

## Non Medical Radiation Exposure

### GENERAL INFORMATION:

#### What is it?

- Radiation (ray-d-A-shun) is a form of energy. It is all around us naturally. The sun gives off radiation. There is radiation in the soil and in the sky. Microwave ovens, computer screens, satellite communications, garage door openers, and televisions all give off tiny amounts of radiation.
- If you are exposed to too much of another type of radiation, you may get radiation poisoning. Material that gives off this type of radiation is called radioactive (ray-d-o-AK-tiv) material. Some metals, like uranium 238, are naturally radioactive. Some metals are not naturally radioactive, but may be changed to become radioactive. Still other metals are man-made, and are radioactive. Following are some of the ways that non-medical radiation exposure can lead to radiation poisoning:
  - **Accident:** Radiation poisoning can happen by accident. For example, a truck or train carrying radioactive material may crash. Radioactive material may spill from the truck or train. If you handle or breathe in some of this material, you may get radiation poisoning. Food and water may also be exposed to radiation. If it is swallowed, you will also get radiation poisoning.
  - **A purposeful (planned) act:** Radiation poisoning can be caused by a person or group wanting to cause harm to others. For example, radioactive material placed in a mall during a busy shopping season would expose many people. People would not know it until they got sick. They might not get sick until days, weeks, months, or even years later.
  - **Act of war:** A person, group, or country can create and set off a nuclear bomb or a dirty bomb. Nuclear and dirty bombs can contaminate (kun-TAM-in-ate) (cover, or become part of) small or large building or land areas.

**What is a dirty bomb?** Dynamite is an example of conventional (typical) bomb material. A "dirty bomb" is conventional bomb material mixed with radioactive material.

- Radioactive material is what makes a nuclear (NEW-klee-er) reactor (ree-ACT-or) ( a device that makes energy for homes and businesses) create energy. Radioactive material also makes a nuclear bomb powerful.
- Small amounts of radioactive material are used in many places close to where we live. For example, hospitals, laboratories, oil drilling companies, and food irradiation plants all use small amounts of radioactive material. Radioactive material comes in many forms. For example, irradiation plants use thin rods called "pencils".
- The radioactive part of a material is never completely used up. Leftover material must be carefully disposed of. Finding a safe place to dispose of radioactive material is difficult and expensive. Over the years, radioactive material has been stolen or misplaced and never found. Radioactive material has been found in scrap yards, in

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vehicles, and in residential buildings.

- People or groups who want to make a dirty bomb steal or gather leftover radioactive material and mix it with conventional bomb materials. Dirty bombs may have a little or a lot of radioactive material in them.

**What causes radiation poisoning?** There are four kinds of radioactive materials. They are alpha (AL-fuh) particles, beta (BATE-uh) particles, gamma (GAM-uh) rays, and neutron (NOO-tron) rays. You may be exposed to any of these materials accidentally, in a purposeful act, or as a dirty bomb.

- **Alpha particles:** Alpha particles lose energy very quickly in the air. By the time they are an inch or two (2-5 centimeters) away from their source they have become harmless. Alpha particles only go through skin with open cuts or sores. Alpha particles are stopped by any clothing or even a piece of paper. If alpha particles are breathed in, swallowed, or get into a cut or sore on your skin, they may harm you.
- **Beta particles:** Beta particles can travel several feet (1 meter) in open air. They can burn your skin because they can go through skin for up to about an inch (2 centimeters). Beta particles are easily stopped by any solid material, including heavy clothing. Beta particles are most dangerous if they are breathed in, swallowed, or get into a cut or sore on your skin.
- **Gamma rays:** Gamma rays are higher energy. They are not particles. Gamma rays travel at the speed of light. They can travel hundreds to thousands of yards (meters) before their energy is gone. Gamma rays can pass through many kinds of materials, including human beings. Gamma rays are stopped only by distance, or very dense materials like lead. Like alpha and beta particles, gamma rays can be inhaled from the air or swallowed with a food or water source. Gamma rays may affect organs like the liver and stomach, and other parts deep in your body. These rays destroy tissue and cause sickness and death.
- **Neutron rays:** Neutrons are usually the result of fallout. Fallout happens after an atomic blast. The ground absorbs a lot of radiation after an atomic blast. The exposed radioactive ground then rises as a cloud (fallout) and neutrons are carried by winds to other places. Neutrons can be inhaled from the air or swallowed with a food or water source.

### How is radiation poisoning diagnosed?

- A diagnosis may be made at the site of the incident. For example, a truck or train carrying radioactive materials is required to have warning signs. Emergency health workers, police, or firefighters will realize that an accident involving radioactive materials has happened when they see these signs.
- A diagnosis can be more difficult if people are exposed to radiation and do not know it.
  - They may find and handle material that is radioactive.
  - They may be exposed through a planned act by a person or group to harm others. An example of this may be a suitcase of radioactive material placed where many people will walk by. An airport or a shopping mall are possible targets. If radioactive material was placed in or near an air vent in a public

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closed area, like a sporting arena, people attending an event would be forced to breathe in contaminated air.

Caregivers will observe your signs and symptoms. If other people have the same symptoms you are having, they will ask for more information. They will ask you to tell them where you have been in the last month. Caregivers gather this information to find a common location and time among people showing signs and symptoms of radiation poisoning.

**What are the symptoms of radiation poisoning?** Symptoms of radiation poisoning depend on several things:

- Were you exposed to the radioactive material continuously, or off and on?
- How much material were you exposed to?
- How close to the material were you?
- Were you shielded by thick concrete walls, lead, or other material?
- Was your whole body exposed or just one part?
- Did the radiation get into your body through breathing, swallowing, or through an opening in your skin?
- What was the type of particle or ray?

Symptoms of radiation poisoning will be worse if you were near to the radioactive material for a long time without any shielding.

- **Symptoms that may appear soon after a heavy dose of radiation poisoning:**

- Headache.
- Disorientation (dis-or-e-in-TA-shun): You may not know where you are, or experience confusing feelings or sights.
- Prostration (pros-TRA-shun): You may not have enough energy to move.
- Ringing in the ears.
- Nausea (feeling sick to your stomach), and vomiting (throwing up).

- **Symptoms that may begin later:**

- Nausea and vomiting may begin within 30 minutes, or even weeks later. You may also have a high fever and loose stools containing blood.
- Latency (LAY-ten-c) period is a time of wellness that follows nausea and vomiting. During this time you will not have symptoms. This time period may last from minutes to weeks.
- A decrease in your white blood cell (WBC) count may occur. This decrease lowers your ability to fight infections (in-FECK- shuns). You may catch colds and other

diseases easily, and you may even die from them.

- Other symptoms and signs may include a high temperature over 101°F (38.4°C), a tendency to bleed easily, or small red spots on your skin. Skin burns that look like a sunburn may appear.
- If you have nausea and vomiting with skin burns it is likely that you came in contact with gamma or neutron rays. If you have only skin burns, it is likely that you were in contact with beta particles.
- **Symptoms that may begin much later:**
  - People who have been exposed to radiation poisoning are more likely to develop cancer 10, 20, 30, or more years later.

### How is radiation poisoning treated?

- Dehydration (de-hi-DRA-shun) means loss of body fluids. This may occur because of vomiting or having diarrhea, and may be treated with intravenous (IV) liquids.
- A decrease in your white blood cell count may be treated in different ways, depending on how low your white cell count goes. You may be in the hospital in "reverse isolation". In reverse isolation, caregivers wear protective gowns, masks, and gloves so they do not make you sick when they visit you.
- If you lose a lot of blood you may have blood transfusions (trans-FEW-shuns).
- You may need a bone marrow transplant.

**What preparations can I make in case of a radiation emergency?** There are two possibilities in case of a radiation emergency. One is to "shelter in place" and the other is to shelter away from home. If you "shelter in place", make sure all family members know where the shelter is and why you will use it. Remind them of why you have a shelter, and that your supplies should not be borrowed. Check your supplies every six months. Replace water and batteries every six months. Replace medicines before prescriptions expire. Check food labels for expiration dates and replace them with new ones before the dates expire. If you replace medicines and foods before the dates expire, you can use them instead of throwing them away.

- **Shelter in Place:** Many radioactive materials rapidly waste away. If an attack happens near where you live, but not in your immediate neighborhood, you may be told to "shelter in place". To prepare for this, find a safe place in your home for you and your family. Choose a place with concrete walls if possible. In most buildings, this is the basement. Avoid a place with windows. Store emergency supplies in this area. Emergency supplies include:
  - **Food with a long shelf life:** Canned, dried, and pre-packaged foods are good to store. Store enough food for each person in the house for 3 days. If you have pets, store a 3 day supply of pet food. Make sure you include a hand-held can opener with the food.

- **Water:** You may store bottled water or water from the tap. If you store water from the tap make sure you replace it every six months. Check the expiration (x-per-A-shun) date on bottled water. Store a gallon for each person, for each day, for 3 days. For example, if there are 3 people in your house, you will need 9 gallons of water.
- **Clothes and bedding:** Store a change of clothing for each person in the house. Check clothing every 6 months and make changes to match the weather and your child's clothing sizes. If you have cots or sleeping bags, store them in this area. Place pillows and warm blankets there, too.
- **Paper and plastic products:** Place paper plates, toilet paper, paper towels, plastic cups, plastic trash bags, and plastic utensils in your shelter. If you need to stay in the shelter, use paper and plastic products. Save your stored water for drinking and washing yourself.
- **Cleaning agents:** Store soap, hand sanitizer, and germ killing products. These may help you feel cleaner.
- **Batteries:** Flashlights, radios, and games need batteries, but they usually aren't the same size. Place batteries of the correct size for each item that needs batteries in your shelter.
- **Radio:** Be sure to include a battery operated radio to listen to emergency messages.
- **Cell phone and land line telephone:** Because telephone service may not be good, have both a cell phone and a regular telephone available to use.
- **Personal items:** If you have a baby or toddler, place enough diapers in your shelter for 3 days worth of changes. You may also need baby formula and bottles. If you wear glasses, store your last pair of glasses. If you wear contact lenses, keep a pair in your shelter. Deodorant can help you feel cleaner.
- **Duct tape and plastic sheeting:** These items will seal vents and the door of your shelter.
- **Pets:**
  - If you have pets, they must stay inside during the emergency.
  - You will need to find a place where pets can relieve themselves in the shelter. Do not let pets out to go to the bathroom. If you do, they will bring radioactive material back inside with them.
- **Games, books, and entertainment:** Do not forget to place items to keep yourself and your family amused while you are sheltering in place. Board games, hand-held electronic games, books to read and books to read to children will help you pass the time peacefully. Other forms of entertainment, such as battery operated TVs with VCR players, may also help.
- **First Aid Kit:** Store the following items in a First-Aid kit in your shelter:

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- **Bandages and adhesive tape:** Store sterile rolled bandages, and clean material that may be used as bandages, such as old sheets. Iron them before storing to help get rid of germs.
  - **Instruments:** Scissors, tweezers, needles, safety pins, and a thermometer are useful items to include.
  - **Other cleaning supplies:** Moistened towels (towelettes), antiseptic (an-tuh-SEP-tik) or antibiotic (an-ti-bi-AH-tik) ointment, petroleum jelly, and latex or vinyl gloves should be included.
  - **Medicines:**
    - Aspirin or aspirin-free pain reliever.
    - Antidiarrhea medicine.
    - Laxatives.
    - Antacids for stomach upset.
    - Activated charcoal to stop vomiting.
  - **Hints:** Removing clothing will remove a lot of radioactive contamination. If you are outside when an alert is given, remove your clothing and place it in a plastic bag. Tie the top of the bag. If it is very cold outside, remove your outer garments, such as your coat and boots and place them in a plastic bag.
- **Shelter Away From Home**
    - If your area is too contaminated for you to shelter in place, you will be told where you can shelter by officials, or on the radio or TV.

#### **CARE AGREEMENT:**

You have the right to help plan your care. To help with this plan, you must learn about your health condition and how it may be treated. You can then discuss treatment options with your caregivers. Work with them to decide what care may be used to treat you. You always have the right to refuse treatment.