Defense Health Agency (DHA) Clinical Communities Speaker Series

2026 FEB CCSS: Operational Medicine: Preparing the Force for Mission Readiness

2026 FEB CCSS S02: Medical Response to Radiation: Navigating Emergencies, Enhancing Survival

Resource List

The study of the human microbiota, while a long-standing field, has accelerated significantly since the launch of the National Institutes of Health (NIH) Human Microbiome Project in 2007. Acute Radiation Syndrome and the Microbiome: Impact and Review (2021) reviews the recent studies that have been conducted and notes this surge in research has particularly advanced our understanding of the microbiome's role in radiation-induced injury. Given that acute radiation syndrome (ARS) is a multisystemic condition, it can disrupt microbial communities throughout the body. Current research focuses on the impact of ionizing radiation on the microbiota and explores its potential utility in several applications: as a therapeutic target, a method for biological dose assessment (biodosimetry), and as a direct medical countermeasure. Furthermore, investigators are examining the use of the microbiome as a prognostic biomarker to determine radiation exposure levels and predict health outcomes. Recent findings confirm that the microbiome holds significant potential for mitigating radiation injuries in both clinical radiotherapy and in the event of radiological or nuclear public health emergencies. Although further research is needed, the field shows considerable promise for developing novel strategies to counter the detrimental effects of radiation.

Acute Radiation Syndrome (ARS) is a life-threatening condition caused by radiation-induced DNA damage to highly proliferative hematopoietic and gastrointestinal stem cells, which inhibits their regenerative capacity. The study Identification of Potential Prophylactic Medical Countermeasures Against Acute Radiation Syndrome (ARS) (2025) evaluates six compounds—Amifostine, Captopril, Ciprofloxacin, PrC-210, 5-AED, and 5-AET—for their potential to protect against ARS. The investigation utilized both *in vitro* models, involving irradiated mouse bone marrow and rat intestinal epithelial cells, and an *in vivo* model where *Mus musculus* were subjected to whole-body irradiation. The efficacy of these agents was assessed through primary endpoints including cellular viability, DNA damage quantification via the γ-H2AX assay, colony formation, and 30-day post-irradiation survival. In addition to assessing these specific compounds, this research sought to establish a reliable set of *in vitro* assays to predict the *in vivo* effectiveness of potential radioprotectors, underscoring the urgent need for FDA-approved medical countermeasures against ARS.

Effective triage following a large-scale nuclear incident is critically dependent on the ability to differentiate significantly exposed individuals from the unexposed public. Rapid Triage of Radiation Exposure Using a 4-Gene Real Time PCR Test (2024) describes the development and performance of a radiation biodosimetry blood test that qualitatively determines radiation exposure with a sensitivity of 99.0% and a specificity of 96.5%. Notably, the assay exhibits comparable performance in both human and non-human primate (rhesus macaque) samples subjected to either *in vivo* total body irradiation or *ex vivo* blood irradiation. The methodology relies on quantifying the relative expression of three radiation-responsive mRNA biomarkers against a stable normalizer mRNA, using a pre-established threshold to classify samples. Logistically, the test requires sample collection in an RNA-stabilizing device and is compatible with the ubiquitous real-time PCR infrastructure used for the COVID-19 pandemic response, enabling rapid and widespread deployment.

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While the twenty-first century has witnessed significant advancements in radiological science and nuclear technology across various sectors, these developments are intrinsically linked to the risks of radiation exposure. Awareness and preparedness level of medical workers for radiation and nuclear emergency response (2024) explores the particular concern for medical personnel, who face potential long-term health effects, such as certain cancers, from low-dose occupational exposure. Although radiation protection measures have notably reduced exposure levels for medical workers since the mid-twentieth century, a significant gap in awareness and understanding of these radiological hazards and requisite safety protocols persists within the profession. This issue is exacerbated by deficiencies in emergency response capabilities. Consequently, there is an urgent need to bolster radiation safety education and training for healthcare staff, who are indispensable in responding to radiological and nuclear emergencies. This review synthesizes the health risks to healthcare workers, evaluates their current level of awareness and educational preparedness, and advocates for the enhancement of training programs and emergency response skills. Ultimately, the goal is to mitigate occupational radiation risks and foster a robust culture of safety within the medical community.

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