RADIOLOGICAL:

A South Carolinian's guide to radiological terrorism

SOUTH CAROLINA DEPARTMENT OF HEALTH AND ENVIRONMENTAL CONTROL

TACTICS AGAINST TERRORISM: **RADIOLOGICAL**

South Carolina Department of Health and Environmental Control
Office of Public Health Preparedness

What is radiation?

Radiation is a form of energy that is all around us. Radiation comes from both man-made and natural sources. There are different types of radiation. Some have more energy than others.

What is radiological terrorism?

Terrorists might use a radiological attack to create fear, disrupt the economy, or to get a response from the government.

Radiological terrorism involves using radioactive material as a weapon. The most common methods are the spreading of contaminated material through the use of a radiation dispersal device (RDD) or "dirty bomb," the use of an improvised nuclear device (IND), or an attack on a nuclear facility such as a nuclear power plant. All methods could produce immediate injuries or death. Also, they have the ability to take advantage of the public's fear of radiation.

A terrorist might also use a radiation-emitting device (RED). This type of device does not explode but provides a means of exposure to radiation.

What is a "dirty bomb"?

A dirty bomb is not the same as a nuclear bomb.
A dirty bomb uses dynamite or other explosives to scatter radioactive dust, smoke, or other material that causes radioactive contamination over a small area. When a dirty bomb explodes, most of the radioactive material would likely fall to the ground within a few miles of the explosion.

A dirty bomb can hurt people in two ways. First, the explosion of the bomb can hurt or kill people. Second, radioactive material spread by the explosion is likely to remain for a long time and can produce illness due to exposure to the material. Since a dirty bomb may appear at first to be a conventional bomb, people covered with radioactive dust may spread the problem when they flee the area.

It is hard to design an RDD that would spread enough radiation to cause immediate harm to public health or kill a large number of people from the radiation exposure alone.

The main purpose of a dirty bomb is to scare people and contaminate buildings or land with radioactive material. A dirty bomb would make these places unsafe for living or working for a short time, disrupting lives and businesses.

Some symptoms of exposure can occur shortly after the incident. Other symptoms could take months or years to create health problems.

What is a nuclear bomb?

A nuclear bomb involves the splitting of atoms. This causes a huge release of energy that makes an explosion that is thousands to millions of times stronger than the kind of explosion caused by a dirty bomb.

When a nuclear bomb explodes, it causes a nuclear blast that makes a powerful wave of heat, light, air pressure and radiation. It also makes a fireball that completely destroys everything in its path, including water and soil, and carries it up into the air. This destruction creates a mushroom cloud. This cloud contains tiny particles of radioactive dust and debris that can fall on a very large area.

When radioactive dust falls back down to earth, it is known as **"nuclear fallout"**. This fallout can be carried for miles by the wind. Since fallout is radioactive, it can contaminate anything it lands on, including food and water. A nuclear blast would likely cause a great deal of damage, death and injury, and affect a wide area. How you are affected by a nuclear blast will depend on the size of the bomb and how far away you are from the explosion.

Terrorists may be more likely to use a dirty bomb than a nuclear bomb. Use of chemical, biological and nuclear weapons requires a lot of scientific knowledge. It takes much less knowledge and skill to create a conventional bomb that spreads radioactive material. A dirty bomb is also less expensive than a nuclear bomb.

How can you be exposed to radiation?

You are exposed to small doses of radiation every day. This exposure is considered normal and is not a threat to your safety. This exposure comes from radiation found in small amounts in:

- Water
- Food grown in soil *(soil can have elements with radioactive properties)*
- Buildings made of stone, concrete or brick *(materials can have some elements with radioactive properties)*
- Sunlight
- X-rays and other medical tests and treatments
- Smoke detectors
- Previous nuclear weapons testing
- Coming into contact with a contaminated person or object.

How will I know if there is a radiological attack?

You cannot see, smell, feel or taste radiation. You may not know immediately if you have been exposed to radiation. It is important to be aware of things going on around you and to watch for people doing things that are suspicious or seem unusual.

Emergency responders have equipment to detect radiation and will know how much, if any, radiation is in the area and whether you are in danger. Public officials will let you know if there has been a radiological attack and what to do.

Symptoms

Large doses of radiation can be deadly. But a dirty bomb would not likely spread enough radiation to cause immediate illness or symptoms.

Higher levels of radiation can cause:

- Nausea
- Vomiting
- Diarrhea
- Swelling and redness of the skin
- Hair loss.

If you have any of these symptoms after a radiological incident, you should get medical help right away.

What is the difference between radiation exposure and contamination?

Radiation exposure: Radioactive materials give off a type of energy that travels in invisible waves or particles called radiation. When you are exposed to radiation, the energy goes through your body. For example, you are exposed to safe amounts of radiation when you have an x-ray. Being exposed to radiation doesn't mean you are contaminated with radioactive material.

Radioactive contamination: Contamination occurs when radioactive material gets on or inside a person or object. Radioactive materials released in the environment can contaminate air, water, surfaces, soil, plants, buildings, people or animals. There are two types of radioactive contamination:

- Internal contamination: This happens when you swallow or breathe in radioactive material. It can also happen when radioactive material enters your body through an open wound or is absorbed through your skin. Some types of radioactive materials leave the body through blood, sweat, urine and feces. Other types stay in the body in different organs.
- External contamination: This happens when radioactive material gets on an object or on your skin, hair or clothes.

How does radiation exposure affect your health?

There are many ways radiation can affect your health. However, you might not see the effects for many years. The effects of radiation exposure depend on:

- The amount of radiation absorbed by your body
- The length of time you are exposed
- The type of radiation you are exposed to
- How you were exposed (internal or external).

Health effects can be mild, such as reddening of the skin. Effects can be serious, such as increased risk of cancer or death.

Being exposed to a large amount of radiation can cause death within a few days or months. Being exposed to lower amounts of radiation can lead to an increased risk of developing cancer.

Another serious consequence of a radiological attack is the psychological impact. Most people are unfamiliar with radiological and nuclear energy. They might become overly frightened. As a result, they might ignore important instructions from emergency responders trying to help.

Effects on unborn babies. Radiation is very harmful to unborn babies, especially in the early weeks of pregnancy. This is because babies are rapidly growing and developing, making them more vulnerable to radiation. Even amounts of radiation too low to make the mother sick can cause serious birth defects, such as stunted growth, deformities, abnormal brain function, or cancer that may develop later in life.

Acute Radiation Syndrome (ARS), or radiation sickness, is a short-term but serious illness that occurs when:

- The amount of radiation is high
- Exposure is short, but strong

- The radiation reaches internal organs
- Most or all of the body is exposed to radiation.

Symptoms include reddening of the skin that looks like a sunburn, nausea, vomiting, diarrhea, hair loss and low blood cell counts. Later, it can cause you to lose bone marrow, which would cause you to lose weight, lose your appetite, feel like you have the flu, get an infection and bleed internally. For those who survive, it might take years to recover.

Treatment

Anyone who has swallowed or inhaled radioactive material needs medical help immediately. There are reliable medicines to take once radiation is swallowed or inhaled, but only trained medical professionals can administer these medicines. They will decide how to treat your symptoms based on how much and what type of radiation you were exposed to.

DHEC has made potassium iodide pills available to people who live within a 10-mile radius of commercial nuclear facilities in South Carolina. Potassium iodide, also known as "KI," is not a magic anti-radiation pill. It provides protection for only the thyroid gland against one form of radiation. It cannot protect against whole body irradiation or other forms of radioactive elements that could result from a nuclear power plant release. You should swallow your "KI" pill only when you have been instructed to do so.

Be safe. Be smart: Make a plan.

Radiological terrorism might occur without warning. Being prepared in advance and knowing what to do and when is important. Having a plan for your family can help you stay calm. It could also save lives. Remember to go over your plan with your family and people you work with regularly so everyone knows what to do to be safe.

A plan for home

Start by making a plan for home. Decide what each family member should do during a radiological emergency. Make sure you make a disaster supply kit *(see section called "Make a Kit")*. Make sure everyone knows where the kit is kept. Remember to include your pets in your home plan. If you live within 10 miles of a nuclear power plant, stay current with the plant's emergency warning systems. The plant can provide you additional information about evacuation routes, shelters, and important contact numbers.

A plan for away from home

You should also plan for a radiological emergency when you and your family members are away from home. Decide how you will let each other know where you are. Many families will ask an out-of-town relative or friend to be their emergency contact person. It could be easier to make a long-distance phone call than a local phone call during an emergency. Make sure each family member knows who the emergency contact is and has the phone number. Finally, decide where everyone will meet when the emergency is over.

A plan for work

You should also plan for a radiological emergency at work. It is best to follow your company's emergency plan. You may have practiced the plan while at work. If possible, keep a disaster supply kit where you work *(see section called "Make a Kit")*. If you own a business or are in charge of other people, make sure they know what to do in case of a radiological emergency.

If there is an attack, don't forget to call your out-of-town emergency contact person to find out if other family members are safe.

A plan for children and elderly relatives

If you have children in school or daycare or a relative who lives in a nursing home, find out what plans each place has for keeping people safe during a radiological emergency. Discuss these plans with your family. Make sure they understand what to do. Make sure they know to listen to their teachers or caregivers and do what they are told.

Remember that teachers and nursing home caregivers are trained to handle emergencies. They will do their best to make sure your family members are safe. Unless you are told to do so, do not try to pick up your children or elderly relatives from school or nursing homes during a radiological emergency. It could put you and others in danger.

A plan for family members with disabilities

If you have a family member with a physical or mental disability, you will need a plan to meet their special needs. Explain the plan to them. If they are able, practice what you would do in an evacuation.

Pets and farm animals

It is important to have a plan for your animals, too. In a radiological emergency, you may have to leave your home. It may be difficult or impossible to find a safe place for your animals to stay. American Red Cross shelters and many other shelters cannot accept pets because of health and safety rules. There are some exceptions. Animals like guide dogs that help people with disabilities are usually the only animals allowed in shelters.

Try to find other places outside of your area for your pet to stay. You may be able to stay in a hotel with your pet. You can ask family or friends to keep your pets or find a shelter, kennel, or veterinarian that will take care of your animals in an emergency. Keep phone numbers for all of these places. When you make your family disaster supply kit, remember to include food for your animals.

South Carolina has many farms with larger animals such as cows and horses. It is more difficult to find shelter for larger animals. If you have a barn, bring the animals inside, keep them on stored food and water, and close doors and windows. You may have to leave larger animals behind if you have to evacuate.

Be safe. Be smart. The best way to protect yourself and your family in a radiological emergency is to make and practice a family response plan.

Be safe. Be smart: Make a kit.

If there is a radiological disaster, you may need to stay inside your home for a few hours or a few days. This is known as having to "shelter in place." You may be required to shelter in place for several days until officials tell you it's safe to go outside again. You will not be able to leave to go to the store, out to a restaurant or to church. This is why you need to keep certain things needed for everyday life like clean water, food and clothing.

If you make a disaster supply kit ahead of time, you will have what you need to be as safe as possible. Make sure everyone in your family knows where the kit is kept. You will need to replace the water every three months and replace the food every six months. Batteries should be replaced regularly so flashlights work when you need them.

Here is what to include in your Disaster Supply Kit:

- First aid kit
- Flashlight
- Battery-operated radio
- Extra batteries
- Bath size towels
- Plastic garbage bags or plastic sheeting
- Duct tape and scissors
- Blankets
- Emergency phone numbers
- Bottled water *(at least one gallon for each day for each person, plus water for pets; plan for at least three days)*
- Ready-to-eat food that won't go bad and doesn't need to be refrigerated
- Paper plates, cups, plastic utensils and a non-electric can opener
- Toilet tissue
- Medicines and a list of medicine each person takes
- Extra eyeglasses, contact lenses or hearing aids
- Change of clothing for each person
- Personal items like soap and deodorant
- Baby formula
- Pet food
- Cash and/or an emergency credit card.

Protection in a radiological emergency:
Time, Distance and Shielding

A radiological attack or emergency can be very dangerous. People can be seriously hurt or die. Here are things you should do to protect yourself if there is a radiological emergency:

Time: decrease the amount of time you spend near the source of radiation.
Distance: increase your distance from the source of radiation. Even walking a short distance from the scene of the attack could protect you.

Shielding: Shield yourself from external exposure and breathing in radioactive material. Covering your nose and mouth with a cloth or going inside a building or vehicle can help shield you from radiation.

If you are close to the area where a radiological incident occurs, do the following:

If you are outside and close to the incident:

- If it is a nuclear blast, turn away and close and cover your eyes to prevent damage to your eyesight. Drop to the ground and put your face down toward the ground and your hands under your body. Stay flat until the heat and two shock waves pass.
- Following any type of radiological release, you should get out of the immediate area quickly. Go inside the nearest building that has not been damaged. Shut all windows, doors and fireplaces. Turn off fans and heating and air conditioning systems.
- Stay away from any dust clouds.
- Do not touch debris from an explosion. It might be contaminated.
- Cover your mouth and nose with a cloth to avoid breathing in radioactive material.
- Take off your outer layer of clothes and seal them in a plastic bag or container.
- Gently wash parts of your body not covered by clothing with soap and water. If possible, do this before going into a clean area.

If you are inside and close to the incident:

- If the windows are not broken, stay where you are and do not leave until you are told it is safe. Shut all windows, doors and fireplaces. Turn off all forced-air heating and air-conditioning systems that draw air from outside. You can leave the unit on to allow the air to recirculate.
- If the windows are broken, go to a room where there are no windows or the windows are not broken.
- Take off your outer layer of clothes right away and seal them in a plastic bag. Getting your clothes away from you will reduce external contamination and help prevent internal contamination. It will also reduce the length of time you are exposed to radiation.

- Gently wash parts of your body not covered by clothing with soap and water.
- First responders will help clean those people closer to the event before finding those who fled the scene. Avoid getting into your car or on mass transit. You could endanger other people – including your family – by spreading the contaminated dust.

If you are in a car and close to the incident:

- Close the windows and outside vents on your air conditioning or heating system. Use only the "recirculate" function, if possible.
- Cover your nose and mouth with a cloth to avoid breathing in radioactive dust or smoke.
- If you are close to your home, office or public building, go there right away and go inside.
- Once you are inside, take off your outer layer of clothes right away and seal them in a plastic bag. Getting your clothes away from you will reduce external contamination and help prevent internal contamination. It will also reduce the length of time you are exposed to radiation.
- Gently wash parts of your body not covered by clothing with soap and water.
- If you cannot get to your home or another building safely, stop at the safest place possible.
- Listen to the radio for information and instructions.

In all situations:

- Listen to your emergency broadcast stations on the radio or television.
- Listen carefully to the instructions of law enforcement, emergency response and public health officials and do as they say. It is important for you to trust them. They have the training and the information about the situation to tell you what you should do.
- Don't use your phone unless it is a life-threatening emergency.
- Don't eat, drink, smoke or do anything that could bring potentially radioactive material to your mouth. Wait until after contamination is removed from your skin and clothing.
- If you are seriously injured, get medical help as soon as possible by calling 9-1-1 or the operator.

Your clothes

It is important to avoid contact with radioactive material or objects that are contaminated. If there is a radiological attack and medical help isn't available right away, here are things you should do:

- Take off your outer layer of clothing, starting from the top and working your way down to your socks. Getting your clothes away from your body normally removes most of the external contamination and helps prevent internal contamination. It will also reduce the length of time you are exposed to radiation.
- Try not to let contaminated clothes touch your bare skin. Any clothes that have to be pulled over your head should be cut off instead. Radioactive particles on the clothing could hurt you if inhaled or swallowed.
- Put the clothes in a plastic bag. Avoid touching contaminated areas of the clothes. Use tongs or a similar object if you need to. Anything that touches the clothes should be put in the bag with them.
- Seal the bag, then seal that bag inside another plastic bag.
- Help family members and children remove their clothing. Avoid touching the contaminated clothes with your bare hands. Try not to let the contaminated clothes touch the skin of other people.
- Put the bags where others will not touch them and keep them until authorities tell you what to do with them. They can be used later to find out how much radiation you were exposed to, which could determine the treatment you need. They might be used as evidence by law enforcement, too.

Your body

It is important to avoid contact with radioactive materials. If there is a radiological attack and medical help isn't available right away, here are things you should do:

- Try to gently wash any radioactive material off your body.
- Use warm, running water *(not hot or cold, if possible)* and soap if you have it.
- Do not scrub. Blot dry.
- Be sure to wash your hair.
- Try not to spread contamination to parts of the body that may not be contaminated, such as areas that were covered by clothing.
- Put all towels, soap and washcloths in the bag with your contaminated clothes.

- If you get dust that could be contaminated in your eyes, flush them with running water for at least five minutes.
- If you have breathed in dust that could be contaminated, blow your nose frequently.
- Put on clean clothes.
- Get medical help as soon as it is safe to leave your shelter.

Be safe. Be smart: Be aware.

What is your risk?

It is possible for a terrorist to commit a large-scale radiological attack. Some radioactive materials are not hard to get because they are used by certain South Carolina businesses and industry. Other radioactive materials are transported on trains, trucks, or boats that travel through our towns, cities and ports. Here are some keys for assessing your risk of a radiological attack or emergency:

- Learn about radioactive materials that might be stored near your home.
- Radiological attacks have the potential to kill more people in indoor spaces or crowded areas. Be aware of your surroundings in:
    - Buildings
    - Subways
    - Sports arenas
    - Concert halls and auditoriums.

How you might be told of a radiological emergency

Public officials will alert you of a radiological emergency as quickly as possible. Here is how you will be alerted:

- You might hear a siren.
- You might be called by telephone. The voice on the other end could be a person or a recorded message.
- Emergency workers might drive by and give instructions over a loudspeaker.
- Emergency workers might come to your door and warn you.
- The Emergency Alert System on television or radio might alert you.

Be safe. Be smart. Listen carefully and do exactly what emergency workers tell you to do. South Carolina's emergency responders are trained to help and protect you. You should trust them.

Helping others

If you find someone who has been exposed to radiation, the first thing you should do is make sure you don't become a victim, too. Avoid close contact.

If the person has swallowed or inhaled radioactive material, call EMS or 9-1-1 right away. Tell the operator where you are located and the phone number you are calling from. Describe what has happened. Listen to the operator and do what he or she tells you to do. Stay on the phone until the operator tells you to hang up.

If you are trained in CPR or first aid and are sure you are safe, take care of the victims' life-threatening injuries first. Then try to treat other injuries. You will be better prepared for an emergency if you are trained in CPR and first aid before a disaster happens.

Evacuation after a radiological emergency

Law enforcement and public health officials might decide it will be safer for you to evacuate in a radiological emergency. You might need to go to an emergency shelter. It is important to stay calm, listen carefully and follow instructions. If you are told to evacuate, listen to your radio or television and make sure the order applies to you. Listen to find out if you need to evacuate right away or if you have time to pack basic things you might need.

If you are told to evacuate right away, you should:

- Take your disaster supply kit and medicine.
- Close and lock your windows and doors.
- Shut off forced-air ventilation systems in your home.
- Move quickly and calmly.

If you have time to pack basic things, you should take:

- Your family disaster supply kit and medicine
- A change of clothing for each family member
- Eyeglasses, hearing aids, dentures, canes or walkers needed by family members

- Personal items like toothbrushes and deodorant
- Baby items like diapers, formula or baby food
- Books, puzzles, cards or games for entertainment.

Shelters will not have everything you need. In most cases, the shelters will provide only meals, cots and blankets.

You don't need to turn off your refrigerator or freezer. You should turn off all other appliances and lights before locking your home when you leave.

Check on neighbors to make sure they know about the emergency and offer to help people with disabilities or other special needs.

Take only one car to the evacuation site. Close your car windows and allow your air conditioning or heating system to only recirculate the air in your car. If you need a ride, ask a neighbor. If there are no neighbors who can help you, listen to the radio or television for instructions. Don't take shortcuts. For your safety, follow the exact route you are told to take.

Shelter in place

In a radiological emergency, you might be told to "shelter in place". This means staying where you are and making yourself as safe as possible until the emergency is over or you are told to evacuate. If you are told to shelter in place, you should:

- Take your children and pets indoors right away.
- Cover your mouth and nose with a damp cloth, if you're outside. If you might have been contaminated, remove your outer layer of clothing and shoes and put them in a plastic bag before going inside to avoid bringing radioactive material into your shelter. Leave clothes and shoes outside.
- Close all windows in your home.
- Turn off heating and air conditioning systems.
- Close your fireplace and any other place air can come in from outside.
- Go to the room that you've picked ahead of time as your shelter room. The safest place in your home during a radiological emergency is near the middle of your home or in the basement. A large room with a water supply or bathroom and a telephone is best. This room should have as few windows as possible. This is different from sheltering in place for a chemical disaster, when the shelter should be high in the home.

- Take your Disaster Supplies Kit with you.
- Wet some towels and stuff them in cracks under doors.
- Tape plastic garbage bags or plastic sheeting over windows.
- Tape around windows and doors to make an unbroken seal. Use tape to cover any exhaust fans, vents, electrical outlets or other openings in case a radiation cloud is passing over. Leave these protective covers in place until you are advised to remove them.
- If you're told there might be an explosion, close the window shades, blinds, or curtains. Stay away from windows.
- Stay in the room and listen to your radio or watch local television news until you are told it is safe to come out or to evacuate.
- You can use the sink and toilet as you normally would. If you need to drink water, drink bottled water, not water from the tap.
- If you are away from your home when a radiological disaster happens, follow the instructions of emergency workers to find the nearest shelter.

Emergencies: **9-1-1**

Emergency Medical Services (EMS): **9-1-1**

Poison Control Center: **(800) 222-1222**

Dial 9-1-1 or Emergency Medical Services only if someone's life is in danger. Go to the hospital only if you have a medical emergency. Listen to your radio and television for information and additional instructions.

My area's Emergency Alert System radio station is:

Aiken/Augusta – WBBQ-FM 104.3
Midlands – WCOS-FM 97.5
Charleston/Low Country – WNKT-FM 107.5
Florence/Pee Dee – WJMX-FM 103.3/AM 970
Myrtle Beach/Grand Strand – WKZQ-FM 101.7
Greenville/Spartanburg/Upstate – WFBC-FM 93.7

Our family contact person is: _____

Phone number: _____

Emergency Meeting Place (outside home): _____

Meeting Place (away from home): _____

For more information

Here are some other good sources of information to keep you and your family safe in a disaster situation.

SC DHEC
http://www.scdhec.gov

SC Emergency Management Division
http://www.scemd.org

Centers for Disease Control and Prevention
http://www.bt.cdc.gov

American Red Cross
http://www.redcross.org

Federal Emergency Management Agency
http://www.fema.gov

U.S. Environmental Protection Agency
http://www.epa.gov

U.S. Department of Energy
http://www.energy.gov

Red Cross Disaster Preparedness
http://www.prepare.org

U.S. Department of Homeland Security
http://www.ready.gov

This publication provides health information for your general knowledge. Talk to your doctor about your concerns about any medical condition. DHEC does not recommend you diagnose or treat yourself for a serious illness.

Notes:

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Revised 12/05
ML-02562 3/06