There are different but interrelated units for measuring radioactivity and estimating health effects.

### Radioactivity

**Radioactivity** is a measure of the ionizing radiation released by a radioactive material. Different types of ionizing radiation have the potential to damage human tissue.

**Use**

- Measuring soil, water, and air samples

**Units**

- Bq | becquerels
- Ci | curies

- 1 becquerel (Bq) = 2.703 x 10^-11 curie (Ci)
- 1 curie (Ci) = 3.7 x 10^10 becquerel (Bq)
- 1 kilobecquerel (kBq) = 1,000 Bq
- 1 picocurie (pCi) = 0.000 000 000 001 Ci

**Examples**

- Surface water natural radium-226 level: 0.0037 to 0.0185 Bq per liter (L) or 0.1 to 0.5 pCi/L
- Drinking water radium limit for daily consumption: 0.185 Bq/L or 5.0 pCi/L

### Absorbed Dose

Absorbed dose measures ionizing radiation absorbed.

**Use**

- Measuring dose from medical equipment

**Units**

- Gy | gray
- rad | rad

- 1 milligray (mGy) = 0.001 Gy
- 1 rad = 0.01 gray (Gy)
- 1 milligray (mGy) = 0.001 Gy

**Examples**

- Dose to the lens of eyes from a brain CT scan: about 60 mGy or 6 rad
- Dose to the thyroid from a chest CT scan: about 10 mGy or 1 rad

### Effective Dose

Effective dose takes the absorbed dose (see above) and adjusts it for radiation type and relative organ sensitivity. The result is an *indicator for the potential for long-term health effects* (i.e., cancer and hereditary effects) from an exposure. It is *used to set regulatory limits* that protect against long-term health effects in a population. It also allows experts to compare anticipated health effects from different exposure situations. Because this value is a calculated approximation, not a physical quantity, it cannot be used to predict individual health effects.

**Use**

- Used to set protective levels for groups of people

**Units**

- Sv | sievert
- rem | rem

- 1 sievert (Sv) = 100 rem
- 1 rem = 0.01 sievert (Sv)
- 1 millisievert (mSv) = 0.001 Sv
- 1 microsievert (µSv) = 0.000 001 Sv
- 1 millirem (mrem) = 0.001 rem

**Examples**

- Worker radiation limit annual dose limit: 0.05 Sv or 5 rem
- Evacuate/shelter in place guidance for emergencies: needed if projected dose exceeds 10-50 mSv or 1-5 rem over four days

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**EPA**

United States Environmental Protection Agency

epa.gov/radiation/radiation-terms-and-units
Reference Material

Sources for Radioactivity Unit Examples


Sources for Absorbed Dose Unit Examples


Sources for Effective Dose Unit Examples
