

## DOSE RELATIONSHIP CHARTS

### Local Skin Absorbed Doses<sup>1</sup>

(Adapted from Linnemann, 2001)

Condition	mrem	mSv	rem	Sv
Erythema	6000,000	6,000	600	6
Dry Desquamation	1 million	10,000	1,000	10
Ulceration	2 million	20,000	2,000	20
Radiodermatitis	2.5 million	25,000	2,500	25
Epilation	300,000	3,000	300	3

<sup>1</sup>These dose-effect relationships are good approximations but can vary from individual to individual. They are energy dependent.

Epilation occurs 10 to 20 days post exposure.

### Total Body External Doses\*

(Adapted from Linnemann, 2001)

Condition	mrem	mSv	rem	Sv
No observable effects	5,000	50	5	0.05
Chromosome damage <sup>1</sup>	15,000	150	15	0.15
White count depression	50,000	500	50	0.50
Symptom threshold <sup>2</sup>	100,000	1,000	100	1.00
Nearly 100% lethality <sup>3</sup>	600,000	6,000	600	6.00

\*For brief exposures of penetrating x-ray or gamma rays to the total body

<sup>1</sup>Seen in circulating lymphocytes

<sup>2</sup>Individual variations

<sup>3</sup>Without treatment

### Acute Effects of Radiation\*

(Linnemann, 2001)

Condition	mrem	mSv	rem	Sv
No observable effects	5,000	50	5	0.05
Blood Abnormalities	15,000	150	15	0.15
Sperm Abnormalities	15,000	150	15	0.15
Nausea/Anorexia	100,000	1,000	100	1.00
Bone Marrow Depression	200,000	2,000	200	2.00
Epilation	300,000	3,000	300	3.00
Erythema	600,000	6,000	600	6.00

\*Brief exposure (minutes to a few hours)

## Long Term Effects of Radiation<sup>1</sup>

(Linnemann, 2001)

Effect	mrem	mSv	rem	Sv
Fetal Abnormalities*	10,000	100	10	0.10
Cancer*	10,000	100	10	0.10
Genetic	25,000	250	25	0.25
Cancer Death Risk 5%	100,000	1,000	100	1.00
Genetic Risk 1%	100,000	1,000	100	1.00
Cataracts 10%**	250,000	2,500	250	2.50

<sup>1</sup> Brief exposure (minutes to hours)

\*Levels below which it becomes exceedingly difficult to consistently demonstrate effects

\*\*10% develop cataracts at this dose (gamma, x-ray)

## Typical Medical Doses\*

(Linnemann, 2001)

Medical X-ray	mrem	mSv
Chest Study	10	0.10
Cervical Spine	11	0.11
Pelvis	27	0.27
Skull	31	0.31
Upper GI	117	1.17
Barium Enema	298	2.98
CAT Scan	1,800	18.00

\*Effective doses. Doses vary depending on equipment, operator, etc.

## Environmental Doses\*

(Adapted from Linnemann, 2001)

	Dose	
	mrem	mSv
Natural background <sup>1</sup> (excluding radon)	100	1.00*
Radon inhalation <sup>1</sup>	200	2.00*
Television viewing	1	0.01
Air flight: New York - Los Angeles**	4	0.04
Chernobyl (avg. Public exposure) <sup>2</sup>	1,500	15.00
Annual limit for radiation workers	5,000	50.00
Annual limit for public exposure	100	1.00
Average public exposure at TMI <sup>3</sup>	2	0.02

<sup>1</sup> Average annual dose in U.S.

<sup>2</sup> Average calculated dose to 135,000 people living within 18 miles of the site

<sup>3</sup> Average calculated dose to people living within 50 miles of Three Mile Island accident site

\*Effective doses

\*\* Per flight