

Unit 6: Public and Personal Safety

Learning Objectives

After reading this unit, the reader will be able to:

- Understand the risks fumigation poses to people and the environment.
- Practice safe fumigation procedures that eliminate personal risk and risk to the public.
- Select appropriate tools and equipment to make fumigation safer and more effective.
- Use safety checklists before, during, and after a fumigation operation.
- Recognize the signs and symptoms of fumigant exposure.
- Administer basic first aid in the event of fumigant exposure.

The Arkansas Core Manual, **Applying Pesticides Correctly**, is a comprehensive guide to pesticide safety. The Core Manual discusses basic safety considerations for all applicators.

This unit covers safety practices specific to food and stored commodities. By reading it, you will learn how to reduce or eliminate fumigation exposure to yourself and to the public. It will teach you how to use personal protective equipment (PPE), warning gases, and threshold limits. You will discover the importance of posting warning signs and writing an application plan. At the end of this unit are several safety checklists. This unit will explain why it is critical to use these checklists before, during, and after every fumigation.

Terms to Know

Aerate – Introduce fresh air into a treated area to dilute and remove fumigant-filled air. Aeration must follow all fumigation operations.

Antidote – A remedy that may counteract the effects of a pesticide.

Exposure – When a person or organism comes in contact with a pesticide.

Overexposure – When a person or organism comes in contact with enough pesticide over a long enough period to cause harm.

PPE (Personal Protective Equipment) – Clothing or devices used to protect the human body from exposure to pesticides and pesticide residues.

Threshold Limit Value (TLV) – The maximum amount of fumigant that can be in the air before conditions are considered unsafe. The TLV is expressed in parts per million (ppm). It is used to monitor short-term exposure.

Threshold Limit Value-Time Weighted Average (TLV-TWA) – The average concentration of fumigant for a normal 8-hour workday and a 40-hour workweek to which workers may be repeatedly exposed without adverse effect. The TLV-TWA is expressed in parts per million (ppm). It is used to monitor long-term exposure.

Volatility – The ability of a substance to turn into a gas at relatively low temperatures.

Warning Gas – A chemical that can be added to an odorless fumigant to help workers detect the fumigant. Warning gases give off strong smells or have an irritating effect.

Fumigants are the most hazardous of all pesticides. They are highly volatile, penetrating, and poisonous. Even experienced fumigators can be injured, can injure others, or can damage items because of these hazards:

- Fumigants can kill humans.
- Fumigants can kill rodents, bats, birds, pets, and other animals that are on site during treatment.
- Fumigants can cause severe burns and damage internal organs.
- Fumigants can cause fires and explosions.
- Fumigant use can result in illegal residues in foods.
- Some fumigants can inhibit the germination of seeds.
- Some fumigants can corrode metals.
- Some fumigants react with certain materials to produce off flavors and bad odors.
- Some fumigants can kill plants.

Three agencies set regulations for the safe use of fumigant pesticides – the Environmental Protection Agency (EPA), the Arkansas State

Plant Board (ASPB), and the Occupational Safety and Health Administration (OSHA). Each agency administers regulations concerning fumigant handling.

You must follow all directives issued by the EPA, ASPB, and OSHA, and the instructions in the fumigant label information. These agencies may fine you for misusing a fumigant or for failing to properly care for your protective equipment.

This unit discusses safety issues, general precautions, and emergency procedures related to fumigation. It will describe how to protect the public, your co-workers, and yourself from exposure. It will also provide safety checklists for all stages of fumigation. However, no publication can cover all situations for all products. Follow the instructions in the label information specific to each product that you use. Remember there is no substitute for good common sense.

Unit 7 will cover safety equipment and its proper use.

Protecting the Public and the Environment

Fumigants are some of the most toxic pesticides available. Their safe use and handling require skill and care. This manual discusses fumigants that control pests in food and stored commodities. Some commodities are edible-corn, wheat, rye, etc. Others are stored where people work and animals live, grain bins, silos, etc. In nearly all cases, fumigants control pests on items or in areas with which people and animals have direct contact. Your ability to apply fumigants safely is critical. You must protect the public and the environment from exposure.

There are several important ways to protect others from fumigant exposure. These include:

- Reading and following the label directions
- Posting warning signs
- Monitoring for the fumigant
- Safely transporting, storing, and disposing of fumigants and their containers
- Following tolerance levels, properly aerating the treatment area, and
- Preparing and planning well before application

Read the Label Information



The most important thing you can do to ensure personal and public safety is to read the label. Fumigant labels include both an abbreviated sticker label and an extended label, often in booklet form. Treat these two documents as you would any pesticide label. Follow their instructions to the letter. It is the law. This manual refers to the sticker label and the label booklet together as “label information.”

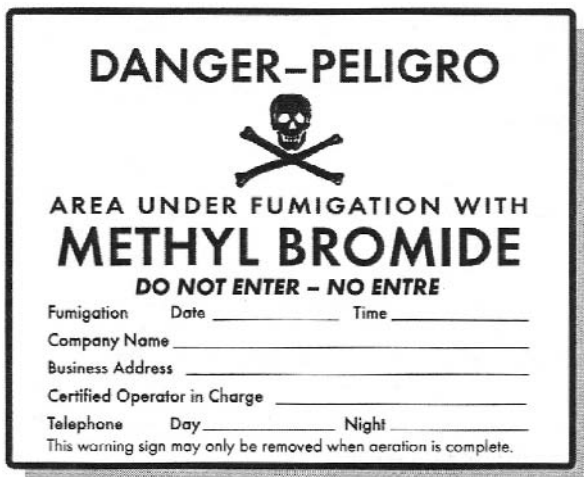
The label information will tell you how and where to use the product. It will give you detailed application and aeration instructions. You will discover how to store the chemical properly. The label information may note specific sites that you should avoid or application methods that are not permitted. It will also describe specific safety precautions. Read all of the label information completely before using any fumigant for any purpose.

Signage for Fumigated Areas

Warning signs or “placards” protect the public during and after fumigation. They are also posted during transportation and storage of a fumigant. A warning sign provides a barrier between people and the fumigated site or item. Federal and state laws require you to post warning signs at all accesses leading to areas or commodities under fumigation. Only authorized fumigators wearing the proper personal protective equipment (PPE) may enter treated areas before and during aeration.

Follow label directions regarding posting warning signs before and during fumigation. Most fumigant labels have specific directions regarding signage:

- What the sign should say
- How many signs to use
- Where to post the signs, and
- How long to leave the signs in place



Posting warning signs will help to keep unauthorized persons away. Do not remove the signs until the treated equipment and surrounding area have been completely aerated.

Monitoring for the Fumigant

There is always a risk that fumigant gas will escape from a treatment area. Monitoring for these leaks is critical. When treating commodities that are next to work areas, be sure to take air samples during treatment. Use appropriate gas detectors to verify that fumigants are not leaking. This is particularly important during indoor treatments. See Unit 7 for more information about gas detectors.

Transporting Fumigants

Transporting a fumigant is dangerous. Leaks and spills caused by accidents are sometimes beyond your control. However, by taking the following precautions and using common sense, you can prevent many accidents.

- Do not use public transportation (subways, buses, trains, or taxis) to transport fumigants.
- Do not transport fumigants through tunnels unless you get permission from the Arkansas Department of Transportation (ADOT).
- Do not transport fumigants and people together in a closed vehicle.
- Be sure you have the required drivers license with any appropriate endorsements for the specific fumigant you plan to transport.
- Read the label information and/or the Material Safety Data Sheet (MSDS) to

determine the signage requirements for transporting each fumigant that you use. You can also contact the fumigant manufacturer for more information on placarding for transportation.

- Be sure cylinders are upright and secured during transport.
- Mount cylinders so they are protected from rear end collision.
- Do not remove protective valve covers until just before use.

NOTE: It is illegal to transport goods over public roads or highways if those goods are undergoing fumigation or have not been completely aerated.

Always follow federal and state department of transportation regulations when transporting fumigants and/or their containers. Contact your local Arkansas Department of Transportation office for further information.

Storage and Disposal of Fumigants

Storage of fumigants is hazardous. Whenever possible, buy them just before you need them to shorten the storage period. Store all fumigants on sturdy shelves in an area apart from feed or seed. A separate building that is well ventilated or has a mechanical exhaust system is best. Be sure that all fumigant storage areas are locked and posted as pesticide storages. Warning signs should indicate the presence of fumigants.

Fumigants can escape from faulty valves or damaged or corroded cans. Leaks can cause dangerous concentrations to build up in closed storerooms. Check valves and containers regularly for leaks. Before entering any storage area, run an exhaust fan to remove vapors that may have built up inside.

Do not risk contamination of water supplies. Dispose of all empty containers, residues, and rinsates according to state waste management procedures. Keep all pesticides and their empty containers out of the reach of children.

Tolerance Levels

Fumigants should not change or impair treated material in any way. Nor should they

leave any residues on raw agricultural products that could be hazardous during processing. The EPA has determined the amount of pesticide residue that may safely remain in or on agricultural products. This is called the “tolerance level.” Be sure fumigant residues never exceed these levels by following label directions to the letter. Consult the label information or the registrant for tolerance levels specific to the product(s) you use and commodity(ies) you treat. Tolerance levels come from the Code of Federal Regulations. If you have additional questions about tolerance levels, contact Arkansas State Plant Board (ASPB).

Proper Aeration

Proper aeration is important for your safety, the safety of your crew, and the safety of your clients. Poor aeration is one of the most common problems associated with fumigation. Read and follow the instructions in the label information exactly. When treating raw agricultural products, be sure the rate of air exchange during the aeration phase will adequately remove the fumigant. If necessary, use fans or other ventilation equipment. Also, check air temperatures. The treatment area should be warm enough to allow the fumigant to completely desorb from the treated agricultural product. Heat the area or increase the aeration time if necessary. Finally, check the sorptive capacity of the commodity you are treating. Highly sorptive materials require longer aeration periods. Adjust your aeration time as needed.

Preparation and Planning

Preventing public and environmental exposure also relies on how well you prepare. How well have you sealed an area? Have you inspected all equipment thoroughly? Are you applying the fumigant at or below the label rate? Have you set aside enough time to completely aerate the site or item? Have you set up fences and posted warning signs to keep people, livestock, and pets out of the treatment area? Details about proper application methods are described in Unit 5 and Unit 8. Use this information to develop a solid application plan. Review your plan several times. Then use the checklists at the end of this unit to be sure nothing has been overlooked. Appendix A contains safety checklists that you can copy and use.

Remember, you, the applicator, are the most important variable in fumigation. Your education and training will directly affect the safety and success of your operation.

Personal Safety

Safety is always a concern for you as a fumigant applicator. You must consider your own safety, as well as that of your co-workers, your clients, and the people who will use the areas you treat.

Human safety is addressed throughout the Arkansas Core Manual, **Applying Pesticides Correctly**. Review these sections of the Core Manual for basic pesticide safety information. Besides taking the precautions outlined in the Arkansas Core Manual, you must also consider the specific risks associated with fumigants.

Always Work in Pairs

One of the most important things you can do to protect yourself during fumigation is to always work with another person when applying fumigants. This person can assist you immediately if you become injured or incapacitated while working around these products. In fact, many fumigant labels require fumigators to work in pairs during application or gas monitoring.

Routes of Exposure

As a fumigant applicator, you may be exposed to fumigants in several ways. Fumigants can enter your body through your lungs (inhalation), your eyes (ocular exposure), your mouth (ingestion), and even your skin (dermal exposure). The most dangerous and common type of fumigant exposure is inhalation. Most fumigants are highly toxic. Breathing even small amounts of some fumigants can cause serious illness or death. To protect yourself, read the label information. Find out what personal protective equipment (PPE) the manufacturer requires. Then, learn what to do in case of exposure. See “First Aid for Fumigant Poisoning” later in this unit for details about how to handle different types of fumigant exposure.

PPE

Personal protective equipment (PPE) is the name given to clothing and devices that protect you from contact with pesticides. The

label information for each product lists the minimum PPE required for using that pesticide. Federal and state laws require pesticide users to follow all instructions on the product label, including wearing the appropriate PPE.

The most important PPE for fumigators is the respirator. Respirators provide you with clean air to breathe when you are surrounded by toxic gas. There are several types of respirators. Each one has its pros and cons. Read the fumigant label to determine which type of respirator you will need. See Unit 7 to learn more about the selection, use, and maintenance of respirators.

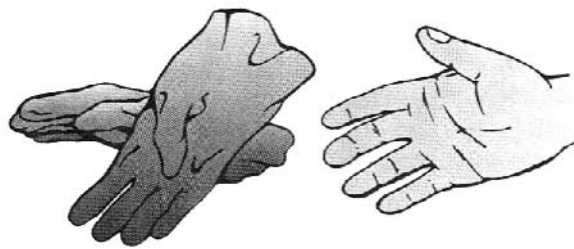


Respiratory equipment

Fumigation also requires other types of PPE. These include protective clothing and gloves. Requirements vary with the fumigant. Read the label information carefully.

If skin absorption is a problem, some fumigants require you to wear thick cloth coveralls or impermeable clothing. Other products direct you to wear short sleeves and loose-fitting clothing.

The need for gloves also varies. For example, some solid fumigants require fumigators to wear gloves because of possible skin irritation. Read the label information to be sure you use the right kind of glove. Other fumigants, particularly liquid products, do not require gloves. Some may even prohibit you from wearing gloves.



Some fumigants require you to wear gloves during fumigation. Others do not.

Read the label information to learn which items are required for the product(s) you plan to use.

Other Tools for Personal Safety

Because inhalation exposure poses the greatest risk to fumigant applicators, the following safety information will focus on preventing this type of exposure. Several tools are available to reduce or prevent inhalation exposure. These include:

- Threshold limits, and
- Gas detectors

NOTE: The safe and effective use of gas detectors is covered in Unit 7 (Safety Equipment).

Threshold Limits

One of the most important tools you can use to protect yourself and others during fumigation is the “threshold limit value” (TLV). The TLV is the maximum amount of fumigant that can be in the air before conditions are considered unsafe. Concentrations at or below the TLV represent conditions that workers may be exposed to on a daily basis. These levels are considered safe. Concentrations above the TLV may lead to “overexposure” of a fumigant. This can cause discomfort, sickness, or even death. These levels are considered unsafe. The TLV is usually expressed in parts per million (ppm).

Every fumigant has a specific TLV. Read the label information to find the TLV for each product you use.

By monitoring the TLV throughout treatment you can prevent illness and injury caused by overexposure. Unfortunately, people's susceptibility to fumigants varies widely. For example, a small number of workers may experience discomfort from fumigant concentrations at or below the TLV. Others may suffer a more serious aggravation due to a preexisting condition. Even when the TLV is low, observe yourself and your co-workers for any signs of exposure.

To monitor long-term exposure, use the threshold limit value-time weighted average (TLV-TWA). This value is the average concentration for a normal 8-hour workday and a 40-hour workweek to which workers may be repeatedly exposed without adverse effect. Every fumigant has a specific TLV-TWA. Consult the label information for the TLV-TWA of each product you use. If you will be exposed to a fumigant for several days or weeks, be sure the fumigant concentration stays at or below the recommended TLV-TWA.

Warning Gases

It is often helpful to add warning chemicals to odorless fumigants. These products give off an odor that can help you detect the presence of harmful gas. However, you should never rely on warning gases alone. Keep the following facts in mind:

- Individuals vary in their ability to detect and quantify odors.
- Odors only indicate whether the fumigant is present. They do NOT tell you the concentration of the fumigant.
- You may suffer olfactory fatigue. Over time, you may lose the ability to smell a particular warning agent.

Warning gases serve a useful purpose, but they are not foolproof. Use them as one of many safety tools.

Exposure Limits

You can also reduce your risk of inhalation overexposure by monitoring fumigant concentrations during treatment and aeration. Be sure your exposure stays below established exposure limits such as the TWA, STEL, and PEL.

An exposure limit is the highest level of fumigant that you may be exposed to without being required to use any controls to reduce your exposure. The American Conference of Governmental Industrial Hygienists (ACGIH), OSHA, and the National Institute of Safety and Health (NIOSH) are all agencies that establish these limits. Each agency uses different terms to refer to long- and short-term exposure limits. Refer to the fumigant label information to find out what the different exposure limits are for each product you use.

The three most common terms used to express the exposure limit of a fumigant are the:

- Threshold limit value-time weighted average (TLV-TWA)
- Threshold limit value-short term exposure limit (TLV-STEL), and
- The permissible exposure limit (PEL)

TLV-TWA or "TWA" is an ACGIH term that refers to the average concentration of a fumigant to which most workers may be repeatedly exposed 8 hours a day, 40 hours a week without adverse effects. Concentrations at or below the TWA represent conditions that you may be exposed to on a daily basis. These levels are considered safe. Concentrations above the TWA may lead to "overexposure" to a fumigant. This can cause discomfort, sickness, or even death. These levels are considered unsafe. The TWA is usually expressed in parts per million (ppm) or milligrams per cubic meter (mg/m³).

By monitoring fumigant levels throughout treatment and keeping your exposure level below the TWA, you can prevent injury and illness caused by overexposure. However, people's susceptibility and response to fumigants varies widely. For example, a small number of workers may experience discomfort or minor irritation from fumigant concentrations at or below the TWA. Others may suffer more serious health effects – even death – due to a pre-existing condition. Even when the TWA is low, observe yourself and your co-workers for any signs or symptoms of exposure.

For short-term exposure, look for the TLV-STEL on the product label. Like the TLV-TWA, this ACGIH term is often shortened to "STEL." Specifically, STEL is the concentration of fumigant to which most workers can be exposed

continuously for a short period without suffering from:

- Irritation
- Chronic or irreversible tissue damage, or
- Narcosis (drunkenness) that may increase the chance of accident or injury

Exposure to concentrations at the STEL should not be longer than 15 minutes and should not occur more than four times per day. The STEL is expressed in ppm or mg/m³.

PEL is an OSHA standard that designates the maximum exposure permitted as an 8-hour TWA. OSHA sets PELs to protect workers against the health effects of exposure to fumigants.

Usually, OSHA PELs are not as conservative as are ACGIH TLVs. With this in mind, it is always wise to comply with the most stringent exposure limit. This will ensure the highest degree of safety and health. In the absence of any exposure limits, you should always strive to minimize your exposure.

Safety Checklists

Keep safety foremost in your mind when planning any fumigation operation. Focus on protecting lives and preventing fires. Plan ahead – especially when working in a remote location. Know how to get help if something goes wrong.

The following checklists will help you organize the many aspects of fumigation. This information is general. It does not apply to all fumigants in all situations. Always read the label information first. Become familiar with the dangers of the product you intend to use. Some manufacturers provide checklists specific to their products. Use these checklists as well.

Preliminary Planning

(Appendix A contains a version of this checklist that you can photocopy and use.)

- ✓ Draw or locate a sketch of the structure you plan to fumigate. Indicate the layout of the structure, connecting structures, and escape routes above and below ground.
- ✓ If you are in an industrial setting, inspect the equipment. It should be as tight as

possible to prevent drafts and leaks. Be sure that production has stopped.

- ✓ Seal all spouts, conveyors, conduits, heating ducts, and other possible openings leading from the areas that you plan to fumigate.
- ✓ Record the number and names of everyone who routinely enters the area. Note the proximity of other nearby people and animals. Keep children, unauthorized persons, and pets away from the application site.
- ✓ If you plan to treat a commodity, learn about it. Find out its mode of storage and its condition. If possible, obtain a previous treatment history.
- ✓ If you plan to treat a structure, learn about it. What does it consist of – wood, brick, concrete? Note the locations of doors, windows, and dividing walls. Check airflow patterns.
- ✓ Locate connections and shut-offs for electricity, water, and gas. Find the nearest telephone or communication device.
- ✓ Obtain and have handy telephone numbers for local health, fire, police, and medical emergency services. Know how to contact the parties responsible for the structure and/or commodity you plan to fumigate.
- ✓ ONLY select a fumigant registered by the EPA and with the ASPB.
- ✓ Read and reread the label information. Study the directions and precautions. Make sure the fumigant is approved for the required work (site, commodity, etc.).
- ✓ Check, mark, and prepare (tarp, seal, etc.) the points of application if the job involves spot fumigation.
- ✓ Notify the local health and fire departments, police and security personnel, and the poison control center. Give them the following information: the location, the chemical name(s), the date and time of application, the type of gas mask and other safety equipment required, the fire hazard rating, and literature about the safety measures you plan to use.

- ✓ Inform the occupants of the structure where treatment will occur. Also, notify the occupants of neighboring structures.
- ✓ Arrange for standby equipment and replacement parts. Outline an alternate plan of action.
- ✓ Review the fumigation plan with all workers. Explain the potential hazards to life and property, required safety measures, and emergency procedures.
- ✓ Prepare warning signs to post near treated areas. Arrange for someone to monitor all entrances and exits during treatment.
- ✓ Have first aid equipment (including antidotes and plenty of fresh water) handy.
- ✓ If possible, plan for application from outside the structure.
- ✓ Seal all cracks, crevices, open fireplaces, broken windows, holes, pipes, chutes, and conveyors.
- ✓ When necessary, obtain fans to evenly distribute the fumigant.
- ✓ Preplan how you will ventilate the area after treatment.
- ✓ Identify areas where you can store any excess fumigant(s). Be sure conditions in the storage area match those required by the label information.
- ✓ Make sure no open fires, motors, or hot surfaces (heat pipes or electric fixtures) are within the space that you plan to treat.
- ✓ Know how to operate the gas detection devices.

Pre-Application Safety

(Appendix A contains a version of this checklist that you can photocopy and use.)

- ✓ Open all doors and drawers inside the area you plan to treat.
- ✓ Shut off pilot lights and gas lights. Disconnect electrical equipment.

- ✓ Remove plastic covers from mattresses.
- ✓ Make a final check. Be sure all occupants, pets, fish, and plants have been removed from the structure.
- ✓ Place warning signs at all entrances and exits.
- ✓ Assign someone to observe all entrances and exits.

During-Application Safety

(Appendix A contains a version of this checklist that you can photocopy and use.)

- ✓ Apply all fumigants according to the directions in the label information.
- ✓ Apply the fumigant from outside where appropriate.
- ✓ Consider the weather. You may need to delay or cancel outdoor treatments on windy or stormy days.
- ✓ Do not enter the area where fumigant gas is being discharged, except in extreme emergencies.

Post-Application Safety

(Appendix A contains a version of this checklist that you can photocopy and use.)

- ✓ Aerate according to structural limitations.
- ✓ Turn on ventilation fans where appropriate.
- ✓ Before reentering a treated area, use a suitable gas detector to determine the fumigant concentration. Some fumigants do not provide an adequate odor warning. Other areas aerate slowly.
- ✓ Remove warning signs only when aeration is complete.
- ✓ Dispose of or return empty containers per the manufacturer's instructions.
- ✓ When using metal phosphide fumigants, return any unused, solid chemicals to clearly labeled containers. Store them properly.

Personal Safety

(Appendix A contains a version of this checklist that you can photocopy and use.)

To protect yourself and others, be sure you and your supervisor(s) always:

- ✓ Know the location of all entrances and exits.
- ✓ Know the location of all fumigant containers and aerating fans.
- ✓ Rehearse the fumigation plan so that each worker knows what to do.
- ✓ Remove all rings, jewelry, and watches as required by the label.
- ✓ Have current health records for all employees. All workers that take part in fumigations must have a physical exam at least once a year. During fumigation, no worker should have a cold or other condition that may impair breathing. Nor should any worker be undergoing medical or dental treatment, unless a physician certifies that they may work with fumigants.
- ✓ Survey workers to make sure they have abstained from alcoholic beverages 24 hours before and will abstain 24 hours after a fumigation job.
- ✓ Instruct all workers about first aid, emergency procedures, antidotes, and decontamination.
- ✓ Work in pairs – especially when entry into a fumigated area is necessary. Stay in sight of one another while inside a treatment area.
- ✓ Report any accidents to your employer or supervisor.
- ✓ Report any signs of illness or physical discomfort, regardless of how minor they may seem. This includes dizziness, diarrhea, nausea, headaches, and lack of coordination.
- ✓ Teach all workers how to select, operate, and maintain protection devices. Warn them

about the hazards that they may encounter if the chemicals are misused.

- ✓ Have and use the necessary personal protective equipment (PPE). Know where emergency equipment is located.
- ✓ Make sure there is enough water on site to wash or flush skin and eyes if an accident should occur.

First Aid for Fumigant Poisoning

Even when you take all of the proper precautions, human exposure can still occur. Be prepared. Know what to do for all types of fumigant poisonings.

First, read the label information. The label information is often your best source of first aid information. Federal regulations require that first aid information appear in the label information if a particular hazard exists. Because most fumigants are highly toxic, first aid information is usually listed. Additional first aid information appears on the product's "Material Safety Data Sheet" (MSDS).

First aid information in the label information is usually specific to the product. Therefore, you must also be familiar with basic first aid procedures for fumigant exposure.

Basic First Aid

First aid is just that – it is your first response to fumigant exposure. First aid is not a substitute for medical help. To protect yourself and your co-workers, know when medical attention is needed and seek it right away.

How you respond to a fumigant poisoning depends, to some extent, on whether you or someone else is the victim. In either case, however, you must follow the same basic principles.

If you have been exposed to a fumigant or if you begin to feel ill, remain calm. Get to a doctor right away. Even when the fumigant is less toxic

than others are, you may need medical attention – particularly if you were exposed to a large amount of the chemical. Do not go alone. Have someone take you to the doctor. Be sure to give the label information to the doctor. Keep an extra copy of the label and MSDS on file for each fumigant that you use. You can take this information to the hospital in case of a medical emergency without risking container transport.

If you are with someone who has been exposed to a fumigant, begin first aid treatment immediately. When possible, get help. First, decontaminate the victim. Take him or her to fresh air. Remove any contaminated clothing. Be careful not to contaminate yourself in the process. If the victim needs medical attention, either call a doctor or take the victim directly to a doctor.

Before, during, and after the fumigation process, watch for unusual behavior of yourself and others. It could be a sign of exposure. If you feel sick, do not stay to finish the job. Get to fresh air immediately and get help. If you are with someone who has been exposed to a fumigant, and if his or her breathing stops or is labored, give artificial respiration. Never give anything by mouth to an unconscious person besides air.

Specific first aid treatment varies according to the type of exposure. Learn all of the appropriate procedures. You will not have time or the opportunity to look them up during an emergency.

The two main types of fumigant exposure are inhalation and skin contact.

Inhalation Exposure

The greatest risk during fumigation is inhalation exposure. Inhalation exposure occurs when someone breathes fumigant gas. Mild exposure by inhalation can cause malaise (a feeling of sickness), ringing in the ears, fatigue, nausea, and pressure in the chest. Exposure to fresh air will usually relieve these symptoms. Moderate inhalation poisoning can cause weakness, vomiting, chest pain, diarrhea,

difficulty breathing, and pain just above the stomach. Symptoms of severe poisoning may occur within a few hours to several days after exposure. Severe poisoning may result in pulmonary edema (fluid in the lungs). This can lead to dizziness, cyanosis (blue or purple skin color), unconsciousness, and even death.

Do not attempt to rescue someone in an enclosed area if you do not have the proper respiratory equipment. If you are with someone who is suffering from inhalation exposure, carry him or her to fresh air immediately. Do not let the victim walk. Then do the following:

- Loosen all tight clothing.
- If breathing has stopped or is irregular, give artificial respiration.
- Keep the victim as quiet as possible.
- Prevent chilling by wrapping the victim in blankets. However, take care not to overheat the victim.
- If the victim is convulsing, protect his or her head from striking the floor or wall.
- Watch for breathing irregularities that may require CPR. Keep the victim's chin up so that the air passage remains free. Do not put anything in the mouth of an unconscious person.
- Do not give alcohol in any form to the victim.
- Get medical attention immediately. Take the victim to a doctor or emergency treatment facility. Take the fumigant's label information with you.

Skin Exposure

Skin (dermal) exposure occurs when a pesticide contacts the skin. This type of contamination is most often associated with liquid and solid pesticides. However, some fumigant gases can also cause serious injury to the skin. This usually occurs if clothing or jewelry holds the gas tight against the skin.

This is the reason that gloves are often not recommended for fumigant application. Most labels suggest that you remove all jewelry and wear loose-fitting clothes. Always consult the label to determine what precautions you should take.



Blisters caused by fumigant exposure

If skin exposure does occur, take the following steps:

- Get to fresh air.
- Remove contaminated items (clothing, jewelry, gloves, shoes, bandages, etc.) immediately.

- Drench the skin with water.
- Wash the skin, hair, and fingernails thoroughly with soap and water.
- Rinse thoroughly and wash again.
- Dry and wrap the affected skin in a blanket.
- If exposure causes a burn, cover the area loosely with a clean, soft cloth. Avoid using ointments, powders, and other medications.
- Do not wear contaminated clothes again until you wash them and air them out for several days.

You can never entirely eliminate the risks associated with fumigation. However, if you take precautions, you can significantly reduce them. Take steps to protect the public, yourself, and your co-workers. Use the checklists from this manual. Read the label information. Learn about the specific risks of each product you use. Find out what PPE your product requires. Unit 7 will teach you how to select, use, and maintain respiratory and gas detection equipment.

Test Your Knowledge

Q. Name the three agencies that set regulations for the safe use of pesticides.

A. The Environmental Protection Agency (EPA), the Arkansas State Plant Board (ASPB), and the Occupational Safety and Health Administration (OSHA)

Q. List several things you can learn from reading the label information of a fumigant.

A. The label information will tell you how and where to use the product. It will give you detailed application and aeration instructions. It may note specific sites that should not be treated or application methods that are not permitted. The label information also describes specific safety precautions including what PPE to wear and basic first aid procedures.

Q. How long should warning signs remain posted?

A. Do not remove warning signs until the treated equipment and surrounding area have completely aerated.

Q. Name several precautions you must take when transporting a fumigant.

A. 1. Do not transport fumigants and people together in a closed vehicle.
2. Make sure fumigant containers are upright, secured, and protected against rear end collision.
3. Mark vehicles in which fumigants are being transported.
4. Do not use public transportation to transport fumigants.
5. Do not transport fumigants through tunnels unless you get permission from ADOT.
6. Do not remove valve protective covers until just before use.

Q. What are the two main routes of fumigation exposure?

A. Inhalation and skin contact

Q. What PPE protects you from inhalation exposure to fumigants?

A. A respirator

Q. True or False: You should always wear gloves when working with fumigants.

A. False. Gloves are not recommended with some fumigants. Others require gloves made of specific materials.

Q. Explain the difference between a TLV and a TLV-TWA.

A. A threshold limit value (TLV) is the maximum amount of fumigant that can be in the air before conditions are considered unsafe. It is used to monitor “short-term” exposure.

A threshold limit value-time weighted average (TLV-TWA) is the average concentration of fumigant for a normal 8-hour workday and a 40-hour workweek, to which workers may be repeatedly exposed, without adverse effect. It is used to monitor “long-term” exposure.

Q. Describe some symptoms of mild inhalation exposure to a fumigant. What should you do if you or a co-worker is experiencing any of these symptoms?

A. Mild exposure by inhalation can cause malaise (a feeling of sickness), ringing in the ears, fatigue, nausea, and pressure in the chest. Exposure to fresh air will usually relieve these symptoms.

Q. Why do some fumigant labels recommend that you remove jewelry and wear loose-fitting clothes during application?

A. Jewelry and tight clothing can trap fumigant gas next to the skin causing irritation or a burn.