

Radiation Terms and Units

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

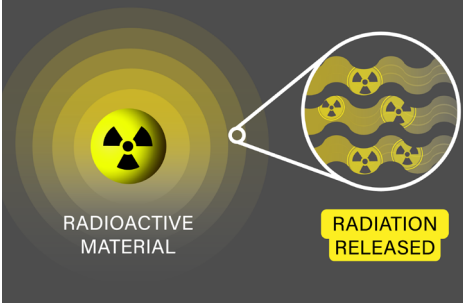
Radioactivity

Absorbed Dose

Effective Dose

Radioactivity

Radioactivity is a measure of the radiation released by a material.



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

Examples

Surface water natural radium-226 level: 0.0037 to 0.0185 Bq per liter (L) or 0.1 to 0.5 pCi/L



Units

Bq | becquerels international unit Ci | curies U.S. unit

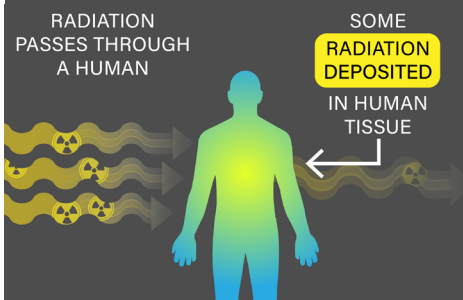
1 becquerel (Bq) = 2.703×10^{-11} curie (Ci)
 1 curie (Ci) = 3.7×10^{10} becquerel (Bq)
 1 kilobecquerel (kBq) = 1,000 Bq
 1 picocurie (pCi) = 0.000 000 000 001 Ci

Drinking water radium limit for daily consumption: 0.185 Bq/L or 5.0 pCi/L



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



Units

Gy | gray international unit rad | rad U.S. unit

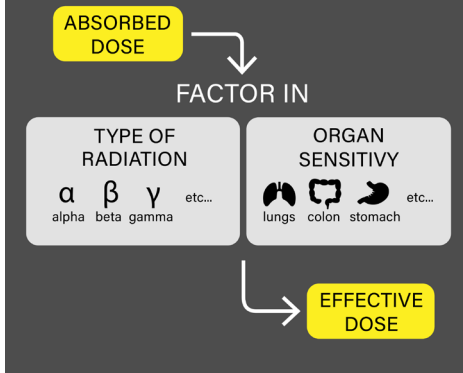
1 milligray (mGy) = 0.001 Gy
 1 rad = 0.01 gray (Gy)
 1 milligray (mGy) = 0.001 Gy

Dose to the thyroid from a chest CT scan: about 10 mGy or 1 rad



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



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 (μSv) = 0.000 001 Sv
 1 millirem (mrem) = 0.001 rem

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



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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