



# Basic Radiation Safety

PRESENTED BY



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## Outline

- A Brief History of Radiation
- What is Radiation?
- Types & Sources of Radiation
- Radiation Dose
- Biological Effects of Radiation
- Radiation Dose Limits & Dosimetry
- ALARA Philosophy – Protecting Yourself from Radiation
- Signage & Postings
- Security of Radioactive Material



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## A Brief History of Radiation

- Wilhelm Roentgen
- 1895 – Discovery of X-rays



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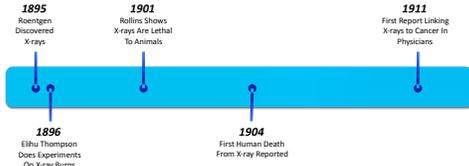
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- The history of radiation biology goes back almost as far as the discovery of X-rays



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## Radium Dial Painters



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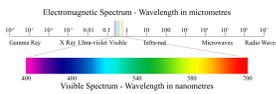
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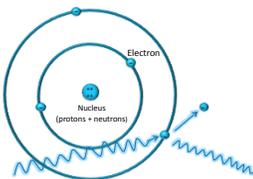
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## What is Radiation?

- Transfer of energy through space



- Radiation can be ionizing or non-ionizing  
 - ionizing radiation can knock electrons off of an atom



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## Types & Sources of Radiation

- Machine Produced
  - X-ray, CT, Cath Lab, etc
  - Linear Accelerators
  - Other particle accelerators



- Radioactive Materials
  - Nuclear Medicine
  - Radiation Therapy
  - The Environment
  - YOU!



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## How Does Radiation Go Away?

- Machine Produced
  - TURN IT OFF!!!



- Radioactive Materials
  - Radioactive Decay



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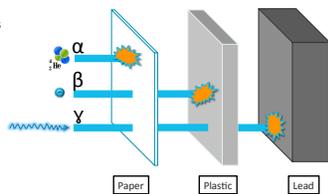
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## Not All Radiation Is Created Equal

- Particles
  - Alpha, beta, protons, neutrons
- Gamma & X-rays
- Hazard is dependent on
  - Type
  - Quantity
  - Energy
  - Matter



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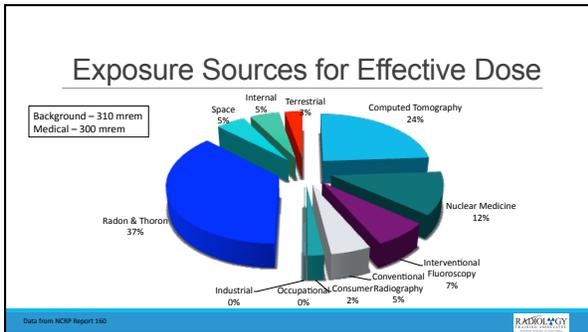
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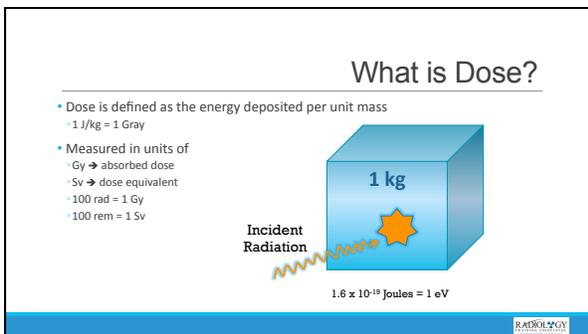
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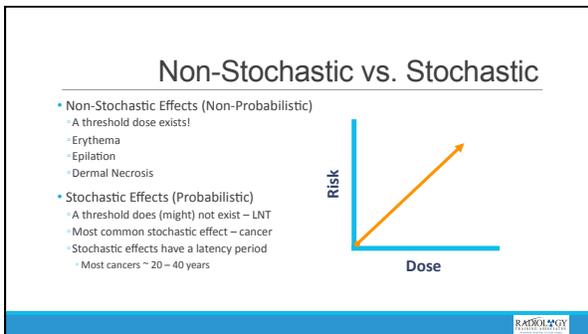
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### Non-Stochastic Effects In Action



6 - 8 weeks



16 - 21 weeks

RADIODIAGNOSTICS

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### Non-Stochastic Effects In Action



18 - 21 months



Post skin grafting

RADIODIAGNOSTICS

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### Dose Limits & Dosimetry

	Annual Limit	
Whole Body (TEDE)	5,000 mrem	50 mSv
Extremities & Skin (SDE)	50,000 mrem	500 mSv
Lens of Eye	15,000 mrem	150 mSv
	Gestational Limit	
Declared Pregnant Workers	500 mrem	5 mSv
	Limits	
Members of the Public	100 mrem*	2 mrem in any 1 hour

\* Limit goes to 500 mrem when source is an individual administered unsealed byproduct material

RADIODIAGNOSTICS

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## Dosimeters

- May be issued monthly or quarterly
- Only wear your badge!
- Store in a low background area
- Wear outside of your lead, if applicable

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## ALARA

- As Low As Reasonably Achievable
  - Reasonable efforts should be made to keep occupational doses as far below regulatory limits as possible
- Fundamentals of radiation protection
  - Time, Distance, & Shielding
- Sources of exposure in a hospital
  - Radiology (X-Ray, CT, NM)
  - Radiation Therapy
  - Cath Lab, GI Lab, Pain Clinics, etc

Time

Distance

Shielding

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## Distance

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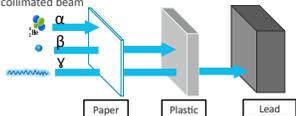
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## Shielding

- Some considerations
  - What types of radiation are you shielding?
  - What is the energy and activity?
  - What shielding material do you have available?
- Shielding should be placed as close to the source as possible
  - Isotropic vs. collimated beam



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## Shielding Examples



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## Signage & Postings



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## Security of Radioactive Material

- Radioactive materials should be stored in a way to prevent unauthorized removal
  - Locked room – “Hot Lab”
  - Locked cabinets
  - Under constant surveillance if not secured
- Increased controls
  - Background Checks / Fingerprints
  - Security Escorts
  - Video surveillance
- Lost or stolen radioactive materials must be reported to appropriate authorities!



RADOLANX  
RADIATION SAFETY OFFICER

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## Closing Thoughts

- Radiation is an extremely useful tool in medicine
- Should be used and handled with appropriate safety measures
  - Time
  - Distance
  - Shielding
- Report conditions you believe are unsafe
- Ask questions!
- Excellent resource is your *RADIATION SAFETY OFFICER*

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