

## The Critical Role of Radiation Protection in Modern Life

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In our modern world, radiation has become an indispensable tool across various domains such as medicine, research, industry, and beyond. From medical imaging techniques like X-rays and CT scans to radiation therapy for cancer treatment, the use of ionizing radiation has revolutionized healthcare, enabling early diagnosis and effective treatment of numerous conditions. In research, radiation plays a pivotal role in advancing scientific knowledge, whether through nuclear physics experiments, radiocarbon dating in archaeology, or studies involving radioactive tracers. Industrial applications are equally diverse, including non-destructive testing for structural integrity, sterilization of medical equipment, and energy production in nuclear power plants.

The ubiquity of radiation in our daily lives underscores its importance. Our dependence on these technologies means that eliminating radiation from our lives is not a feasible option. However, this dependence also brings to the forefront the potential risks associated with radiation exposure. Both ionizing and non-ionizing radiation can have detrimental effects on human health, ranging from acute radiation sickness to long-term risks such as cancer and genetic damage.

Given the essential role of radiation in modern society, it is imperative to develop and implement robust radiation protection strategies. These strategies are designed to minimize the harmful effects of radiation while allowing us to harness its benefits safely. Effective radiation protection involves a combination of regulatory measures, technological advancements, and practical protocols aimed at reducing exposure and mitigating risks. This includes everything from shielding and protective equipment to monitoring and controlling environmental radiation levels.

As we continue to rely on radiation for various critical applications, the importance of radiation protection cannot be overstated. Ensuring the safe use of radiation will not only protect human health but also sustain the many advancements and conveniences that radiation technology provides in our modern life. This special issue of the Journal of Biomedical Physics and Engineering (JBPE) is dedicated to exploring the latest research and developments in the field of radiation protection, highlighting innovative approaches and new insights that will help safeguard our future.

### Investigating Gene Expression in Industrial Radiation Workers

In the article “Investigating the Expression Levels of Bax and Bcl-2 Genes in Peripheral Blood Lymphocytes of Industrial Radiation Workers in the Asaluyeh Region,” Omid Keshavarzi and colleagues explore the genetic impact of radiation exposure on industrial workers. Their study focuses on Bax and Bcl-2 genes, which play critical roles in the regulation of apoptosis. By examining these gene expressions, the researchers aim to identify biomarkers for radiation exposure, contributing to enhanced occupational safety protocols.

### Novel Approaches to Radiation Protection in Dentistry

Hassan Vafapour and Zaker Salehi present a novel approach to radiation

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Received: 25 May 2024  
Accepted: 25 May 2024

protection in dentistry with their study, “Assessment of the Absorbed Dose Variations in the Thyroid Gland Exposed to Orthopantomography (OPG) while Swallowing.” This research addresses the variations in absorbed radiation doses to the thyroid gland during dental imaging procedures, offering new insights into minimizing radiation exposure and improving patient safety.

#### **The Protective Role of Taurine and Other Agents**

The modulation of radiation-induced apoptosis is a critical area of study. In “Modulation of Ionizing Radiation-Induced Apoptosis by Taurine in Human Peripheral Blood Lymphocytes,” Shahab Faraji and colleagues investigate the protective effects of taurine. Their findings, based on flow cytometry quantification, suggest that taurine may play a significant role in mitigating the harmful effects of ionizing radiation, potentially leading to new therapeutic strategies.

Complementing this, Faraji’s other study, “Radioprotective Effect of Resveratrol, Crocin, and Their Combination on Cytogenetic Alterations in Human Lymphocytes,” delves into the synergistic effects of these compounds in protecting human lymphocytes from radiation-induced damage. This research highlights the potential of natural compounds in enhancing radioprotection.

#### **Addressing Radioactive Waste and Contamination**

Zahra Mohamadi Baghmolaei and her team tackle the critical issue of radioactive waste management in their article, “Evaluating the Radioactive Waste Produced per Patient by Radiopharmaceutical Sources and Measuring the Radioactive Contamination of Surfaces and Staff at the Bushehr Nuclear Medicine Department.” Their evaluation provides valuable data for improving safety measures and reducing radioactive contamination in medical facilities.

#### **Blue Light Exposure and Human Health**

In “Blue Light and Digital Screens Revisited: A New Look at Blue Light from the Vision Quality, Circadian Rhythm and Cognitive Functions Perspective,” Masoud Haghani and colleagues revisit the impact of blue light from digital screens. This review underscores the importance of understanding the non-ionizing radiation effects on human health, particularly in our increasingly digital world.

#### **Revisiting Peto’s Paradox and Radiation Shielding**

The special issue also includes a mini-review by Seyed Mohammad Javad Mortazavi et al., “A Reexamination of Peto’s Paradox: Insights Gained from Human Adaptation to Varied Levels of Ionizing and Non-ionizing Radiation,” which explores human adaptation to radiation exposure. Additionally, Arash Safari’s review, “Development of Lead-Free Materials for Radiation Shielding in Medical Settings,” highlights advancements in creating safer, more effective radiation shielding materials.

#### **Historical Perspectives and Future Directions**

Historical perspectives and future directions are provided in articles such as “Professor John Roderick Cameron’s Influence on Radiation Safety in Terrestrial and Space Environments” by Joseph John Bevelacqua et al., and “A Critical Look at Heavy Ion Beam Irradiation for Vaccine Development” by Payman Rafiepour et al. These commentaries offer a broader context and emphasize the ongoing evolution of radiation protection strategies.

#### **Learning from Past Disasters**

Finally, the issue reflects on the aftermath of historical radiation events with “Thyroid Cancer in Regions Most Contaminated after the Chernobyl Disaster” by Marek K. Janiak and Grzegorz Kamiński. This mini-review provides crucial insights into the long-term health impacts of radiation exposure and underscores the need for continued vigilance and research.

In summary, this special issue of JBPE underscores the multifaceted nature of radiation protection in modern life. The diverse range of studies and reviews not only advance our understanding of radiation risks but also pave the way for developing innovative protective measures. As technology and medical practices continue to evolve, the insights gained from these articles will be instrumental in safeguarding public health against the potential dangers of radiation exposure.

### **Conflict of Interest**

None