

CHAPTER CHEMICALS

CHEMICAL SAFETY

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CHEMICAL AND GERM CONTAMINATION

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CHEMICAL SAFETY

Learning Objectives

After completing this station, participants should be able to:

1. Describe the risks of farm chemicals.
2. Identify the proper clothing and safety equipment to use when handling chemicals.
3. Describe key elements of proper chemical storage.
4. Identify symptoms of pesticide poisoning and proper first aid procedures.

Safety Requirements

1. If containers that hold chemicals are used for display make certain that the container has an unbroken seal and is under the observation of an adult at all times.
2. If using a look-a-like display, all products should be “safely” displayed and actual dangerous chemicals are locked and not accessible to the participants. If chemicals are displayed, create a 4 ft. (1.2 m) barrier between the participants and the display.
3. Make certain that no chemically contaminated items are used for display or demonstration (gloves, goggles, shoes, chemical containers, chemical labels).

Age-Appropriateness

This lesson is appropriate for participants of all ages. Participants should not be taught how to use chemicals. The focus of the lesson is the dangers of chemicals and how to avoid contact with them. For younger participants, emphasis will be on the types and dangers of chemicals, as well as terminology. Older children may be familiar with some or all of the terms. Review the terms with them by asking questions such as what dermal exposure means and what is a fungicide used for. Terms with which children may not be familiar are chemical, toxic, toxicity, fatal, oral, ingestion, dermal, inhalation, herbicide, fungicide, and rodenticide.

First aid steps with chemicals require much knowledge about chemicals and related dangers (for example, a person should never go into a manure pit to get the victim away from the area). For younger children, only discuss calling 9-1-1 or local poison center, and finding an adult. If the other steps are covered with older participants, explain related material. What should you do if the victim is not breathing? When is it not safe to remove the source of exposure or the victim? How to safely remove the source of exposure, the victim, and contaminated clothing? Discussing the types of clothing to be worn and the proper storage methods are not as important to participants. If you show clothing, talk about staying away from these items because a person can be exposed to chemicals simply by handling clothing that has been used with chemicals. When talking about storage, emphasize staying away from storage areas.

The depth of content and the discussion needs to be tailored to the level of understanding of the group. Refer to the “Teaching Tips” and “Childhood Growth and Development” located in the Teaching Kids section of the manual.

Suggested Instructors

Agricultural chemical company representative, elevator chemical specialist, or extension agent knowledgeable about chemicals.

Activities/Demonstrations

Choose a Hands-On activity/demonstration listed below or create your own. Develop your discussion points around the Hands-On activity/Demonstration chosen. If time allows, you may choose more than one activity/demo as part of your safety presentation.

1. **Chemical and Germ Contamination** – During this activity/demo the participants will view how chemicals can be passed from one surface to another by casual contact.
2. **GOOP** – During this activity/demo the participants will learn about the dangers of mixing

chemicals and how something entirely different can be produced.

3. **Chemical PPE** – During this activity/demo the participants will observe various types of personal protection equipment (PPE) for chemical applicators.
4. **Chemical Look-A-Likes** – During this activity/demo the participants will learn that chemicals look similar to things we eat and drink.

Subject Outline

I. Introduction/Capture Their Attention

- A. Introduce yourself and tell about your role in working with chemicals.
- B. Find out about your audience. Ask questions: How many of you can name a chemical used at your home, farm, or ranch? How many of you help with a home garden or picking vegetables? Describe different types of chemicals (pesticides – insecticides, herbicides, fungicides, and rodenticides; fertilizers, disinfectants, paints, fuels, etc.) Do any of you know or have heard of someone who has been poisoned? What happened?
- C. You may want to start with a personal story or a community experience.

II. Discussion points

- A. At the chemical display, discuss the dangers of using and handling chemicals. Stress the importance of staying away from chemicals. Compare risks of chemical use to other high-risk activities (smoking, driving, drinking, etc.).
- B. Have participants name some of the chemicals used on their farms. (Prompt participants to be sure they mention some of the less obvious chemicals, such as cleaning solutions, acids, ant killer and garden dust that may be in use.)
- C. Explain what the following signal words on chemical containers mean and discuss how exposure can occur:
 1. **Danger! Poison! Skull/Crossbones** – Exposure by oral, dermal or inhalation is highly toxic. Very small amount (taste to a teaspoon) can be fatal.
 2. **Warning!** – Exposure by oral, dermal or inhalation is moderately toxic, slight skin/eye irritation. Small amount (teaspoon to 1 ounce) can be fatal.
 3. **Caution!** – Exposure by oral, dermal or inhalation is low toxicity to relatively nontoxic. Moderate amount (one ounce to one cup) can be fatal.
- D. Children would be most interested in the ways that they might be exposed even if they avoid chemicals. Explain various ways chemicals can enter the human body:
 1. **Dermal (skin)** – Accidental spill, touching or wiping skin with contaminated gloves. Show poster with areas of possible exposure.
 2. **Oral** – Not washing hands before eating. Unintentional ingestion (by drinking or placing contaminated objects in mouth).
 3. **Inhalation** – Breathing in fumes or dust.
- E. Explain that chemicals can look similar to those things that we may eat or drink. Many of these chemicals can hurt you if you touch them or put them in your mouth and that is why it is important not to eat or drink something unless an adult tells you. Other concerns arise when different containers and improper labeling are used making safe identification difficult.
- F. Identify the symptoms of chemical exposure: Headache, fatigue, weakness, dizziness, nausea and thirst, skin/eye/nose/throat irritation, stomach cramps, diarrhea, confusion, blurred vision, muscle twitching or convulsions.
- G. Show pictures of injuries sustained from chemicals and discuss their seriousness.
- H. Reinforce the importance of having soap and water available at all times. When discussing having soap and water available, ask why participants think this is important.

- I. Ask participants what type of clothing should be worn when handling chemicals. Using the mannequin (or a participant volunteer wearing protective equipment), briefly discuss the function of each of the following items:
1. Two-strap face mask - for certain situations
 2. Respirator - depends on chemical
 3. Goggles or safety glasses, with face shield
 4. Gloves and boots
 5. Eye-wash bottle
- J. Ask participants to explain proper chemical storage methods. Have them answer the following questions:
1. Why is it dangerous to store chemicals in unmarked containers such as pop bottles, etc.? (Always store chemicals in the original containers with label intact.)
 2. Why and where should chemicals be stored? (In a separate, locked, clearly marked building.)
 3. Why should children never play in this area?
- K. Discuss first aid steps:
1. Get professional help as soon as possible, call 9-1-1 or local poison center
 2. Be sure victim is breathing
 3. Remove source of exposure or get victim away from area and to fresh air
 4. Remove contaminated clothing
 5. If chemical in eyes, rinse eyes for 30 minutes with cool water
 6. Cover with a blanket
 7. Make sure the chemical label stays with the victim, so that medical professionals can see it.

CHEMICAL AND GERM CONTAMINATION

Learning Objectives

After watching this demonstration, participants should be able to:

1. Describe the risks of farm chemicals.
2. Understand various ways chemicals and germs can enter the body.

Safety Requirements

1. None of the items contaminated during this demonstration is consumed or used.
2. Adequate hand sanitization is available for clean up after the demonstration.
3. Make certain that no chemically contaminated items are used for display or demonstration (gloves, goggles, shoes, chemical containers, chemical labels).
4. If using a look-a-like display, all products should be “safely” displayed and actual dangerous chemicals are locked and not accessible to the participants. If chemicals are displayed, create a 4 ft. (1.2 m) barrier between the participants and the display.

Age-Appropriateness

This activity is appropriate for participants of all ages. However, participants should not be taught how to use the chemicals. Participants should be encouraged to keep away from chemicals. The focus of the activity is how easily chemicals and germs can be spread. When discussing proper hygiene, be very specific about washing with soap and water.

The depth of content and the discussion needs to be tailored to the level of understanding of the group. Refer to the “Teaching Tips” and “Childhood Growth and Development” located in the Teaching Kids section of the manual.

Suggested Instructors

Agricultural chemical company representative, elevator chemical specialist, or extension agent knowledgeable about chemicals.

Equipment/Supplies Needed

1. Glow Germ® liquid or powder
2. Ultraviolet light
3. An item to contaminate, (Wrapped piece of candy or even the instructor's hand.)
4. Cloth Cover, (This helps darken an area for the ultraviolet light to work.)
5. Conducting Farm Safety Demonstration Tape #1

Subject Outline

I. Introduction/Catch Their Attention

- A. Introduce yourself and tell about your role in working with chemicals.
- B. Find out about your audience. Ask questions: How many of you can name a chemical used at your home, farm, or ranch? How many of you help with a home garden or picking vegetables? Describe different types of chemicals (pesticides – insecticides, herbicides, fungicides, and rodenticides; fertilizers, disinfectants, paints, fuels, etc.) Do any of you know or have heard of someone who has been poisoned? What happened?
- C. You may want to start with a personal story or a community experience.

II. Activity/Demonstration

- A. Contaminate an item such as a candy bar or your hand with Glow Germ® before the participants arrive.

- B. Engage the participant in discussion about how chemicals and germs are transmitted by casual contact.
- C. Shake a volunteer's hand with the hand that was contaminated earlier or give them the contaminated item.
- D. Wait a few moments and then demonstrate that the contact transferred the chemicals or germs by using the ultraviolet light. It may be difficult to demonstrate the transfer if the location cannot be darkened enough for the ultraviolet light to illuminate the Glow Germ®.
- E. Discuss how easy it was to pass that contaminate to an unsuspecting person by dermal exposure.

II. Discussion Points

- A. At the chemical display, discuss the dangers of using and handling chemicals. Stress the importance of staying away from chemicals. Compare risks of chemical use to other high-risk activities (smoking, driving, drinking, etc.).
- B. Have participants name some of the chemicals used on their farms. (Prompt participants to be sure they mention some of the less obvious chemicals, such as cleaning solutions, acids, ant killer and garden dust that may be in use.)
- C. Discuss with the participants how easily and unintentionally it is to transfer chemicals or germ by common contact.
- D. Explain to the participants, the necessity of proper hygiene when there is exposure to chemicals or germs.

GOOP

Learning Objectives

After watching this demonstration, participants should be able to:

1. Describe the risks of farm chemicals.
2. Understand how combinations can create something entirely different.

Safety Requirements

1. If containers that hold chemicals are used for display make certain that the container has an unbroken seal and is under the observation of an adult at all times. Provide a 4 ft. (1.2 m) barrier between participants and display.
2. If using a look-a-like display, all products should be “safely” displayed and actual dangerous chemicals are locked and not accessible to the participants.
3. Make certain that no chemically contaminated items are used for display or demonstration (gloves, goggles, shoes, chemical containers, chemical labels).

Age-Appropriateness

This activity is appropriate for participants of all ages. However, participants should not be taught how to use the chemicals. Participants should be encouraged to keep away from chemicals. The focus of the activity is learning how two substances combine to make a completely different one. Children will understand best if you begin by asking them what they think will happen when you mix glue with borax water. If you have a relatively small group of participants, each could make their own GOOP. The depth of content and the discussion needs to be tailored to the level of understanding of the group. Refer to the “Teaching Tips” and “Childhood Growth and Development” located in the Teaching Kids section of the manual.

Suggested Instructors

Agricultural chemical company representative, elevator chemical specialist, or extension agent knowledgeable about chemicals.

Equipment/Supplies Needed

1. Two spoons
2. One plastic or Styrofoam cup
3. One bowl (Large enough to hold 1 to 2 cups [250 to 500 ml] of liquid.)
4. One zip-closure plastic bag for each participant
5. One 4-oz. (125 ml) bottle of school glue (Can use colored glue)
6. One to 2 tsp. (5 to 10 ml) Borax (20 Mule Team laundry booster)
7. One cup (250 ml) distilled water
8. A few drops of food coloring (Optional)

Subject Outline

I. Introduction/Catch Their Attention

- A. Introduce yourself and tell about your role in working with chemicals.
- B. Find out about your audience. Ask questions: How many of you can name a chemical used at your home, farm, or ranch? How many of you help with a home garden or picking vegetables? Describe different types of chemicals (pesticides – insecticides, herbicides, fungicides, and rodenticides; fertilizers, disinfectants, paints, fuels, etc.) Do any of you know or have heard of someone who has been poisoned? What happened?

- C. You may want to start with a personal story or a community experience.

II. Activity/Demonstration

- A. This is a messy procedure that is best done outside or over a washable floor. Do not make over carpet.
- B. Pour glue into cup, rinsing bottle with a teaspoon or two of the distilled water to get all the glue into cup. Stir in food coloring, if desired. Set glue mixture aside.
- C. Pour remaining distilled water into bowl. Add Borax and stir until dissolved and water is cloudy.
- D. Add glue mixture to the borax/water mixture, scraping the cup to get all the glue mixture.
- E. PREPARE TO GET MESSY!
- F. Remove glue mixture from water with hands. As you continue to remove all glue from water, knead and roll it in your hands. Mixture will be very sticky at first, but then will begin to thicken and form the GOOP.
- G. Continue rolling GOOP between hands, collecting all the GOOP into a mass. (This will clean the excess from hands and between fingers.)
- H. Store finished product zip-closure plastic bag. The product is similar to play dough.

III. Discussion Points

- A. At the chemical display, discuss the dangers of using and handling chemicals. Stress the importance of staying away from chemicals. Compare risks of chemical use to other high-risk activities (smoking, driving, drinking, etc.).
- B. Have participants name some of the chemicals used on their farms. (Prompt participants to be sure they mention some of the less obvious chemicals, such as cleaning solutions, acids, ant killer and garden dust that may be in use.)
- C. Discuss with the participants if they would have imagined the resulting end product from the beginning ingredients? Explain that chemical combinations can create something entirely different.
- D. Explain to the participants that while this substance is not dangerous, you never know when the resulting product could be harmful.

CHEMICAL PPE

Learning Objectives

After watching this demonstration, participants should be able to:

1. Describe the risks of farm chemicals.
2. Identify the proper clothing and safety equipment to use when handling chemicals.
3. Describe key elements of proper chemical storage.

Safety Requirements

Make certain that no chemically contaminated items are used for display or demonstration (gloves, goggles, shoes, chemical containers, chemical labels).

Age-Appropriateness

This activity is appropriate for participants of all ages. However, participants should not be taught how to use the chemicals. Participants should be encouraged to keep away from chemicals. The focus of the activity is to show the proper clothing and safety equipment used when handling chemicals. Stress staying away from these items because a person can be exposed to chemicals simply by handling clothing that has been used with chemicals.

The depth of content and the discussion needs to be tailored to the level of understanding of the group. Refer to the “Teaching Tips” and “Childhood Growth and Development” located in the Teaching Kids section of the manual.

Suggested Instructors

Agricultural chemical company representative, elevator chemical specialist, or extension agent knowledgeable about chemicals.

Equipment/Supplies Needed

1. A mannequin or a participant volunteer
2. Proper clothing: Long-sleeve shirts and long trousers or a plastic/paper chemical suit
3. Protective gear: Unlined rubber gloves and boots, bump hat with plastic headband, respirator and goggles or face shield
4. Other protective gear, safety glasses, dust/mist mask and eye-wash bottle
5. Photographs of proper and improper chemical storage
6. Examples of proper and improper chemical storage containers
7. Color photographs of injuries sustained from chemical exposure (optional)

Subject Outline

I. Introduction/Catch Their Attention

- A. Introduce yourself and tell about your role in working with chemicals.
- B. Find out about your audience. Ask questions: How many of you can name a chemical used at your home, farm, or ranch? How many of you help with a home garden or picking vegetables? Describe different types of chemicals (pesticides – insecticides, herbicides, fungicides, and rodenticides; fertilizers, disinfectants, paints, fuels, etc.) Do any of you know or have heard of someone who has been poisoned? What happened?
- C. You may want to start with a personal story or a community experience.

II. Activity/Demonstration

- A. Dress mannequin or volunteer in proper protective equipment for chemical handling. (If using a mannequin, name him PAPA –Protection Against Pesticide Accidents.)
- B. Display the mannequin or have the volunteer stand in a prominent location (or ask the volunteer to put on appropriate equipment during the demonstration).

- C. Place photographs of injuries sustained from chemical exposure around the mannequin or volunteer.
- D. Set up a table next to the mannequin and display photographs of proper and improper chemical storage situations, as well as photos of proper and improper chemical storage containers.
- E. Arrange samples of various protective gear on a display table.

III. Discussion Points

- A. At the chemical display, discuss the dangers of using and handling chemicals. Stress the importance of staying away from chemicals. Compare risks of chemical use to other high-risk activities (smoking, driving, drinking, etc.).
- B. Have participants name some of the chemicals used on their farms. (Prompt participants to be sure they mention some of the less obvious chemicals, such as cleaning solutions, acids, ant killer and garden dust that may be in use.)
- C. Identify the symptoms of chemical exposure: Headache, fatigue, weakness, dizziness, nausea and thirst, skin/eye/nose/throat irritation, stomach cramps, diarrhea, confusion, blurred vision, muscle twitching or convulsions.
- D. First aid steps with chemicals require much knowledge about chemicals and related dangers (for example, a person should never go into a manure pit to get the victim away from the area). You may want to only stress calling 9-1-1 or local poison center, and finding an adult. If the other steps are covered with older participants, explain related material. What to do if the victim is not breathing. When it is not safe to remove the source of exposure or the victim. How to safely remove the source of exposure, the victim, and contaminated clothing. Discuss first aid steps:
 1. Get professional help as soon as possible, call 9-1-1 or local poison center
 2. Be sure victim is breathing
 3. Remove source of exposure or get victim away from area and to fresh air
 4. Remove contaminated clothing
 5. If chemical in eyes, rinse eyes for 30 minutes with cool water
 6. Cover with a blanket
 7. Make sure the chemical label stays with the victim, so that medical professionals can see it
- E. Ask participants what type of clothing should be worn when handling chemicals. Using the mannequin (or a participant volunteer wearing protective equipment), briefly discuss the function of each of the following items:
 1. Two-strap face mask - for certain situations
 2. Respirator - depends on chemical
 3. Goggles or safety glasses, with face shield
 4. Gloves and boots
 5. Eye-wash bottle
- F. Show pictures of injuries sustained from chemicals and discuss their seriousness.
- G. Apply Vaseline to lenses of safety glasses. Let participants try them on to demonstrate visual impairment from a chemical injury to the eyes.
- H. Reinforce the importance of having soap and water available at all times.



CHEMICAL LOOK-A-LIKES

Learning Objectives

After completing this activity, participants should be able to:

1. Explain why they should never eat or drink anything without an adult's permission.
2. Understand why they should not touch any liquid, powder or tablet (or containers of these) that they find in the house or on the farm, unless an adult tells them it is OK.
3. Understand that they should tell an adult if they see any of these products that are not where they should be.

Safety Requirements

1. Seal all products used for this activity in clear, preferably unbreakable containers.
2. If containers that hold chemicals are used for display make certain that the container has an unbroken seal and is under the observation of an adult at all times.
3. If using a look-a-like display, all products should be "safely" displayed and actual dangerous chemicals are locked and not accessible to the participants. If chemicals are displayed, create a 4 ft. (1.2 m) barrier between the participants and the display.
4. Make certain that no chemically contaminated items are used for display or demonstration (gloves, goggles, shoes, chemical containers, chemical labels).
5. Set up a barrier so participants are always at least 4-feet (1.2 m) away from these products. (Do not let participants handle the containers.)
6. An adult should supervise this exhibit at all times. When an adult is not supervising it, even for 5 minutes, the products should be locked in a location or container that is inaccessible to participants or other volunteers.

Age-Appropriateness

This activity is appropriate for participants of all ages. However, participants should not be taught how to use the chemicals. Participants should be encouraged to keep away from chemicals. The focus of the activity is to show the proper clothing and safety equipment used when handling chemicals. Stress staying away from these items because a person can be exposed to chemicals simply by handling clothing that has been used with chemicals.

The depth of content and the discussion needs to be tailored to the level of understanding of the group. Refer to the "Teaching Tips" and "Childhood Growth and Development" located in the Teaching Kids section of the manual.

Suggested Instructors

Agricultural chemical company representative, elevator chemical specialist, or extension agent knowledgeable about chemicals.

Equipment/Supplies Needed

1. Use superglue to seal look-a-like item containers
2. Clear, preferably unbreakable containers that are numbered by pairs
3. Labels for each paired items, "24-A" for one and "24-B" for the other
4. Prepare and duplicate a list showing all the paired items, leaving a blank in front of each for the participant will fill-in which container they think holds a specific product. For example:

Look-A-Like	Paired Item#	Chemical Item
_____ Water	24	_____ Rubbing alcohol



Subject Outline

I. Introduction/Catch Their Attention

- A. Introduce yourself and tell about your role in working with chemicals.
- B. Find out about your audience. Ask questions: How many of you can name a chemical used at your home, farm, or ranch? How many of you help with a home garden or picking vegetables? Describe different types of chemicals (pesticides – insecticides, herbicides, fungicides, and rodenticides; fertilizers, disinfectants, paints, fuels, etc.) Do any of you know or have heard of someone who has been poisoned? What happened?
- C. You may want to start with a personal story or a community experience.

II. Activity/Demonstration

- A. As the instructor holds up each pair of look-a-likes, ask the participants to fill-in their activity sheet with the letter of the container that holds each item.
- B. After the participants have tried to determine the identity of each product, discuss the answers with them.

III. Discussion Points

- A. Many liquids, powders and tablets in your home or on a farm look like things we eat or drink. However, some of these products can hurt you if you touch them or put them in your mouth.
- B. Even if you guess the right answer, you won't always be able to. And, it's even harder for younger children or old people to tell the difference.
- C. That's why you should not touch or put anything in your mouth unless an adult tells you it's OK.
- D. Sometimes people put things in different containers. So, ask an adult to make sure something is what the label says and that it is safe to eat or drink.
- E. Sometimes harmful products get left where an animal or child could touch, eat or drink them. When you see chemicals that are not where they should be, don't touch them, tell an adult.



Product Look-A-Likes

Tablet or Capsule Look-A-Likes

Look-a-Like	Chemical
Altoids mints	Aspirin
Red Hots (cinnamon) candies	Sudafed tablets
M&M candies	Drixoral cold tablets
Sweet Tart candies	Tums Antacid tablets
Jelly beans	Iron-supplement capsules
Hershey's chocolate bar squares	Ex-lax chocolate laxative
Clarets gum	Aspergum

Liquid Look-A-Likes

Look-a-Like	Chemical
Water	Rubbing alcohol
Mountain Dew	Mr. Clean liquid detergent
Gatorade (lemon-lime)	Antifreeze
Listerine	Turpentine
Grape Kool Aid	Dimetapp liquid cough syrup
Kool Aid Bursts (blue)	Vicks cough spray
Gatorade (blue)	Window cleaner (blue)
Vegetable oil	Brake fluid
Dark syrup	Used motor oil
Sesame oil	Dual herbicide
Sunkist (orange soda)	Treflan herbicide

Powdered Look-A-Likes

Look-a-Like	Chemical
Pancake mix	Seven Dust (pesticide) or powdered carpet cleaner

Package Look-A-Likes

Look-a-Like	Chemical
Parmesan cheese container	Comet cleanser container
Tooth Paste	Bathtub caulking
Eye drops	Super glue

**Note: Brand names are provided only to help the presenter quickly find products for this activity. There are many other products that could be used. List adapted from information provided by: Heather N. Lifsey, Northampton County, North Carolina Cooperative Extension Service*



