

THREE TYPES OF UNITS FOR IONIZING RADIATION

1. Exposure

quantity of radiation in terms of its ability to ionize dry air

units = charge / mass = 1 Coulomb / kg = 3876 Roentgen

2. 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

3. Biologically Equivalent Dose (aka Dose Equivalent)

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

<u>radiation</u>	<u>RBE</u>
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

<u>Source</u>	<u>Bio Equivalent Dose (mSv)</u>	
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

<http://www.doh.wa.gov/ehp/rp/factsheets/factsheets-htm/fs10bkvsman.htm>