



The Risks of Radiation: Fact or Fiction

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This fact sheet is one in a series prepared for RAB members about the Travis AFB Installation Restoration Program (IRP).

Perhaps its invisibility is what disturbs us most. Radiation is all around us and has been since the Earth began. It comes from cosmic rays, rocks and soil, even our own bodies. Naturally occurring radioactive materials were discovered in 1896. The first man-made radioactive materials were developed less than 50 years later. The horrifying effects of atomic weapons have impressed us all with radiation's power. Both natural and man-made radiation are a part of our lives.

Radioactive materials serve many useful purposes particularly in medical procedures. Radiation is naturally occurring in the earth and in rays from the sun. Nuclear testing in the atmosphere and fallout from nuclear accidents like Chernobyl have added to the environmental radiation that our bodies accept daily. The biological effect of absorbed radiation is expressed in units of "rem" or "millirem" (mrem). In the United States, a typical background level of radiation is 60 mrem/year at sea level. This fact sheet discusses the different types of radiation and its effects on our health.

From 1953 to 1962, Travis AFB handled nuclear weapons. Because radiation exposure can threaten our health and the environment, Travis has designated for investigation all locations where nuclear materials were handled, stored or transported. These include buildings, burial sites, and the site of a 1950 B-29 Bomber crash. This fact sheet may help RAB members understand the significance of any radiation above background levels that is found at these radiological sites

WHAT IS RADIATION?

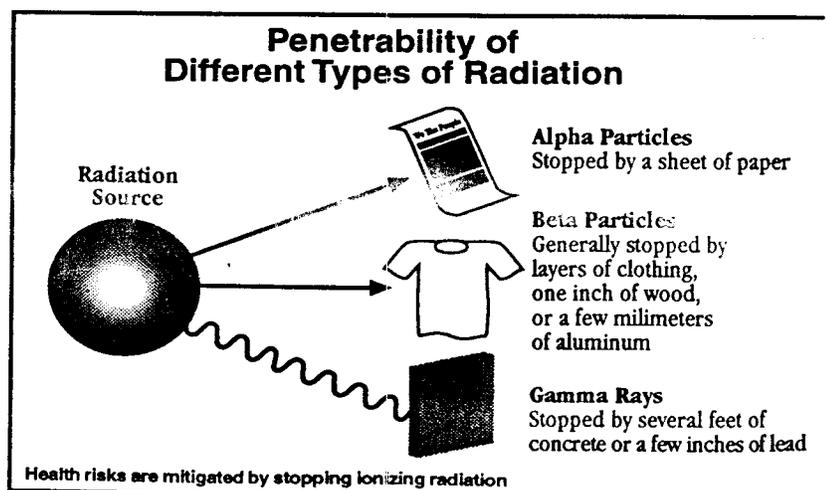
Matter is composed of atoms, some of which

are unstable. As these atoms change to become more stable, they emit invisible energy waves or particles called radiation.

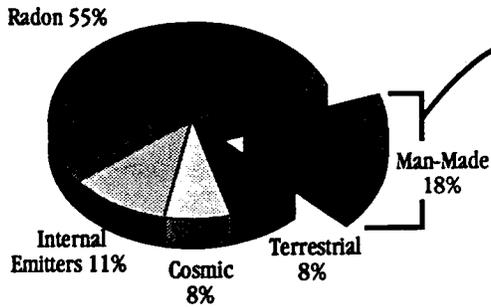
Some types of radiation are more energetic than others. Materials that are radioactive emit ionizing radiation, which can cause cellular damage.

WHAT AFFECTS OUR HEALTH THE MOST?

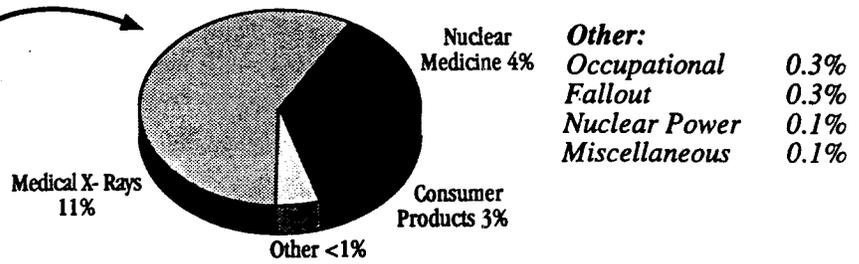
Three types of ionizing radiation are of primary concern: *alpha particles*, which are the largest particle form; *beta particles*, which are electrons and smaller than alpha particles; and *gamma rays*, which are similar to x-rays. Each type of ionizing radiation presents different health risks. Alpha particles can travel only a few inches through the air. Radionuclides that emit alpha particles, such as radon gas and its decay products, are hazardous if inhaled. Both alpha and beta particles are easily shielded and therefore pose little risk of external exposure. Gamma rays, which many people are routinely exposed to in their doctor's office, easily penetrate the human body and could cause cellular damage, even when not inhaled or ingested.



Natural Radiation Sources



Man-Made Radiation Sources



HOW ARE WE EXPOSED?

Exposure to radiation, natural or man-made, is inevitable. About 80 percent of our exposure to ionizing radiation comes from natural sources, including radioactive elements found in the earth's crust (uranium, thorium, and potassium), and radon, a radioactive gas released during the decay of thorium and uranium in rock and soil. Radon accounts for about 55 percent of our total exposure to naturally occurring radiation. Our own bodies, which contain the radioactive element potassium, account for 11 percent of our total exposure. The remaining 20 percent comes from man-made sources such as hospitals, medical procedures (primarily x-rays), and consumer products. Less than 1 percent comes from research institutions, nuclear reactors, manufacturing processes, and facilities involved in nuclear weapons production.

Radioactive materials can remain radioactive from fractions of a second to billions of years. Radionuclides decay at different rates. For example, for one-half of the radioactivity in plutonium -239 and uranium -238 to decay or disappear takes 24 thousand years and 4.5 billion years, respectively. The composition of naturally occurring uranium is mostly (more than 99%) U-238, with less than 1% of uranium -235 (U-235). To make weapons or reactor-grade uranium, physicists increase the

amount of U-235. This is what is meant by "enriched uranium." (The leftover is called "depleted uranium.") There are many radioactive isotopes. The contaminants of concern at Travis AFB are predominantly uranium and plutonium.

HOW DOES EXPOSURE AFFECT HEALTH?

Any exposure to radiation poses some risk. Much of what we know about the effects of radiation has been learned from studies of the survivors of the atomic bombs used in Japan during the Second World War.

Current evidence suggests that for the entire dose of radiation that we accumulate over a lifetime from natural radiation, the risk of developing cancer is about one in one hundred. In other words, one person out of a hundred could develop cancer from naturally occurring radiation. Based on these estimates, several percent of all fatal cancers in the United States may be attributable to natural radiation.

FILL IN THE BLANKS — COMPUTE YOUR EXPOSURE LEVEL

Each of us is exposed to between 100 to 360 mrem of radiation per year. To get an idea of how much radiation you are exposed to every year, fill in the blanks below.

| | | | |
|---|-----|---|-------|
| <i>Cosmic Radiation</i> | 31 | <i>1 mrem for every</i> | |
| <i>Natural radioactivity in your body</i> | 39 | <i>1500-mile flight</i> | _____ |
| <i>Location (and add 1 mrem for every 100 feet above sea level)</i> | 25 | <i>210 mrem for intestinal x-rays during year</i> | _____ |
| <i>Type of dwelling: Brick</i> | 45 | <i>30 mrem for mammogram during year</i> | _____ |
| <i>Stone</i> | 50 | <i>Live within 5 miles of a nuclear plant, add 1 mrem</i> | _____ |
| <i>Wood</i> | 35 | <i>Total</i> | _____ |
| <i>Nuclear weapons fallout</i> | 4 | | |
| <i>Average radon</i> | 200 | | |