

# FACTS ABOUT RADIATION EXPOSURE

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## How much is too much?

Every day we are exposed to naturally occurring radiation from the sun and the earth. Interestingly, most man-made background radiation comes from coal-fired power plants. Everyone on earth is exposed to a total of about .003 rems per year of background radiation.

Exposure standards have been established by the Nuclear Regulatory Commission (NRC), and set at a level where apparent injury due to ionizing radiation during a normal lifetime is unlikely. This limit is called the "maximum permissible exposure". However, people should not completely disregard exposures at or below these limits. Individuals should keep their exposure to all radiation as low as is reasonable, and to avoid all exposures to radiation when such exposures are unnecessary.

The exposure limit for whole body exposures is lower than that for a single organ because all organs and tissues are exposed in a whole body exposure, while only a single organ is involved in the single organ exposure limits. Maximum permissible exposure limits to radiation for adults, minors and radiation workers are in the table below.

Part of Body	Radiation Workers Yearly	Minors Yearly (< 18 yrs. age)	Adult Yearly
Whole Body, Head and Trunk, Active Blood Forming Organs	5 rem	0.5 rem	0.5 rem
Lens of Eye	15 rem	1.5 rem	1.5 rem
Extremities (Elbows, Forearms, Hands, Knees, Lower Legs, Feet)	50 rem	5 rem	5 rem
Single Organ Dose	50 rem	5 rem	5 rem
Skin of Whole Body	50 rem	5 rem	5 rem

## How much does an X-ray exam contribute to your yearly dosage of radiation exposure?

Below are charts showing average exposure rates for a variety of imaging procedures that use radiation.

Exam	Dose
Chest (AP & LAT)	0.006 rem
Mammogram (four views)	0.07 rem
Dental (lateral—1 view)	0.002 rem
Hand or Foot (3 Views)	0.0015 rem
Abdomen	0.12 rem
Barium Swallow (24 images, 106 sec. fluoroscopy)	0.150 rem
CT Head	0.2 rem
CT Chest	0.8 rem
CT Abdomen	1.0 rem

Nuclear Medicine Scan	Radiopharmaceutical (common trade name)	Dose
Brain (PET)	<sup>15</sup> O water	0.1rem
Bone	<sup>99m</sup> Tc MDP	0.420 rem
Heart (stress)	<sup>99m</sup> Tc sestimibi (Cardiolite)	0.585 rem
Various PET studies	<sup>18</sup> F FDG	1.4 rem

## FACTS ABOUT RADIATION EXPOSURE (Continued)

The more a body is exposed to radiation, the greater potential there is for harm to the body. The NRC has put the maximum permissible dose levels far below the point at which radiation is likely to harm the body. It would be extremely difficult to reach dangerous dose levels from diagnostic medical radiation because it would take many exams within a very short period of time.

The dose levels at which harmful changes within the body can be measured are as follows:

Effect	Dose (whole body)
Blood Count Changes	50 rem
Vomiting (threshold)	100 rem
Mortality (threshold)	150 rem
Lethal Dose (with minimal supportive care)	320-360 rem
Lethal Dose (with supportive medical treatment)	480-540 rem
100% mortality (with best available treatment)	800 rem

## What are the benefits vs. risks?

A recent report from the National Academy of Sciences concludes that low-doses of radiation from medical and dental X-rays, natural and other manmade sources pose some risk for cancer but that risk is small and shouldn't keep people from seeking care. "It is unlikely that there is a threshold below which cancers are not induced, but at low doses the number of radiation-induced cancers will be small," said the panel, adding that more research is needed in medical and occupational radiation.

## Benefits

- No radiation remains in a patient's body after an x-ray examination.
- X-rays usually have no side effects in the diagnostic range.
- X-ray equipment is relatively inexpensive and widely available in emergency rooms, physician offices, ambulatory care centers, nursing homes and other locations, making it convenient for both patients and physicians.
- Because x-ray imaging is fast and easy, it is particularly useful in emergency diagnosis and treatment.

## Risks

- There is always a slight chance of cancer from excessive exposure to radiation. However, **the benefit of an accurate diagnosis far outweighs the risk.**
- Radiographers are trained to take special care during x-ray examinations to use the lowest radiation dose possible while producing the best images for evaluation. The ERMC Radiology Department Radiographers are trained and adhere to the ALARA Principle. That is, to keep radiation exposure "As Low As Reasonably Achievable".
- ERMC has state-of-the-art x-ray systems with tightly controlled x-ray beams with significant filtration and dose control methods to minimize stray or scatter radiation. This ensures that those parts of a patient's body not being imaged receive minimal radiation exposure.

## Internet Resources

To read more about x-ray exams, go to <http://www.radiologyinfo.org/>

To read more about pregnancy and x-rays, go to <http://hps.org/publicinformation/radterms/>.

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