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Editorial

THE DEPARTMENT OF ENERGY'S RUSSIAN HEALTH STUDIES PROGRAM

U.S. Department of Energy Office of Domestic and International Health Studies (AU-13/GTN B-214), 19901 Germantown Road, Germantown, MD 20874, USA

Recognized for conducting cutting edge science in the field of radiation health effects research, the Department of Energy's (DOE) Russian Health Studies Program has continued to generate excitement and enthusiasm throughout its 22-year quest to assess worker and public health risks from radiation exposure resulting from nuclear weapons production activities in the former Soviet Union.

The three goals of the program are to:

(1) Clarify the relationship between health effects and chronic low-to-medium dose radiation exposure,
(2) Estimate the cancer risks from exposure to gamma, neutron and alpha radiation,
(3) Provide information to the national and international organizations that determine radiation protection standards and practices.

Research sponsored by DOE's Russian Health Studies Program is conducted under the authority of the Joint Coordinating Committee for Radiation Effects Research (JCCRER), a binational committee representing federal agencies in the United States and the Russian Federation. In the USA, DOE is the executive agent. In Russia, the Federal Medical Biological Agency is the executive agent. The JCCRER Agreement established the legal basis for the collaborative research between US and Russian scientists to determine the risks associated with working at or living near Russian former nuclear weapons production sites. Originally signed in 1994, the JCCRER Agreement was renewed at the highest levels of both governments in 2011 through 2014, with automatic renewals thereafter. JCCRER Projects funded by DOE comprise the Russian Health Studies Program. DOE's Office of Domestic and International Health Studies (AU-13) manages the program. For historical details, please see[1, 2], the Russian Health Studies Program website at http://energy.gov/ehss/russian-health-studies-program, and the JCCRER website at http://energy.gov/ehss/russian-health-studies-program-joint-coordinating-committee-radiation-effects-research-jccrer.

Pursuant to the JCCRER Agreement, it is possible to study the effects of radiation at multiple nuclear weapons production facilities throughout Russia. To date, however, the research has focused on: (1) current and former workers from the Mayak Production Association (Mayak), the first Russian nuclear weapons production facility in Ozersk, Russia and (2) current and past residents along the Techa River who were impacted from airborne and waterborne radioactive releases from Mayak. Mayak is comparable to DOE's Hanford facility in Richland, Washington. Mayak workers and Techa River residents received protracted exposures at low-to-moderate dose rates to both internal and external ionizing radiation. Because for over 50 years the Russian Government collected and stored data on Mayak workers and residents in surrounding communities along the Techa River exposed to external and internal radiation, there was a large amount of exposure, workplace and clinical data suitable for conducting epidemiological studies.

The Russian Health Studies Program has evolved through four phases since its inception in 1994: (1) coordinating, planning and building infrastructure and facilitating links between US and Russian researchers; (2) conducting feasibility studies and preserving paper records; (3) awarding multi-year projects to researchers whose feasibility studies were judged to be relevant and likely to demonstrate a high probability of success; and (4) refining dosimetry, reducing uncertainty and revising cancer risk estimates.

The products of the program are peer-reviewed publications on cancer risk estimates from worker

and community exposure to ionizing radiation following the production of nuclear weapons in Russia. The scientific return on investment has been substantial. Through 31 December 2015, JCCRER researchers have published 299 peer-reviewed publications.

In the current phase, the core focus of the research is the cancer epidemiology and radiation dosimetry in Mayak workers and Techa River populations. The five current projects in the program are:

(1) Project 1.1: *Techa River Population Dosimetry*
(2) Project 1.2b: *Techa River Population Cancer Morbidity and Mortality*
(3) Project 2.2: *Mayak Worker Cancer Mortality*
(4) Project 2.4: *Mayak Worker Dosimetry*
(5) Project 2.8: *Mayak Worker Tissue Repository.*

All studies are conducted jointly, with both a US and a Russian principal investigator. US researchers are funded through various contractual mechanisms. Russian researchers are funded by a grant from DOE through the Civilian Research and Development Foundation (CRDF) of Arlington, Virginia.

The research is performed by scientists from Mayak and the Southern Urals Biophysics Institute in Ozersk and the Urals Research Center for Radiation Medicine in Chelyabinsk in collaboration with scientists from US universities and DOE National Laboratories. Organizations currently performing the work in the USA are Georgetown University, Pacific Northwest National Laboratory—Battelle, the University of Florida, the University of Southern California and the University of Utah. Also playing a key role in internal dosimetry and mathematical modeling of dose uncertainty are UK Public Health England and Global Dosimetry, Ltd.

Two standing external Scientific Review Groups (SRGs), one in the USA and one in the Russian Federation, consisting of nationally and internationally recognized experts, provide ongoing oversight and written feedback to the researchers on the semi-annual technical progress reports and evaluate proposals.

Besides DOE, the European Commission (EC) also sponsored research in the Southern Urals under the auspices of the Epidemiological Studies of Exposed Southern Urals Populations (SOLO) Program, which was completed in March 2015, and its predecessor Southern Urals Radiation Risk Research (SOUL) Program, which was completed in December 2009. Whereas the Russian Health Studies Program has primarily focused on computing risks from cancer following exposure to ionizing radiation, both the SOLO and SOUL Programs primarily focused on dosimetry data validation, cancer and non-cancer risks in adults and cancer risks following in utero exposure. Through collegial arrangements, close collaboration and active participation in each program's annual review meetings, DOE worked closely with EC's leadership to ensure coordination of the research agendas, minimize duplication and maximize resources. For further details on research conducted with EC sponsorship, please refer to the SOLO Program website at http://www.solo-fp7.eu.

Radiation dose reconstruction systems for large worker and community epidemiological studies by nature are complicated, time-consuming and expensive. Gone are the days of computing point estimates of individual doses, which are needed to compute cancer risk estimates. In an effort to obtain more accurate cancer risk estimates, epidemiologists have requested that dosimetrists not only provide point estimates of individual dose but also generate through a multiple realization approach, dose distributions and concomitant uncertainties about the dose distributions. This is to take into account both shared and unshared errors.

The series of articles in this issue of *Radiation Protection Dosimetry* focus on the Mayak Worker Dosimetry System (MWDS)-2013, which is the most recent iteration of the dosimetry system for the reconstruction of individual doses and assessment of uncertainty about those doses of the Mayak worker cohort. This work is conducted in Project 2.4, *Mayak Worker Dosimetry*. For an overview of Project 2.4, please see http://www.energy.gov/ehss/russian-health-studies-program-active-projects#community.

Project 2.4 provides the dose estimates to companion Project 2.2, *Mayak Worker Cancer Mortality*. The Mayak worker cohort consists of 25 757 workers, 25% of whom were female, first employed between 1948 and 1982 who worked in one or more of the following facilities at Mayak: nuclear reactor plant, plutonium production plant, radiochemical plant and auxiliary facilities. Epidemiologists working on Project 2.2 have published data on bone, lung and liver cancer associated with radiation dose using previous iterations of the dosimetry system, Doses 2005 and MWDS-2008, and are using the updated dosimetry data and uncertainties in MWDS-2013 to reanalyze the data. The enhancements to the reconstructed worker doses discussed in this issue of *Radiation Protection Dosimetry*, with emphasis on the multiple realization approach to dosimetry uncertainty, will further improve the ability of investigators to clarify radiation risks for both cancer and non-cancer effects in the Mayak worker cohort. Project 2.2 epidemiologists are now analyzing the data using the MWDS-2013 dose estimates and are producing revised radiation cancer risk estimates. The next iteration, planned for completion in September 2016, will be called MWDS-2016 and will take into account the impact of health status on dose.

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REFERENCES

Seligman, P. J. *The U.S.-Russian radiation health effects research program in the Southern Urals*. Health Phys. **79**, 3–8 (2000).

Fountos, B. N. and Rabovsky, J. L. *The Department of Energy's Russian Health Studies Program*. Health Phys. **93**, 187–189 (2007).

B. N. Fountos*

**Corresponding author: Barrett.Fountos@hq.doe.gov*