

## EXPOSURE vs CONTAMINATION

**EXPOSURE** could be compared to the radioactive material being close to you.

**CONTAMINATION** is when that material has come in direct contact with you

Radiation can harm you by Ingestion, Inhalation, Injection or Direct Contact by absorption through wounds.

## How Do I Reduce My Exposure

**Minimize time** - Limiting the time spent near the source of radiation reduces the amount of radiation exposure you will receive.

**Maximize distance** - The more distance between you and the source of the radiation, the less radiation you will receive.

**Use shielding** - Place the most heavy, dense materials available between you and the source of the radiation.

## WHAT PEOPLE SHOULD DO FOLLOWING AN EXPLOSION

First and probably most importantly

### STAY CALM

Losing your head could cost you your LIFE  
Move away from the immediate area at least several blocks from the explosion--and go inside. This will reduce the exposure to any radioactive airborne dust. Do not eat, drink or smoke until after you have been decontaminated.

Turn on local radio or TV channels for advisories from emergency response and health authorities. Remember they are trying to take control of the situation. It may be a few minutes before they know exactly what's

happening and are setup and ready for you. If facilities are available, wipe off your face and wash your hands first, being very careful not to ingest or inhale any contaminated particles. Remove your clothes and place them in a sealed plastic bag and put them in another room. Saving contaminated clothing will allow testing for radiation exposure.

Take a shower to wash off dust and dirt. This will reduce total radiation exposure if there was an explosive device, transportation or industrial accident and it released radioactive material.

If in fact a radioactive material was released, local news broadcasts will advise people where to report for radiation monitoring and blood and other tests to determine whether they were in fact exposed and what steps to take to protect their health.

Remember that this brochure cannot provide all the information that you need. Please continue to research this hazard and prepare yourself appropriately.

### Information Resources

Department of Energy: [www.energy.gov/](http://www.energy.gov/);  
tel 202-586-4940.

Environmental Protection Agency: [www.epa.gov/](http://www.epa.gov/);  
tel 202-564-9828.

Nuclear Regulatory Commission: [www.nrc.gov/](http://www.nrc.gov/);  
tel 301-415-8200.

Federal Emergency Management Agency:  
[www.fema.gov/](http://www.fema.gov/); tel 202-646-4600.

Department of Health and Human Services:  
[www.hhs.gov/](http://www.hhs.gov/); tel 202-690-6343.

Department of Homeland Security: [www.dhs.gov/](http://www.dhs.gov/);  
tel 202-282-8010.

National Nuclear Security Administration:  
[www.nnsa.doe.gov/](http://www.nnsa.doe.gov/); tel 202-586-7371

# RADIATION

## INFORMATION TO HELP YOU IN THE EVENT OF A RADIOLOGICAL INCIDENT

### *A Guide for your SAFETY*



**Have you prepared your family to be self-sufficient for at least 72 hours?**

**Provided by:**

**Henry County Office of  
Emergency Management/  
Department of Homeland Security**  
216 South 12<sup>th</sup> Street  
New Castle, IN 47362  
(765) 521-0582

## “RADIATION” WHAT IS IT AND WHERE DOES IT COME FROM

Radiation is all around us. It comes from the Sun, the Earth and even human beings. Radiation is another one of those things that we could not live without, but when we receive too much too quick it can cause us harm. Radiation comes from two sources, natural and manmade

### MEASURING RADIATION

REM (Roentgen Equivalent Man) measures the biological damage of radiation. It takes into account both the amount, or dose, of radiation and the biological effect of the type of radiation in question. Written as: Microrem ( $\mu\text{rem}$ ), millirem (mrem), or rem

1,000,000  $\mu\text{rem}$  = 1,000 mrem = 1 rem

### Are there any legal limits for radiation exposure?

An 18 year old adult male can be exposed to 5 REM a year, and a pregnant woman can be exposed to 500 millirem (mrem) during pregnancy. As per the US Environmental Protection Agency

<http://www.epa.gov/radiation/rert/radfacts.htm>

### NATURAL SOURCES

An example of a natural source is the energy that the Sun emits. It bombards the earth with Non-Ionizing radiation everyday of the year. This radiation warms us and makes it possible for our food to grow. Other sources include the Earth's Crust such as; Ground, rocks, soil, and sand, natural radioactive elements of radium, uranium, thorium, and potassium.

NATURAL BACKGROUND	mrem/year
Cosmic Radiation	26
Terrestrial (Earth's crust)	28
Internal Sources (body)	40
Radon	200
Round trip cross-country airplane flight	5

### MANMADE SOURCES

Ionizing radiation lets us do many things that are impossible without it, such as identifying broken bones and healing tumors in the human body, checking for flaws in jet engines, and testing the thickness of eggshells. Life for many of us would be more difficult if we were to suddenly stop creating and using radiation.

MAN-MADE SOURCES	mrem/year
Smoking (Tobacco Products)	1300
Medical X-rays	40
Medical Diagnosis and Therapy	14
Building Materials	7
Domestic Water Supply	5

### TYPES OF RADIATION

#### ALPHA $\alpha$

RANGE: 1 to 2 inches

SHIELDING: paper or cloth or dead layer of skin

Biological hazard: not an external radiation hazard, easily stopped by the dead layer of skin. Internal hazard – if material is inside the body, then the alpha radiation reaches live cells.

Sources: uranium (nuclear power plant fuel and nuclear weapons), plutonium (nuclear weapons), americium (smoke detectors), thorium (high-temperature metals)

#### BETA $\beta$

RANGE: up to about 10 feet

SHIELDING: thick clothing or 1/4 inch aluminum or 1/4 inch plastic  
"...DO NOT USE LEAD."

Biological hazard: external hazard to skin and eyes. Internal hazard if the material that emits the beta radiation is inside the body. Then beta radiation can deposit energy in a small area of

body tissue.

Sources: used nuclear reactor fuel, nuclear weapons fallout (strontium), some industrial radioactive sources such as cesium, tritium in glow-in-the-dark exit signs, watch dials, and night-sights on firearms, radioactive nickel in chemical agent detectors

#### GAMMA RAYS/X-RAYS $\gamma$

RANGE: Hundreds of feet

SHIELDING: 1 inch of lead or 3 inches of steel or 6 inches concrete or 1 foot of dirt

Biological hazard, gamma rays and x-rays easily penetrate body tissues, outside or inside of the body. Whole body (internal and external) hazard

Sources: autunite, uranium, plutonium, radioactive cobalt, and cesium, industrial radiation sources, medical sources, cancer treatment machines, many beta-emitters also emit gamma, radiation, potassium in soil, bananas, and potassium chloride (salt substitute)

#### NEUTRON

RANGE: Hundreds of feet

SHIELDING: 10 Inches of Plastic or 1 foot of Concrete or 3 feet of Dirt or 3 feet of Water

Biological Hazard: Whole body hazard (external and internal neutrons are a whole body hazard). Neutrons penetrate body tissues. Neutrons cause damage whether the material is inside or outside of the body.

Sources: Nuclear reactions inside nuclear reactor while reactor is operating. Burst of radiation from exploding nuclear weapon., industrial sources, moisture gauges with californium or mixture of americium and beryllium