

Radiation Terms and Units

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

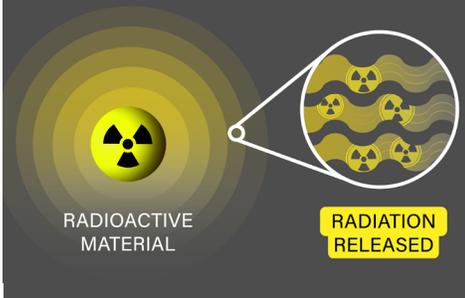
Radioactivity

Absorbed Dose

Effective Dose

Radioactivity

Radioactivity is the **release of radiation** by a material.



Radioactivity is the release of ionizing radiation when the nucleus of a radioactive atom decays. Activity refers to the frequency of radioactive decay produced by a radioactive material. Different types of ionizing radiation have the potential to damage human tissue.

Use

Measuring soil, water and air samples

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

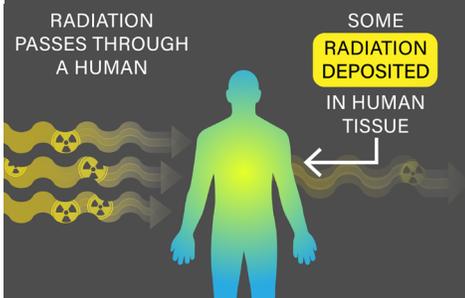


Units

Bq | becquerels international unit
Ci | curies U.S. unit
1 becquerel (Bq) = 2.703×10^{-11} curie (Ci)
1 curie (Ci) = 3.7×10^{10} becquerel (Bq)
1 kilobecquerel (kBq) = 1,000 Bq
1 picocurie (pCi) = 0.000 000 000 001 Ci

Absorbed Dose

Absorbed dose measures ionizing **radiation absorbed**.



Absorbed dose describes the amount of energy deposited per unit mass in an object or person.

Use

Measuring dose from medical equipment

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

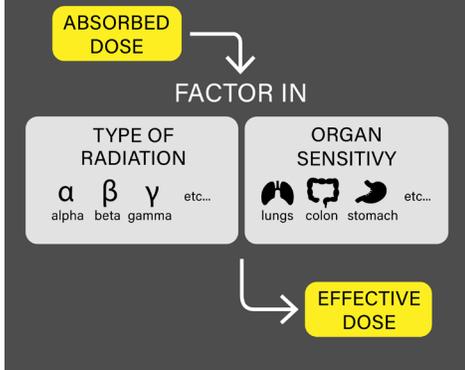


Units

Gy | gray international unit
rad | rad U.S. unit
1 milligray (mGy) = 0.001 Gy
1 rad = 0.01 gray (Gy)
1 milligray (mGy) = 0.001 Gy

Effective Dose

Effective dose indicates radiation **health effects** for a population.



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

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



Units

Sv | sievert international unit
rem | rem U.S. unit
1 sievert (Sv) = 100 rem
1 rem = 0.01 sievert (Sv)
1 millisievert (mSv) = 0.001 Sv
1 microsievert (μ Sv) = 0.000 001 Sv
1 millirem (mrem) = 0.001 rem

Reference Material

Sources for Radioactivity Unit Examples



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Sources for Absorbed Dose Unit Examples



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Sources for Effective Dose Unit Examples



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