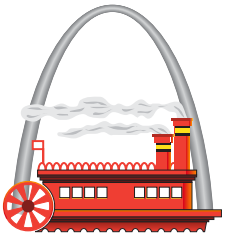
U.S. Army Corps of Engineers
St. Louis District

St. Louis Sites Fact Sheet

RADIATION BASICS



"Gateway to Excellence"

The United States Army Corps of Engineers (USACE), St. Louis District, is conducting a radiological cleanup program for four Missouri sites (SLDS, SLAPS, SLAPS VPs, HISS). These sites contain soils contaminated with radium, thorium, and uranium as a result of activities associated with the Manhattan Engineer District/Atomic Energy Commission during the nation's early atomic program in the 1940s and 50s.

Radiation is energy that travels in the form of waves or particles. Radioactivity is the property of some atoms to spontaneously give off energy. The atoms that make up the radioactive materials are the source of radiation. Ionizing radiation can be found in everything in nature in trace amounts—including people—but in high enough concentrations, it can cause chemical and/or physical changes in human tissue. While it is true that radiation can cause biological damage, it is important to keep the risks in perspective. We cannot eliminate radiation from our environment, but we can reduce our risks by controlling exposure.

The Corps of Engineers encourages private citizens to participate fully in the cleanup program.

To learn more about FUSRAP or to inquire about public involvement opportunities, contact the FUSRAP Project Office at (314) 260-3924 or write to the St. Louis District, Corps of Engineers, FUSRAP Project Office, 8945 Latty Avenue, Berkeley, Missouri 63134

WHAT IS RADIATION?

Radiation is energy that travels in the form of waves or particles. Radiation is everywhere - in, around, and above the world we live in. Depending on how much energy it has, radiation is described as either non-ionizing (low energy) or ionizing (high energy). Non-ionizing radiation includes the sun and various electronic devices. Ionizing radiation can be found in everything in nature in trace amounts — including people. Every element such as carbon and potassium, as well as uranium and thorium has a radioactive form. Although ionizing radiation is all around us, in high enough concentrations it can present a health hazard if it is not properly controlled.

WHAT EFFECTS CAN RADIATION HAVE?

Because it can knock electrons from the atoms and molecules in its path, ionizing radiation can cause chemical and/or physical changes in human tissue. The effect of radiation on the body depends on how long the exposure was, how much energy was absorbed, and the type and number of cells that were affected. Most of the time, the cells can repair any damage themselves; however, sometimes they cannot. While there are billions of cells in the body, if enough are damaged, there is a risk of adverse health effects.

IS ALL IONIZING RADIATION THE SAME?

Ionizing radiation may be one of three types (alpha, beta, or gamma). Alpha particles can travel approximately one to two inches in air and can be blocked by a sheet of paper. Beta particles can travel 6-10 feet in air but can be blocked by a few millimeters of substance (i.e. clothing, glass, plastic, aluminum). Gamma particles can travel the farthest but may be stopped with lead or concrete.

WHAT IS DOSE? HOW IS RADIATION MEASURED?

The dose is the quantity of radiation or energy received. A basic unit for measuring the amount of energy absorbed from radiation received is the *rad*. To show biological risk and the probability of harmful effect, rads are converted to *rems*. The rem reflects tissue dose and takes into account the type of radiation absorbed into the body and the likelihood of damage. Because exposure to radiation normally occurs in fractions of a rem, the commonly used unit of exposure is the *millirem (mrem)*. One rem equals one thousand millirem.

It is important to understand doses are averages that span a rather large range of values. For example, individual doses due to radon average about 200 millirem per year per person in the U.S. The actual dose can vary widely, depending on where you live/work.

WHAT ARE THE SOURCES OF EXPOSURE TO RADIATION?

While it is true that radiation can cause biological damage, it is important to keep risks in perspective. Each year, we receive about a 300 millirem dose of radiation from natural sources. Natural sources include rocks and soil, which contain naturally occurring radioactive isotopes such as radon, thorium, uranium and radium, or from cosmic sources such as the sun and other sources in space. The average American receives an additional 60 millirem per year from human activities, mostly medical sources (such as x-rays). Thus, in the United States, the average person receives a dose of about 360 millirem per year from all sources.

WHAT IS THE DIFFERENCE BETWEEN RADIATION AND RADIOACTIVITY?

Radiation is the energy or particles that are released during radioactive decay. The radioactivity of a material refers to the rate at which it emits radiation.

Each decay throws off particles and energy and is referred to as a "disintegration". The number of disintegrations per second, or per minute is the *activity* of a sample. Activity is expressed in Curies. *One Curie equals 2.2 trillion disintegrations per minute*. At the FUSRAP St. Louis Sites, activity is commonly expressed in picocuries (pCi), which is one 1 trillionth of a Curie. In comparison, one picocurie is 22 disintegrations per minute.

HOW ARE PEOPLE EXPOSED TO RADIATION AND HOW CAN THEY PROTECT THEMSELVES?

We can be exposed to ionizing radiation through a number of pathways. We can be exposed through inhalation, ingestion, and direct exposure. The main pathways for most people are exposure to cosmic radiation, exposure to and breathing indoor and outdoor air, exposure to radiation from rocks and soils, and through all of the foods and liquids that we eat and drink.

We can protect ourselves from direct exposure by using time, distance and shielding to limit our cumulative levels of exposure. A person is safer the farther from the source of radiation, the shorter the time of exposure, and the thicker the shielding. We cannot eliminate radiation from our environment; we can however, reduce our risks by controlling our exposure.

It may also be interesting to note, that the radiation dosage varies depending on where we live. For instance, the dose in Colorado is about 100 millirem/year more than would be present at sea level. This is due mainly to the increased altitude, which brings the person in closer proximity to the sun in a thinner atmosphere, but also due to the geology of the area.