

Units of Radioactivity, Exposure and Dose

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Unit of Radioactivity

- **Radioactivity** is the spontaneous emission of energy from a nucleus
- **Curie** is the unit for radioactivity in the U.S.
- **Curie = 37 billion disintegrations per second**
- Named for Mdme. Curie, discoverer of Radium and Polonium

Unit of Radioactivity

| Unit | Abbreviation | Activity (dps) |
|------------|--------------|----------------|
| Curie | Ci | 37,000,000,000 |
| milliCurie | mCi | 37,000,000 |
| microCurie | uCi | 37,000 |
| picoCurie | pCi | 0.037 |

The 3 R's of Radiation

- Roentgen
- Rad (Radiation absorbed dose)
- Rem (Roentgen equivalent in man)

The Three “R”s Radiation

- **Roentgen** - unit of exposure, energy deposition in air, specific to X-rays
- Rad
- Rem

The Three “R”s Radiation

- Roentgen
- **Rad - energy deposition in matter (other than air), in man the term is usually organ specific**
- Rem

The Three “R”s Radiation

- Roentgen
- Rad
- **Rem - energy deposition in human tissue, energy deposition and biological effectiveness considered**

Units of Exposure and Dose

- **Roentgen and Rem** are, by habit, sometimes assumed to be equal and interchangeable

| Unit | Abbreviation | Fraction |
|----------------------------|--------------|----------|
| Roentgen | R | 1.0 |
| milli- | mR | 0.001 |
| micro- | uR | 0.000001 |
| Roentgen Equivalent Man | Rem | 1.0 |
| milli- | mRem | 0.001 |

Average Dose (Non-medical)

| | |
|--|---------------------------|
| Average dose to US public from all sources | 360 mrem/year |
| Average dose to US public from natural sources | 300 mrem/year |
| Average dose to US public from medical uses | 53 mrem/year |
| Coal burning power plant | 0.2 mrem/year |
| Average dose to US public from weapons fallout | < 1 mrem/year |
| Average dose to US public from nuclear power | < 0.1 mrem/year |
| Dose limit to member of public from nuclear power station | 100 mrem/yr |

Dose from Medical Activities

| | |
|---|-------------------|
| Chest X ray | 8 mrem |
| Dental X ray | 10 mrem |
| Head/neck X ray | 20 mrem |
| Shoe fitting fluoroscope (not in use now) | 170 mrem |
| CT (head and body) | 1,100 mrem |
| Therapeutic thyroid treatment (dose to the whole body) | 7,000 mrem |

**“ A rose by any other name
would ... ”**

| SI Unit | U.S. Unit | Ratio |
|----------------|------------------|------------------------|
| Gray | Rad | 1 to 100 |
| Sievert | Rem | 1 to 100 |
| Bequerel | Curie | 37,000,000,000 to 1 |