles available from National Technical Information System)
(404) 539-6000

Toxic Substances Control Act (TSCA) Hotline/ Public Information Office (EPA)
Answers questions & gives general technical assistance on TSCA. Guidance on TSCA regulations
(202) 554-1404

Toxic Chemical Release Inventory System (EPA) Information about which chemicals are used, stored, released by companies
(800) 535-0202

Chemical Referral Center (American Chemical Society)
Non-emergency health and safety information on chemicals
Outside continental US
(202) 887-1315

Water
EPA Safe Drinking Water Hotline
(800) 426-9607
An American Farm Tale. Chronic Organophosphate Exposure and Treatment: The Rea Farm Case Study
Louisiana Department of Health and Hospitals
1201 Capitol Access Road East Entrance
PO Box 629
Baton Rouge, LA 70821
(504) 342-9500

Maine Bureau of Health Department of Human Services
State House Station
11 Augusta, ME 04333
(207) 289-2736

Maryland Department of Health and Mental Hygiene
201 W. Preston Street Baltimore, MD 21201
(301) 225-6500

Massachusetts Department of Public Health 150
Tremont Street Boston, MA 02111
(617) 727-2700

Michigan Department of Public Health
3423 N. Logan Street PO Box 30195 Lansing, MI 48909
(517) 335-8024

Minnesota Department of Health
717 Delaware Street SE
PO Box 9441 Minneapolis, MN 55440
(612) 623-5000

Mississippi Department of Health
PO Box 1700
2423 N. State Street Jackson, MS 39215
(601) 960-7634

Missouri Department of Health
PO Box 570
Jefferson City, MO 65102
(314) 751-6001

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Lockey Street Helena, MT 59620
(406) 444-2544

Nebraska Department of Health
301 Centennial Mail S.
PO Box 95007 Lincoln, NE 68509
(402) 471-4047

An American Farm Tale. Chronic Organophosphate Exposure and Treatment: The Rea Farm Case Study
Medical Consultation Resources

American College of Occupational and Environmental Medicine
55 W. Seegers Arlington Heights, IL 60005
(708) 228-6850
Board-certified occupational physicians and members of the College of Occupational Medicine can be obtained from The American College of Occupational Medicine

American Board of Medical Toxicology
National Office
Lewis Goldfrank, MD
New York Poison Center
Bellevue Hospital
27th Street & 1st Avenue New York, NY 10016
(212) 561-3346

Association of Occupational and Environmental Clinics
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1030 15th Street NW, Suite 410
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(202) 347-4976
The Association of Occupational and Environmental Clinics (AOEC) is a network of clinics affiliated with medical schools throughout the U.S. Member clinics provide professional training, community education about toxic substances, exposure and risk assessment, clinical evaluations, and consultation. A lending library of training materials is maintained for use by members. Membership is open to any person who shares the goals of the Association. Clinicians can contact the AOEC office for referrals.

Teratogen Exposure Registry and Surveillance (TERAS)
Frederick Bieber, Ph.D.
Department of Pathology Brigham and Women's Hospital
75 Francis St. Boston, MA 02115
(617) 732-6507
TERAS is a network of geneticists and pathologists studying human embryos and fetuses exposed to teratogens. TERAS maintains information networks for consultation and evaluations.
The professionals in the Association of Occupational and Environmental Clinics act as consultants regarding treatment of persons exposed to hazardous substances.

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An American Farm Tale. Chronic Organophosphate Exposure and Treatment: The Rea Farm Case Study

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Poison Control Centers were established around 1953 to help physicians deal with poisoning of adults and children in the United States. In 1983, the American Association of Poison Control Centers (AAPCC) was established as the professional organization for Poison Control Centers. The Regional Poison Control Centers can act as a valuable resource in providing information about the toxicity and health effects of hazardous exposures involved in poisonings.

ALABAMA
Birmingham
Children's Hospital of Alabama Poison Control Center
(205) 939-9201 (800) 292-6678 (In state) (205) 933-4050

ARIZONA
Samaritan Regional Poison Center
(602)253-3334
Tucson
Arizona Poison and Drug Information Center
(800) 362-0101 (In state) (602) 626-6016

CALIFORNIA
Fresno
Fresno Regional Poison Control Center
(800) 346-5922 (In state) (209) 445-1222
Orange
UCI Regional Poison Center
(714) 634-5988 (800) 544-4404 (Southern CA only)
Sacramento
UCDMC Regional Poison Control Center
(800) 342-9293 (Northern CA only) (916) 453-3692
San Diego
San Diego Regional Poison Control Center
(619) 543-6000; (800) 876-4766 (619 area only)
San Francisco
SF Bay Area Regional Poison Control Center
(415) 476-6600
San Jose
Santa Clara Valley Medical Center Regional Poison Center
(408) 299-5112; (800) 662-9886 (CA only)
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Hennepin Regional Poison Ctr
(612) 347-3141 (612) 337-7474 (T D D) (612) 337-7387 (Petline)
St. Paul
Minnesota Regional Poison Ctr
(612) 221-2113

MISSOURI
St. Louis
Cardinal Glennon Children's Hospital
(800) 366-8888 (314) 772-5200

MONTANA
Denver (C O L O R A D O)
Rocky Mountain Poison and Drug Center
(303) 629-1123

NEBRASKA
Omaha
The Poison Center
(402) 390-5555 (O m a h a only)
(800) 955-9119 (In state)

NEW JERSEY
Newark
New Jersey Poison Information and Education System
(800) 962-1253 (In state)

NEW MEXICO
Albuquerque
New Mexico Poison and Drug Information Center
(800) 432-6866 (In state) (505) 843-2551

NEW YORK
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Long Island Regional Poison Control Center
(516) 542-2323, 2324, 2325, 3813
New York
New York City Poison Center
(212) 340-4494 (212) 764-7667 (212) 689-9014 (T D D)
OHIO
Cincinnati
Regional Poison Control System and Cincinnati
Drug and Poison Information Center
(513) 558-5111 (800) 872-5111 (In state)
Columbus
Central Ohio Poison Center
(800) 682-7625 (614) 228-1323 (614) 228-2272 (TTY) (614) 461-2012

OREGON
Portland
Oregon Poison Center
(503) 494-8968 (800) 452-7165 (In state)

PENNSYLVANIA
Philadelphia
Poison Control Center
(215) 386-2100 or 2111

Pittsburgh
Pittsburgh Poison Center
(412) 681-6669

RHODE ISLAND
Providence
Rhode Island Poison Center
(401) 277-5727

TEXAS
Dallas
North Texas Poison Center
(800) 441-0040 (In state) (214) 590-5000

UTAH
Salt Lake City
Intermountain Regional Poison Control Center
(801) 581-2151 (800) 456-7707 (In state)

VIRGINIA
Charlottesville
Blue Ridge Poison Center
(804) 925-5543 (800) 451-1428

Washington D.C.
National Capital Poison Center (Northern VA only)
(202) 625-3333 (202) 784-4660 (TTY)
WEST VIRGINIA
Charleston
West Virginia Poison Center
(800) 642-3625 (In state) (304) 348-4211

WYOMING
Omaha (NEBRASKA)
The Poison Center
(402) 390-5555 (Omaha) (800) 955-9119 (from Wyoming only)
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