



UNIVERSITY OF CALIFORNIA, SAN DIEGO  
HUMAN RESEARCH PROTECTIONS PROGRAM

**FACT SHEET**

**Lay language equivalents for radiation doses**

The principle of informed consent for participation in research requires that study subjects have a reasonable understanding of the risks and benefits associated with being in the study. Understanding the risks of radiation exposure is particularly difficult, because the units of radiation dose used in biomedical research are unfamiliar to most lay persons (and many healthcare professionals also!). This fact sheet contains dose equivalents for common medical procedures, and comparisons with radiation exposure from natural sources. These data are abstracted from dosimetry information published by the National Radiological Protection Board (NRPB). Absorbed radiation doses are expressed in Gray units, while effective radiation dose is generally expressed in Sievert units. Natural background radiation from all sources at sea level is about 1 milli-Sievert (mSv) per year.

Activity	Effective dose (mSv)
Round trip airline flight from Los Angeles to Boston	0.05
Round trip airline flight from New York to Tokyo	0.20
One year's residence in Denver, CO	1.88

One Sievert is a large radiation exposure. A sudden exposure to one Sievert would produce observable symptoms such as hair loss, nausea, and lowered white blood cell counts. Radiation doses below 0.1 to 0.5 Sievert (100 to 500 mSv) do not produce immediate observable effects, but increase cancer risk and risk of genetic damage. NRPB has published equivalent risk tables that compare the increased risk of dying due to cancer caused by an additional 1 mSv of radiation, to the additional risk of dying from other common activities.

Procedure	Effective dose (mSv)
Chest x-ray	0.04
Abdominal x-ray	1.5
Lumbar spine x-ray	2.4
Intravenous Pyelography	4.6
Abdominal CT scan	7.2
Chest CT scan	8.3
Brain CT scan	1.8
Technetium-99m bone scan	3.6
Technetium-99m lung scan	1.0
Iodine-123 thyroid scan	4.4

Risks equivalent to 1 additional mSv of radiation
Smoking 75 cigarettes
Drinking 1 glass of wine daily for 6 months
Traveling 125 miles by motorcycle
Traveling 2500 miles by car
Rock climbing for 75 minutes
Canoeing for 5 hours

For purposes of informed consent, these doses can be compared to exposures from background radiation (primarily cosmic rays)

Since the translation of excess risk is a difficult concept to communicate, and even more difficult when the activities being described are not related to one another (such as a medical x-ray being compared to canoeing) in most cases the use of the radiation exposure analogies would be preferred. For example, "the radiation from one chest x-ray is equivalent to the extra radiation received on a round trip airline trip between Boston and Los Angeles."