Radiation's Effect on Tissue

- **Not all radiation is harmful (e.g. light)**
- **Harmful radiation breaks molecular bonds and creates ions**
- **Harmful radiation is called "ionizing radiation"**

Absorbed Dose

quantity of radiation energy absorbed per quantity of tissue

units = energy / mass = 1 Joule / kg = 1 Gray = 100 rad

Gy is abbreviation for Gray

Relative Biological Effectiveness

experimentally determined damage done by radiation compared to that done the same absorbed dose of x-rays

RBE of x-rays = 1.0

radiation	RBE
x-rays	1
electrons	1
protons	5
alpha particles	20
heavy ions	20
slow neutrons	5 – 20

Biologically Equivalent Dose

= RBE x (absorbed dose)

unit = Sievert (when absorbed dose is in Gy)

unit = rem (when absorbed dose is in rad)

1 Sievert = 100 rem

Sv is the abbreviation for Sievert

mSv is the abbreviation for milli Sievert

Radiation Hazards

Source	Bio Equivalent Dose (mSv)	
dental x-ray	0.02	
chest x-ray	0.2 – 0.4	
background radiation	1.0 / year	at sea level
	2.0 / year	at 5000 feet
10-hr plane flight	0.02	
FAA flight crew limit	20 / year	
Federal occupational limit	50 / year	
CT scan	10	
PET scan	7	

Lethal dose = 5 Sv (death in a few days)

Localized dose of 100 Sv ➔ complete tissue destruction