RADIATION MEASUREMENT

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Types of Radiation

- **<u>Ionizing Radiation</u>**: Radiation capable of liberating electrons from an atom.

  ex. beta particles, x-rays

- **<u>Non-ionizing radiation</u>**: Radiation not capable of liberating electrons, but can excite the atom.

  ex. microwaves, radio waves, lasers

Radiation Units

- There are two systems of units used in the measurement of radioactivity and radiation dose.
- The older units (Curie, rad and rem) are commonly used in U.S. regulatory language.
- The SI units (Becquerel, Gray and Sievert) are commonly used internationally.

Radiation Unit

- **Roentgen**: unit for measuring the amount of ionization in air (exposure) due to gamma or x-rays. (SI unit is Coulomb per kilogram)

- **RAD** : Radiation Absorbed Dose

  a unit used to describe the amount of energy deposited per unit mass from radiation in any type of medium.

  SI Unit: 100 rads = 1 Gray

- **REM**: Roentgen Equivalent Man

  a unit used for measuring human dose equivalent.

  SI Unit: 100 rem = 1 Sievert

Radiation Quantities

Curie: 3.7×10^{10} disintegrations per second or

2.2×10^{12} disintegrations per minute.

1 milliCurie (mCi) = 2.2×10^{9} dpm

1 microCurie (μCi) = 2.2×10^{6} dpm

100 μCi = 0.1 mCi

Becquerel: one disintegration per second. (SI system)

1 mCi = 3.7×10^{7} dps = 37 MegaBecquerel (MBq)

1 μCi = 3.7×10^{4} dps = 37 kiloBecquerel (kBq)

Radiation Quality Factors

Two different types of radiation may deliver the same absorbed dose, but produce a different biological effect, and hence, dose equivalent.

1 rad of alpha = 20 rem

1 rad of beta = 1 rem

External Exposure

- Common isotopes with external exposure potential

  P-32, I-125, Cr-51

- Not all radioisotopes are external exposure hazards

  H-3, C-14, S-35

External exposure occurs when all or part of the body is exposed to penetrating radiation from an external source.

Pathways of Internal Exposure

- **Ingestion**
- **Absorption**
- **Inhalation**
- **Puncture**

Contamination and Exposure

Radioactive Contamination is

Radioactive material where it shouldn't be. e.g. floors, bench tops, hands

Fixed vs. Removable Contamination

All radioisotopes have **contamination** potential even if they do not have **external exposure** potential.

The goal is to prevent contamination from getting on to your skin and/or inside your body**.**

How Contamination Differs From Exposure:

A person exposed to radiation is not necessarily ***contaminated*** with radioactive material.