Mid-Atlantic States Radiation Conference
September 20, 2018

Radiation Protection and Your National Council on Radiation Protection and Measurements (NCRP)

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NCRP – A Council of 100 Radiation Professionals

1929: U.S. Advisory Committee on X-Ray and Radium Protection

1946: U.S. National Committee on Radiation Protection

1964: National Council on Radiation Protection and Measurements chartered by Congress (Public Law 88-376)
Advice, Reports, Research

DECISION MAKING FOR LATE-PHASE RECOVERY FROM MAJOR NUCLEAR OR RADIATIONAL INCIDENTS

National Council on Radiation Protection and Measurements
796 Woodmont Avenue / Suite 400 / Bethesda, MD 20814-3995

Where Are the Radiation Professionals (WARP)?
Synopsis of NCRP Statement No. 12
January 23, 2015

Background: Since the discovery of x rays and radioactivity in the late 1800s, sources of ionizing radiation have been employed in medicine, academia, industry, power generation, and national defense. To provide for the safe and beneficial use of these sources of radiation, the United States developed a cadre of professionals with the requisite education and experience. Unfortunately, their numbers have diminished alarmingly, as assessed by the National Research Council, the Health Physics Society, and the Government Accountability Office.

Methods: To study the decline in radiological personnel, the Council on Radiation Protection and Measurement convened experts in Arlington, Virginia to evaluate whether the current workforce can support the various radiological activities and needs in the future. This workshop included representatives from the NAS: NRC: NRC Regional walks: and NCRP.

DOSE RECONSTRUCTION FOR THE MILLION WORKER STUDY: STATUS AND GUIDELINES

Seven Program Area Committees (PACs) and Two Council Committees (CCs)

- PAC 1 - Epidemiology & Biology
- PAC 2 - Operational Radiation Safety
- PAC 3 - Security & Safety
- PAC 4 - Medicine
- PAC 5 - Environment & Waste
- PAC 6 - Dosimetry & Measurements
- PAC 7 - Risk Communication & Outreach

Scientific Committees under PACs

- CC-2 – Meeting the Needs of the Nation for Radiation Protection (WARP: Where Are the Radiation Professionals?)
14 (more or less) Active Committees Under PACs

- SC 1-24P2 – Radiation Exposures in Space/CNS Effects
- SC 1-26 – Integrating Radiation Biology and Epidemiology for Low Dose Risks
- SC 2-7 – Radiation Safety of Sealed Radioactive Sources (Report 182; 2018)
- SC 2-8 – Operational Radiation Safety Program
- SC 3-1P2 – Implementation of Guidance for Radiation Responder Dosimetry
- SC 4-5 – Radiation Protection in Dentistry
- SC 4-7 – Evaluating and Communicating Risks for Human Studies
- SC 4-8 – Improving Patient Dose Utilization in CT
- SC 4-9 – Medical Exposures of Patients in the US
- SC 4-10 – Error Prevention in Radiation Safety
- SC 5-2 – Radiation Protection for NORM/TENORM
- SC 6-11 – Medical Worker Dosimetry
- SC 6-12 – Brain Dosimetry for Internal Radionuclides
Recently Completed Committees (2017-2018)

• SC 2-6 – Radiation Safety Aspects of Nanotechnology
• SC 3-1 – Guidance for Emergency Responder Dosimetry
• SC 1-25 – Recent Epidemiologic Studies and Implications for LNT
• SC 1-20 – Biological Effectiveness of Low-LET Radiations
Committees Coming Soon

- SC 1-27 – Sex Differences in Lung Cancer (with Relevance to Astronauts)
- SC 6-10 – Doses to Air Crew
Highlighting Selected Committees
CC-1/Report no. 180: Radiation Protection Guidance for the United States (will be available soon)

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L.T. Dauer
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J.E. Till, Liaison
S.J. Adelstein, Consultant
R.L. Anderson, Consultant
M. Boyd, Consultant
M. Rosenstein, Staff Consultant

Thanks to CDC & NRC for financial support
CC 2: Meeting the Needs of the Nation for Radiation Protection – WARP

W.D. Newhauser (Med Phys), Co-Chair
J.P. Williams (Rad Bio), Co-Chair

Preparing Commentary
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Where are the Radiation Professionals (WARP)?

NCRP Statement No. 12, December 17, 2015.

Since the discovery of x-rays and radioactivity in the 1890s, sources of ionizing radiation have been employed in medicine, academia, industry, power generation, and national defense. To provide for the rational and safe use of these sources of radiation, the United States developed a cadre of professionals with the requisite education and experience. Unfortunately, their numbers have diminished alarmingly (ASAS, 2014; GAO, 2014; EPS, 2013; NANSIC, 2012).

Methods

To study the decline in radiation professionals and potential national crisis, the National Council on Radiation Protection and Measurements (NCRP) sponsored a workshop in June 2013 in Arlington, Virginia to evaluate whether a sufficient number of radiation professionals exist now and into the future to support the various radiation disciplines essential to meet national needs. Attendance at this workshop included professionals from government, industry, academia, medicine, and professional societies. Presentations from over 30 groups (NCRP, 2015) resulted in the recommendations found in this Statement.

Findings

Evidence presented at the workshop revealed that the country is on the verge of a severe shortfall of radiation professionals such that urgent national needs will not be met. Further contributing to the downturn are the economy, attrition, redirected national priorities, and decreased public funding. The magnitude of this shortfall varies with radiation disciplines and practice areas. Radiation biology has already been critically depleted and other specialties are following the same downward spiral. All radiation professionals share the same goal to develop or implement scientific knowledge to protect workers, members of the public, and the environment from harmful effects of exposure to ionizing radiation. Accordingly, the workshop concluded that the current and projected shortfall will adversely affect the public health, radiation occupations, emergency preparedness, and the environment. Major shortfalls have already been observed in day-to-day operations, leaving policy development, regulatory compliance, research and development, environmental monitoring, emergency management, and military applications as unfunded and under-supported mandates.

The dwindling number of professionals will be of particular concern in mounting a response to a catastrophic nuclear or radiological incident, including terrorist attack. The current concept of operations for response includes surge support from the existing body of radiation professionals to serve as technical subject matter experts to aid in the management of the consequences of such an event. However, as the number of radiation professionals decreases, the nation’s resilience and ability to cope and manage a catastrophic nuclear or radiological event is severely degraded.

NCRP (2014) estimates that 31% of the federal workforce that regulate the use of radioactive materials and radiation safety that over 30% of the technical staff in the state’s radiation protection program within government will result in an inability to supply an adverse effect on the ability to manage the consequences of a power plant accident in the United States. The basic radiation protection program is a vital enterprise that directly and materially benefits the

Thanks to CDC for funding
Conclusion: Based on current epidemiologic data, no notably different alternative to the LNT model appears more practical and prudent for radiation protection purposes.

Thanks to NRC for financial support.
SC 3-1: (1) Guidance for Emergency Responder Dosimetry and (2) Implementation Guidance for Responder Dosimetry in an Emergency

S. V. Musolino
A. Salame-Alfie
Co-Chairs

Thanks to DHS, CDC, and NYC for financial support
SC 5-2: Radiation Protection for NORM & TENORM from Oil & Gas Recovery

Thanks to CRCPD and CDC for financial support
Radiation Exposure in the US

Total Average Exposure per Person in US: 6.2 mSv/yr (2x higher than 25 years earlier)

Exposures from medical procedures increased 6-fold in ~25 years

From NCRP Report No. 160, 2009
SC 4-9: Medical Exposure of Patients in the United States

F.A. Mettler, Chair
M. Mahesh, Co-Chair

Thanks to CDC for funding
SC 1-24 Continuation: Radiation Exposures in Space and the Potential for CNS Effects – Phase II Report

Human Exploration Research Analog (HERA), JSC

Les Braby    Jacob Raber    Thanks to NASA for funding
Radiation Effects on Dendritic Spines of Neurons Correlates with Behavior Changes

Scale bar: 20 μm
Drebrin/ MAP2/ DAPI

(from Puspitisari, Held, et al., unpublished)

Fig. 3. Reductions in dendritic spine density in the mPFC after HZE particle exposure. Representative digital images of 3D reconstructed dendritic segments (green) containing spines (red) in unirradiated (top left panel) and irradiated (bottom panels) brains. Dendritic spine number (left bar chart) and density (right bar chart) are quantified in charged particle–exposed animals 8 weeks after exposure. *$P = 0.05$, **$P = 0.01$, ANOVA.

(from Parihar et al. 2015)
Going to Mars – Alzheimer’s?

**Galactic Cosmic Radiation Leads to Cognitive Impairment and Increased Aβ Plaque Accumulation in a Mouse Model of Alzheimer’s Disease**

Jonathan D. Cherry, Bin Liu, Jeffrey L. Frost, Cynthia A. Lemere, Jacqueline P. Williams, John A. Olschowka, M. Kerry O’Banion

**What happens to your brain on the way to Mars**

Vipan K. Parihar, Barrett Allen, Katherine K. Tran, Trisha G. Macaraeg, Esther M. Chu, Stephanie F. Kwok, Nicole N. Chmielewski, Brianna M. Craver, Janet E. Baulch, Munjal M. Acharya, Francis A. Cucinotta, Charles L. Limoli

**Study: Deep-Space Radiation Could Damage Astronauts’ Brains**

Cosmic rays could leave travelers to Mars confused, forgetful and slow to react

Can Epidemiology Studies Help?
NCRP Annual Meetings
Assessment of National Efforts in Emergency Preparedness for Nuclear Terrorism: Is There a Need for Realignment to Close Remaining Gaps?

March 6–7, 2017

Hyatt Regency Bethesda
One Bethesda Metro Center
7400 Wisconsin Avenue
Bethesda, MD 20814

Armin Ansari & Adela Salame-Alfie, Co-Chairs
Fifty-Fourth Annual Meeting Program

Radiation Protection Responsibility in Medicine

March 5–6, 2018

Hyatt Regency Bethesda
One Bethesda Metro Center
7400 Wisconsin Avenue
Bethesda, MD 20814

D Frush
L Dauer,
Co-Chairs

Proceedings to be published in Health Physics, early 2019
2019 Annual Meeting:
April 1-2, 2019

NCRP at Ninety: Our Best Answers to Frequently Asked Questions

Fred A. Mettler, Jr., Chair, & Jerrold T. Bushberg & Richard J. Vetter, Co-Chairs

See You There!
Other NCRP Activities

- Research – Million Person Study (MPS, MWS)
- Partnerships (to name a few)
  - CRCPD
  - Image Gently Alliance
  - Health Physics Society
  - ICRP
  - UNSCEAR
  - IRPA

![One Size Does Not Fit All...](image)
National Study of One Million U.S. Radiation Workers and Veterans

- Manhattan Project 360,000
- Atomic Veterans 115,000
- Nuclear Utility Workers 150,000
- Industrial Radiographers 115,000
- Medical & other >250,000

Robert Oppenheimer, General Leslie Groves, Enrico Fermi, Hans Bethe, Theodore Hall

- Low-Dose Radiation Research Act of 2018 – HR 4675
- HR 589 DOE OS “shall carry out a low-dose radiation research program” …

Funding from DOE, DOD, NRC, NASA
Summary

• NCRP chartered by US Congress to provide independent scientific advice on matters related to radiation protection and measurements.
• Numerous documents on topics such as dose to lens of the eye, nanotechnology, emergency preparedness, dosimetry for epidemiology, LNT and low dose effects, space radiation, medical radiation, etc.
• Other activities include annual meetings, research, partnerships with numerous organizations.
Sponsors (Past & Present)
Acknowledgments

- Dr. John Boice, Staff at NCRP and Members of NCRP PACs and SCs

THANK YOU