Radiation Safety
College of Dental Medicine
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Max Amurao, PhD, MBA
Radiation Safety Officer - Clinical Programs
Training Outline

- Sources of Radiation Exposure
- NYC Regulations
- Potential Hazards of Radiation
- Principles of Radiation Protection
- Obligations of CODM Employees
Common Sources of Radiation Exposure

- Everybody on the planet is exposed to radiation.
- Radiation occurs naturally in the atmosphere, in building materials, even in our own bodies.
- Individuals are also exposed to man-made sources of radiation.
- Naturally occurring background (baseline) radiation levels in the United States averages approximately 3 mSv per year.
- The baseline radiation is not included in dosimeter reports.
- Exposure versus Contamination
  - Radioactive Materials – Contamination & Exposure
  - X-ray Devices – Exposure. A person receiving an x-ray is exposed to radiation but is not contaminated.
The Changing Patterns of Radiation Use in the USA

- **NCRP Report 93 (1987)**: Man Made, 18%; Natural, 82%

- **NCRP Report 160 (2009)**: Man Made, 50%; Natural, 50%

* NCRP – National Council on Radiation Protection and Measurements
The Changing Patterns of Radiation Use in the USA

Average Effective Dose (1987)
3.6 mSv / year

Average Effective Dose (2009)
6.2 mSv / year
Sources of Radiation Exposure to CODM
New York City Regulations

- The safe use of radiation is governed by Article 175 of the Rules of the City of New York
- CUMC and NYP use radiation under licenses and permits issued by the New York City Department of Health and Mental Hygiene
- Applicable regulations, radioactive materials licenses, x-ray registrations, conditions, information notices, bulletins, etc. are available for review by any CUMC and NYP employee by contacting Radiation Safety
NYC Regulations

<table>
<thead>
<tr>
<th>Exposure Type</th>
<th>Annual Limit (mrem)</th>
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<tbody>
<tr>
<td>Whole Body (Deep)</td>
<td>5,000</td>
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<tr>
<td>Lens of Eye</td>
<td>15,000</td>
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<tr>
<td>Whole Body (Shallow)</td>
<td>50,000</td>
</tr>
<tr>
<td>Extremity</td>
<td>50,000</td>
</tr>
<tr>
<td>Any Individual Organ</td>
<td>50,000</td>
</tr>
<tr>
<td>Embryo/Fetus (DPW)</td>
<td>500 /entire pregnancy</td>
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<tr>
<td></td>
<td>50 /month of pregnancy</td>
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</tbody>
</table>

Average annual exposure of CODM personnel is less than 10 mRem*
Potential Hazards for Radiation Workers

High Dose Risks
Deterministic Effects

- Threshold dose below which effect is not observed
- Severity of effect increases with increasing dose
- e.g. Cataracts, erythema, fibrosis, hematopoietic damage

Low Dose Risks
Stochastic Effects

- No threshold dose for effects to appear
- Severity of effect is unchanged with increasing dose
- e.g. Cancer
Principles of Radiation Protection

- **ALARA = As Low As Reasonably Achievable**

**Time**
- The less time exposed, the less dose received
- Only use machine when you have to

**Distance**
- The greater the distance, the less dose received
- Stand outside room during exposure

**Shielding**
- A physical barrier of high-Z material (i.e. lead or concrete) can absorb photons
- Walls of most dental offices provide adequate shielding from x-rays

Radiation Safety
www.ehs.columbia.edu
Declared Pregnant Workers

- The embryo and fetus have a heightened sensitivity to radiation.

- CUMC provides a voluntary and confidential program for workers/students who are pregnant while working with radiation.

- The program provides for enhanced protection and dosimeter monitoring of the unborn child.

- All individuals interested in the program should set up a confidential consultation with the Radiation Safety Officer.
Obligations of CUMC Personnel

- Each employee has an obligation to report unsafe conditions to the Radiation Safety Office.

- Each employee has the right to be informed of occupational radiation safety exposure, and may request a dosimeter.

- Each employee has an obligation to return personal radiation dosimeters to the Radiation Safety Office in a timely manner.
Clinical Radiation Safety Contact Information

Location:
601 W 168th st
Suite #56
Phone: (212) 305-0303

- Grant Fong
  Associate Health Physicist
  Email: gf@2364@columbia.edu

- Kassia Kelly
  Associate Health Physicist
  Email: kk2955@Columbia.edu

- Kostas Georgiou
  Associate Health Physicist
  Email: kg2537@Columbia.edu

- Eva Neumannova
  Dosimetry Coordinator
  Email: en2386@Columbia.edu

- Daniela Nicoletti
  Training Coordinator
  Email: dn2347@Columbia.edu

- Eugenio Silvestrini
  Senior Health Physicist
  Email: es3064@Columbia.edu

Max Amurao, PhD, MBA
Radiation Safety Officer
Email: ma3272@columbia.edu
Thank you!