RADIOLOGICAL EMERGENCY

CITIZEN AND MEDIA BOOKLET

INTRODUCTION

This booklet is for all State of Indiana residents but is most relevant for those who live within 50 miles of a nuclear power plant, in the area known as the Ingestion Pathway Zone (IPZ).

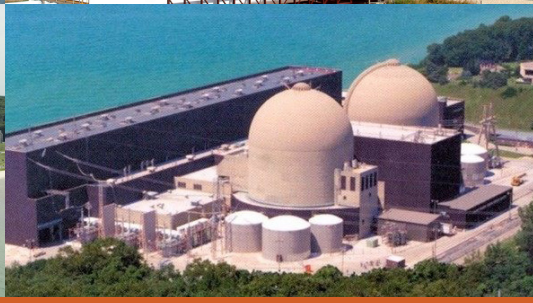
This booklet describes:

- Steps taken to prevent contamination during and after an incident at a nuclear power plant.
- How the safety of food and water supplies will be ensured in the event of a disaster.
- What you can do to protect yourself and your family.

For non-emergencies, anyone with questions may contact:

Indiana Department of Homeland Security
Radiological Emergency Preparedness Program
302 W. Washington St., Room E-208
Indianapolis, IN 46204
Phone: (317) 232-2222
Email: hazmat@dhs.in.gov
Website: dhs.in.gov



WHAT IS A NUCLEAR POWER PLANT EMERGENCY?

A nuclear power plant emergency may involve a release of radioactive dust and gas particles into the atmosphere. The dust and gas particles released are spread by the wind and eventually fall and collect on the ground. The distance that particles travel depends on the weather. Strong winds spread lighter particles over large areas while heavier particles fall more quickly. Rain can also force radioactive particles to fall and concentrate in an area. Nuclear power plant emergencies are categorized as follows:

Notification of Unusual Event (Lowest Severity)

Alert

Site Area Emergency

General Emergency (Highest Severity)

Notification of Unusual Event (Lowest Severity)

A Notification of Unusual Event (NOUE) can be triggered by any problem within the plant that potentially could lead to a decrease in safety. In this emergency level, no releases of radioactive material requiring off-site response or monitoring are expected, and the situation does not pose any threat to public safety.

Some examples of Unusual Events:

- Small on-site fire contained to one room
- The loss of off-site power for more than 15 minutes
- On-site or off-site communications equipment becoming unavailable

Alert

An Alert emergency level is triggered by any type of event that causes a reduction in plant safety. A radiation release from the power plant is possible, but only in small amounts that are within the U.S. Environmental Protection Agency (EPA) protection action guideline exposure levels. Alerts are not considered a threat to the public, although state agencies are able to choose what precautionary actions should be taken (i.e. activation of Emergency Operations Center).

Some examples of Alerts:

- An on-site fire that could potentially cause failure of plant safety systems
- Natural or man-made events that threaten the stability of vital plant equipment
- Radiation levels becoming high in certain areas of the plant, which causes an unsafe environment for plant operators

Site Area Emergency

Site Area Emergencies (SAE) are triggered when events that cause a serious safety condition occur at the plant. In this emergency level, a radiation release is possible, but it is not expected to exceed the U.S. EPA protective action guideline exposure levels or leave the boundaries of the plant itself. The purpose of an SAE is to adequately staff emergency response centers and to ensure the public is prepared if the situation worsens.

Some examples of Site Area Emergencies:

- The reactor losing large amounts of cooling water
- The actual or potential loss of two of three power plant safety barriers
- Power plant security becomes compromised

General Emergency (Highest Severity)

A General Emergency (GE) is the highest emergency level and is triggered when the reactor core becomes or is expected to become damaged. During General Emergencies, radiation release is expected to be above the U.S. EPA protective guidelines, and exposure levels are expected to go beyond plant boundaries. Members of the public living within a 50-mile radius of the power plant will promptly be notified and provided with protective action information.

Some examples of General Emergencies:

- Plant operators have lost control of the facility
- Two of three safety barriers have been lost, and the third barrier is expected to be lost
- The reactor core has experienced severe damage

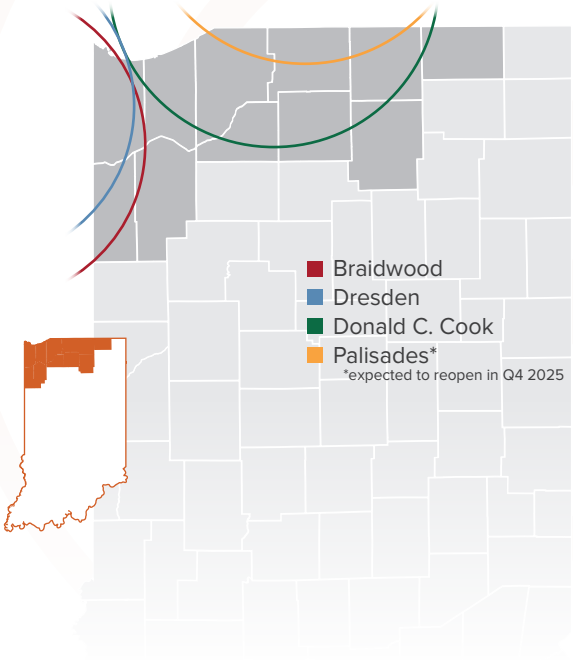
INGESTION PATHWAY ZONE

During and after a General Emergency situation, land within a 50-mile radius of the plant is known as the Ingestion Pathway Zone (IPZ). Following a large-scale incident, experts anticipate that food and water found outdoors within this area may become contaminated with radioactive material. Any food or water found outdoors within the IPZ should not be consumed, as it may be a threat to the health and safety of the general public. Wild game that is hunted in the IPZ during the events of a General Emergency should not be consumed, as there is a possibility it could be contaminated with radioactive material.

Following an incident, radiation and food specialists will work to test food, water and other items that may have been impacted. As these specialists learn more, they will work with local and state officials to provide additional safety instructions to citizens.

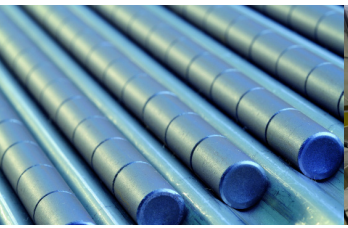
There are 11 Indiana counties that are in an Ingestion Pathway Zone:

- Elkhart
- Jasper
- Kosciusko
- LaGrange
- Lake
- LaPorte
- Marshall
- Newton
- Porter
- St. Joseph
- Starke



POWER PLANT CONTAINMENT BARRIERS

Nuclear power plants have three different containment barriers to keep the fuel and radiation from entering the environment and harming the public. Although there are only three major barriers, each is designed with a number of fail-safe measures and redundancies that allow operators to address any small issues that might arise. The likelihood of one of these containment barriers failing is minimal, meaning the likelihood of all three barriers failing at the same time is highly unlikely to occur.



What could be released from a nuclear power plant?

Any radioactive materials released from the nuclear power plant would be in the form of radioactive gases and radioactive particles. These gases and particles would travel away from the nuclear plant in a cloud, or a “plume.” Winds, atmospheric stability, temperature, and precipitation impact the path, size, distance, and deposition of the plume.

The concentration of radioactive particles and gases, or “plume”, is expected to be strongest at, and in the immediate vicinity of, the release point (in this case, the nuclear power plant would be the release point). As the plume moves along with the wind, it spreads out and becomes less concentrated.

Radioactive particles deposit out onto the ground and other surfaces (similar to how soot and ash settle out of smoke) and most of the radioactive gases blow away. As you move farther away from the plant, less and less radioactive material remains in the plume.

RADIATION AND ITS EFFECTS

What is radiation?

Radiation is present at low levels in our environment all the time. Naturally occurring radioactive material can be found in soil and in buildings. Radiation comes from other sources, such as the sun and X-ray machines when they are activated. The effects of radiation on people and animals depend on the amount and length of time of exposure, as well as the general health and age of the person or animal. Radioactive gases and particles can be inhaled, ingested and absorbed through the skin.

There are three main types of radiation:

- **Alpha Particles** can travel only a few inches in air and can be stopped by a sheet of paper or the outer layer of a person's skin. These particles are only harmful if swallowed or inhaled.

- **Beta Particles** can travel only a few feet in air and can be shielded with aluminum foil or plastic. As with alpha particles, beta particles are most harmful if swallowed or inhaled.

- **Gamma Rays** are high energy rays similar to those used to produce medical x-rays. Gamma rays are very penetrating and require shielding with high density materials such as concrete or lead.

Why are radioactive materials harmful?

Radioactive materials are harmful to people, animals and the environment because they give off radiation that can damage living cells. The amount of damage that radiation can cause depends on:

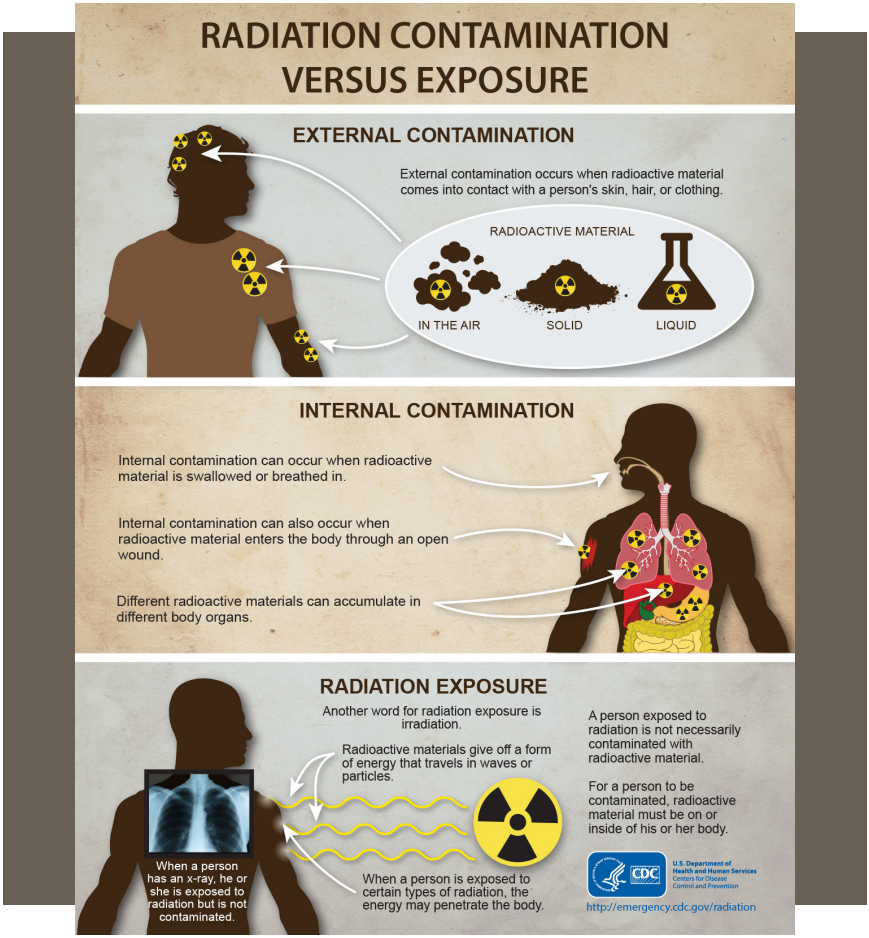
- The type(s) of radiation present;
- Activity, or strength, of the radiation;
- Distance to the radioactive material;
- How long the radioactive materials are in, on, or near the body; and
- Overall health of the individual absorbing the dose.

How can I be exposed to radiation from a power plant release?

When discussing radiological emergencies at nuclear power plants, the public's main safety concerns are contamination and exposure. Both can occur if radioactive materials are released during a radiological emergency.

Contamination: Radioactive contamination is the presence of radioactive materials where they are not wanted. Contamination occurs when radioactive materials (e.g., dusts) are deposited on or in an object or person. External contamination occurs when radioactive material or particles comes into contact with a person's skin, hair or clothing. People can also become internally contaminated if radioactive materials get into their bodies by swallowing or breathing in radioactive materials. Once contaminated, you will continue to receive a radiation dose, be exposed to radiation, until the contamination is removed.

Exposure: Radioactive materials give off radiation, a form of energy that travels in waves or particles. This energy can penetrate the body. Exposure occurs when an induvial is close enough to the radioactive materials for the body to absorb that energy. Exposure stops when the individual is no longer in the presence of the radioactive material. This can be achieved by shielding (i.e. shelter-in-place) or increasing the distance from the radioactive material (i.e. evacuation). Guidelines that are issued following a radiological emergency are designed to keep the public's radiation exposure to "As Low as Reasonably Achievable" (ALARA).



How can I limit or minimize my exposure to radiation from a power plant release?

You can limit and minimize your exposure to radiation by following the guidance of local and state public safety officials after a radiological emergency is declared. If you live within 50 miles of a nuclear power plant, you may be asked to evacuate or shelter-in-place in an emergency. Removing contaminated clothing and washing off any radioactive materials will minimize exposure from external contamination. Avoid eating contaminated foods to prevent internal contamination.

I think I have been externally contaminated. What should I do?

- Remove the outer layer of clothing and place in a plastic bag before moving to a non-contaminated area.
- Shower or wash the exposed areas with soap and warm water. Do not use hair conditioner. Do not scour.
- Do not eat, drink, smoke, chew or vape until you have washed your hands and face.

If you think you have been internally contaminated, seek evaluation by a medical professional.

Are there any health risks expected from exposure to released radioactive materials?

There are two types of radiation exposure: **acute** and **chronic**.

To have an immediate, noticeable health effect from radiation, an individual must receive a very large dose of radiation in a short amount of time, known as an acute exposure. Acute exposures are not likely to occur as a result of a radiological emergency at a nuclear power plant. Residents living near the plant may be evacuated or be told to shelter in place in order to prevent anyone from being over-exposed to radiation by any actual or potential releases.

Chronic effects of radiation exposure include an increased risk of developing cancer. Any exposure to radiation can increase this risk; as the exposure gets larger, the risk for developing cancer later in life increases. Adhering to the guidelines and protective actions (evacuation, taking potassium iodide (KI), avoiding fresh produce, etc.) that are put in place by public safety officials following a radiological emergency should minimize your exposure to radiation and, therefore, minimize the increased risk of developing cancer.

MINIMIZING EXPOSURE TO THE PUBLIC

During a General Emergency, citizens living within a 50-mile radius of the affected power plant will be given specific instructions from local or state officials to shelter in place, evacuate or relocate to an area that will keep them safe from harmful radiation exposure. Disregarding a shelter-in-place, evacuation and/or relocation notice has the potential to put you in unnecessary danger. Please follow the guidelines issued by state and local officials in the event of a radiological emergency.

Shelter-in-Place

A shelter-in-place order is a protection strategy that involves the action of staying or going indoors immediately. Doors, windows and HVAC systems should be closed and/or shut off. Shelter-in-place orders are used when the risks and feasibility of an evacuation outweigh the risks of the anticipated radiation dose.

Evacuation

An evacuation is a protection strategy that moves citizens away from an actual or potential hazard and involves a sense of urgency to protect the lives and health of those in the area. Evacuation orders will be issued with specific directions to assure a safe and orderly evacuation.

Relocation

Relocation is when citizens need to be moved out of an area for a length of time in order to avoid chronic radiation exposure. While this process allows for more packing and preparation time than evacuation, following the instructions of public safety officials is important.

Would I need to take potassium iodide (KI)?

Only those people directed to evacuate would be told to take KI as they are the most likely to be exposed to radioiodine that is in the air. Radioiodine released from the plant would likely be in the atmosphere for a short time, then deposited to the ground and other surfaces. Persons in other areas would have little risk of breathing in the radioiodine and would not need to take KI. Avoiding foods grown in the contaminated area would prevent exposure to radioactive iodine deposited on the ground.

How can food or water become contaminated?

Food and water become contaminated when radioactive particles or materials come into direct contact with the food or water (remember that contamination is radioactive materials being in a place where it is not wanted). For plants and animals, the contamination can be on the surface, taken up by the plant or animal, or both. People may be affected by eating contaminated food.

If a plant or animal is contaminated, will it die?

Not necessarily. Livings things tolerate radiation differently. In most cases, humans are more susceptible to radiation than plants and animals; meaning plants and animals can absorb a higher dose of radiation than humans before becoming ill. It is important to remember that despite any potential or implied radiation resilience, plants and animals may be unsafe to eat if they become contaminated with radioactive materials. Local and state field teams will be dispatched to measure and map contamination levels following a radiological emergency.

PROTECTING THE PUBLIC

How would I receive information about the incident?

As with other emergencies, news media outlets and the Emergency Alert System (EAS) will be your most reliable and up-to-date sources of information regarding the incident. When watching television, listening to the radio or reading the newspapers during a disaster, make sure you are taking advice from official sources, who should be quoted and giving out information that is easy to understand. If you are ever uncertain about the information given, or if you hear conflicting advice, contact your local emergency management office. In an emergency, a public hotline would be made available to those with questions or concerns.

How would I know what areas are contaminated?

During and after the release of radioactive material from a nuclear power plant, the Indiana Department of Homeland Security (IDHS) and affected counties would deploy field monitoring teams to measure the amount and types of radioactive materials that have been released. Information gathered from the field monitoring teams and other sources would be used to define the contaminated area, or “footprint.” Once defined, the location and extent of contamination would be relayed to the public through media outlets. It’s important to note that only areas of significant contamination will be evacuated. Lesser contaminated areas will remain occupied.

What precautions would be taken to prevent contamination of the food supply?

When power plant operators and the State of Indiana believe that a radioactive release could occur, farmers downwind of the power plant would be instructed by state and local officials to bring animals inside, if possible. Farmers would also be advised not to allow animals to graze, eat uncovered feed or drink water from uncovered sources. This is especially important for dairy animals because radioactive iodine, one of the contaminants which might be released from the nuclear plant, can concentrate in milk. IDHS has a separate Farm and Agriculture booklet that contains information regarding actions to be taken by those industries.

In addition, an agricultural embargo may be established in the areas of potential contamination, restricting the movement of any food products and livestock in those areas and keeping them from entering into the marketplace. State officials would lift this embargo after levels of contamination are deemed safe.

Finally, once the release begins, traffic would be diverted to prevent the transportation of food products through areas where it may become contaminated.

If radiation was released from the plant before the message to bring animals inside was broadcast, or if the farmers did not have time to take all the precautions advised, the animals could become contaminated. Food products from these animals would be tested before they were marketed.

Would all food supplies be tested immediately?

As soon as the state has identified areas with radioactive contamination, a plan for testing the food would be developed. The first product tested would be milk, as radioiodine concentrates in milk. Children are the primary consumers of milk, and radioactive iodine may damage a child's thyroid gland. This makes it very important to prevent or reduce exposure of the cows, goats and sheep to radioactive iodine, and to keep contaminated milk from the market. This is why farmers are advised to shelter dairy animals as early as possible during an incident. Testing of milk from farms in contaminated areas would continue until the milk is safe.

All other food supplies would be tested as close to market time as possible because radioactive materials on plants or animals might decrease or be washed away by rain. An early test might show a higher level of contamination than if the product was tested just prior to harvest or market. Alternatively, a plant or animal could absorb radioactive contamination from the soil or from its food over time. In this case, a radiological measurement taken earlier could show lower levels of contamination than one taken at harvest time.

Who decides what food is safe? How is this decision made?

The State of Indiana would make decisions on the safety of the food supply of Indiana residents. The governor would be advised by several state agencies, including the Indiana State Department of Agriculture (ISDA), Indiana State Board of Animal Health (BOAH), Indiana Department of Health (ISDH), the Indiana Department of Environmental Management (IDEM), and the Indiana Department of Homeland Security (IDHS). These agencies make recommendations based upon results obtained from laboratory testing. The federal government can also provide guidance and recommendations during an emergency by deploying the Advisory Team for Environment, Food and Health (Advisory Team or A-Team), which includes representatives from the U.S. EPA, U.S. Department of Agriculture (USDA), Food and Drug Administration (FDA) and Centers for Disease Control and Prevention (CDC). Test results would be compared to the guidance given by the federal government, including the USDA), the FDA, and the EPA. Foods with contamination higher than the guidelines would not be allowed to go to market.

Would the water supply be at risk for contamination?

Open water supplies: Any radioactive material that could be in an uncovered water supply, such as an open reservoir, would be greatly diluted by the quantity of water in the reservoir. Therefore, it is unlikely that the water would be significantly contaminated. In addition, standard water treatment will remove some of the contamination, making it even less likely that the water in your home would not be safe to drink. When possible, use alternate water sources until water can be tested.

Water samples would be collected from numerous public water supplies within the affected area, and the state would ask for federal assistance in getting test results back quickly. As an extra precaution, uncovered water storage reservoirs could be taken off-line pending sample results.

Well water: Because soil is a very good filter for contaminants, well water is unlikely to be affected. As a precaution, wells that provide water for public water supplies would be tested. Individuals may request testing of their private wells through an approved laboratory.

Information on the safety of the water supply and recommendations for limiting exposure to potentially contaminated water would be provided through media outlets.

What would happen to contaminated food, water or milk?

Depending on the type and amount of contamination, food could be considered safe and be released to market, be stored for a period of time until the contamination has decreased or be condemned and destroyed in a safe manner.

Food products with intermediate levels of contamination (which may vary according to the kind of food and the type of contamination present) could be held in storage until the radiation levels decreased to a natural level. Food could be held for the radiation to decrease if all of the following conditions are met:

- The radioactivity will decrease in a short period of time (before the food is spoiled or past its shelf life);
- There are facilities which can process or hold the contaminated product; and
- The governor approves.

If any of these conditions were not met, the product will be destroyed. The State of Indiana will release guidance on when, or if, food products need to be destroyed.

Is there a possibility that contaminated food would be mixed with uncontaminated food so it can be sold?

No. The USDA prohibits the mixing of contaminated foods with uncontaminated foods, no matter what the source of contamination.

How safe would it be to hunt or fish?

The State of Indiana would evaluate the potential for wildlife and forage to be contaminated and make appropriate recommendations. This could include restrictions on the taking of fish and game or requiring monitoring for contamination before butchering. Fish and wild game should not be harvested for consumption during a radiological emergency unless it has been cleared by state or local officials.

Migratory wildlife, including game birds, could present a problem outside of the affected area if the animal became contaminated and then moved to an unaffected area. Anyone who suspected that hunted wildlife migrated from a contaminated area would be instructed to contact the Department of Natural Resources or call the public inquiry hotline.

Would the food in my house be safe to eat?

If you live in an area where there was no contamination found, the food in your house would not have any contamination, either. If you live in an area where there was some contamination, food packaged in airtight containers such as cans or sealed plastic bags, and food in the refrigerator or freezer, would be uncontaminated.

If radiological contamination was found in your home, you would be given advice or assistance about how to remove the contamination. Washing the surface of the package or the exterior of the refrigerator with soapy water usually removes contamination.

If an area has radioactive contamination that can affect the food supply, why is it considered safe for children and pets to live there?

Radioactive material inside the body is much more dangerous than radioactive material outside the body. Therefore, an area may be safe to live in even though it is not safe to eat food from that location.

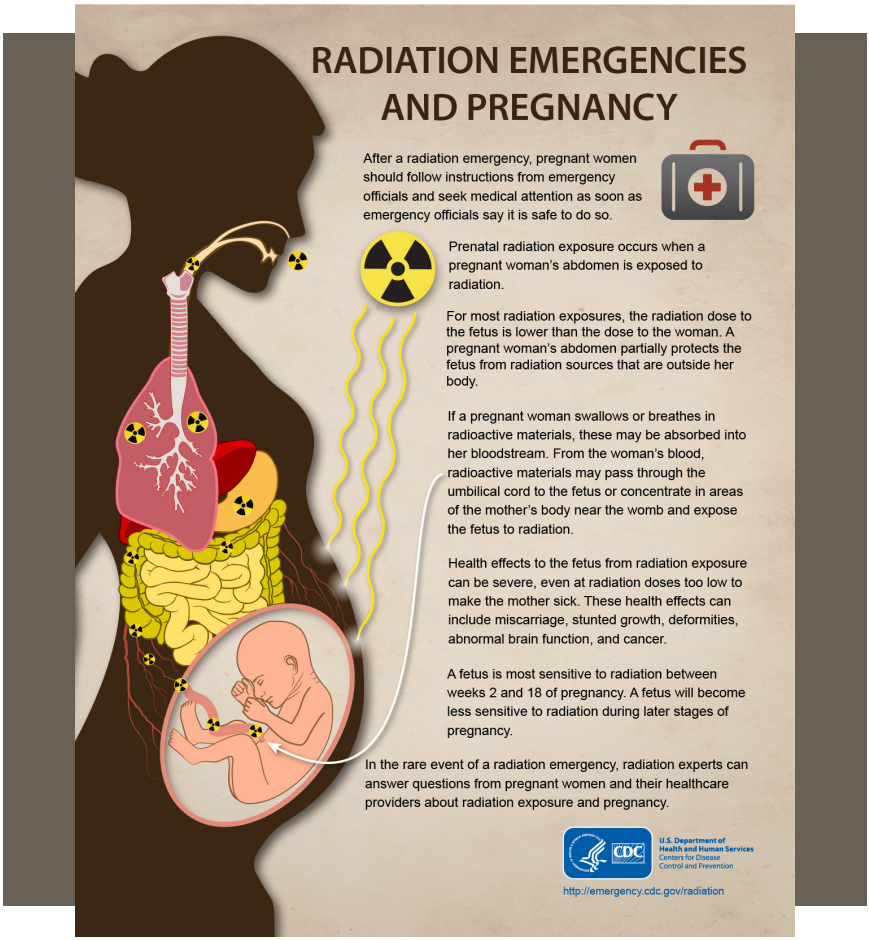
Is there anything I could do to further decrease contamination in my home?

Remember that contamination is radioactive dust and, in most cases, can be removed by washing with soap and water. To reduce potential exposure, you could take the following steps inside your home:

- Throw away food open to the environment, such as a bowl of fruit on a countertop. There is no need to throw away food that was kept in a closed refrigerator or was in a closed container. Still, if you are concerned about it, throw it away.
- Use wet methods to wipe things whenever possible. Use a damp rag or mop to clean surfaces. Dispose of cleaning materials in the regular trash.
- Do not use a vacuum cleaner until after you have done a wet wash.
- Do not eat, drink, smoke, chew or vape while you are cleaning up.
- Wear disposable gloves and use good hygiene. Wash hands after cleaning up.
- Start your cleanup work in the cleanest part of the work area (e.g., center of room) and work toward the dirtiest area (e.g., near an open window) to avoid spreading contamination.
- Dispose of used wash water down the toilet. Do not pour it on soil.
- Shower and wash your hair right after finishing.
- Be careful of your shoes tracking radioactive materials. Wipe your feet before entering a clean area.
- Limit pets' time outside. Wash with warm, soapy water to remove contamination. Wipe pets' feet when they enter the house.

Should pregnant women take special precautions?

Actions recommended to the public would also protect fetuses. In some instances, homes in which pregnant women reside would receive higher priority for radiological monitoring. Pregnant women should inform their health care providers of the results of any radiological monitoring and refer all of their health questions and concerns to their health care provider.



What about lawn furniture, swing sets and/or swimming pools?

Depending on the area in which you live, the amount and type of radioactive contamination to your area, and materials (wood, metal, plastic) that could be contaminated, you could be advised to:

- Use your yard as you usually do.
- Leave everything alone for a short period of time (a few weeks to a month or two) to allow the weather to remove contamination.
- Scrub down surfaces with water and soap or other special products or dispose of your belongings.
- Empty pools or sandboxes.

For the safety of you, your family and your community, please follow the guidance of your local and state officials after a radiological emergency.

COUNTY EMERGENCY MANAGEMENT AGENCIES IN THE INGESTION PATHWAY ZONE

Elkhart County Emergency Management
26861 County Rd. 26
Elkhart, IN 46517
(574) 891-2238
https://emergencymanagement.elkhartcounty.com/en/

Jasper County Emergency Management
125 S. Cullen St.
Rensselaer, IN 47978
(219) 866-9423
https://www.jaspercountyin.gov/departments/emergency-management

Kosciusko County Emergency Management
121 N. Lake St.
Warsaw, IN 46580
(574) 371-2602
https://www.kosciusko.in.gov/department/index.php?structureid=11

LaGrange County Emergency Management
105 N. High St.
LaGrange, IN 46761
(260) 499-6431
https://www.lagrangecounty.org/department/index.php?structureid=18

Lake County Emergency Management & Homeland Security
2900 W. 93rd Ave.
Crown Point, IN 46307
(219) 755-3549
https://lakecountyin.gov/departments/emergency-mgmt

LaPorte County Emergency Management of Homeland Security
809 State St.
LaPorte, IN 46350
(219) 362-7210
https://laporteco.in.gov/departments-online/emergency-management-of-homeland-security/

Marshall County Emergency Management
112 W. Jefferson St., Room 207
Plymouth, IN 46563
(574) 936-3740
https://www.co.marshall.in.us/department/index.php?structureid=18

Newton County Emergency Management
3218 W. County Rd. 100 N.
Morocco, IN 47963
(219) 285-0844 x 5300
https://www.newtoncounty.in.gov/department/index.php?structureid=29

Porter County Emergency Management
1995 S. State Rd. 2
Valparaiso, IN 46385
(219) 462-8654
https://www.portercountyin.gov/174/Emergency-Management

St. Joseph County Emergency Management
125 S. Lafayette Blvd., 1st Floor
South Bend, IN 46601
(574) 800-6252
https://www.sjcindiana.gov/1933/Emergency-Management-EMA

Starke County Emergency Management
53 E. Mound St.
Knox, IN 46534
(219) 205-2057
https://starke.in.gov/homepage/departments/ema/

FREQUENTLY ASKED QUESTIONS

What is the difference between radiation contamination and radiation exposure?

Radiation contamination is when an object or person has radioactive particles on or inside his/her body. An object or person's body can be decontaminated by removing all clothing and washing with soap and water. **Radiation exposure** is when a person's body absorbs radiation. Exposure stops when a person leaves the area of the radiation source.

How can exposure to radiation be minimized?

An individual can reduce his/her exposure to radiation by spending less time around radiation sources, keeping a greater distance away from radiation sources and providing better shielding from a radiation source, such as a concrete structure.

Can a nuclear power plant explode like a nuclear weapon?

No, it cannot. A nuclear power plant's reactor is designed and configured differently from a nuclear weapon. Unlike a nuclear weapon, the amount of radiation energy created in a nuclear reactor is controlled and maintained through the use of reactor control rods.

Is radiation exposure from a nuclear power plant always fatal?

No, it is not necessarily fatal. During normal power plant operations, the routine radiation emission amount is never enough to be lethal. If a General Emergency incident were to occur, it is highly unlikely that individuals living within the 50-mile Ingestion Pathway Zone will be within the area long enough for the exposure to be lethal.

ADDITIONAL RESOURCES

To learn more about the Indiana Department of Homeland Security's Radiological Emergency Preparedness program, visit: https://on.in.gov/idhs-rep-program

To learn more about nuclear power plants and their safety guidelines, visit the U.S. Nuclear Regulatory Commission's website: https://www.nrc.gov

For more information on radiation emergency preparedness, visit the Centers for Disease Control and Prevention's website: https://emergency.cdc.gov/radiation/

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