THE ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE (AFRRI): ROLES AND PERSPECTIVES ON BIODOSIMETRY

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AFRRI is a Department of Defense research institute that is a component of the Uniformed Services University of the Health Sciences (USU). AFRRI was chartered by the U.S. Congress in 1961 to conduct research in the field of radiobiology and related matters essential to the operational and medical support of the military services and DoD. In addition to its research efforts, AFRRI has an operational mission to advise DoD and other U. S. government agencies, to provide training on the medical response to radiation injury, and to respond to radiation-related emergencies.

Scientists at AFRRI are engaged in many exciting areas of research. They are exploring the mechanisms of injury from ionizing radiation in *in vitro* and *in vivo* animal models, developing new approaches to prevent the life-threatening and health-degrading effects of ionizing radiation, and investigating biomarkers of injury that might be used to assess radiation exposure. The countermeasure program seeks to develop prophylactic and therapeutic drugs that prevent and treat radiation injuries. The biodosimetry program aims to develop rapid high-precision analytical methods that assess radiation exposure doses from clinical samples and thus aid in the triage and medical management of radiological casualties. Ongoing research efforts range from studies focused on understanding the basic mechanisms of radiation injury to advanced development of products useful in the event of a radiological or nuclear incident. The institute has widespread collaborations with other government facilities, academic institutions, and private industry in the US and abroad. Funding for research comes from an intramural program, interagency agreements, grants from various funding agencies, and cooperative agreements with commercial enterprises.

The extensive radiation facilities housed at AFRRI can simulate almost any radiation exposure scenario in animal and cellular experiments. The panoramic cobalt facility simulates acute effects of gamma radiation. A low-level cobalt exposure room can simulate the effects of a heavily contaminated fallout field. The TRIGA research reactor allows investigators to evaluate the effects of neutrons and mixed fields on their biological samples. The AAALAC-accredited, AFRRI vivarium houses a wide variety of species including rodents, pigs, and non-human primates.

Researchers in the biodosimetry program are developing dose-assessment assays that test easily-obtained samples such as a drop of blood, urine, or hair with transportable equipment. With innovative approaches, they are improving the accuracy, dose range, ease of use, and speed of classical biodosimetry based on cytogenetic damage. Among current research and development efforts are 1) development of software tools to allow quick assessment of radiation exposure, 2) automation of the analysis and scoring of dicentric chromosomal aberrations, the "gold standard" for biodosimetry, 3) validation of gene expression, protein, and metabolic biomarkers, 4) interactions of biodosimetric assessments with pharmaceuticals, and 5) approaches to multi-biomarker analysis.