

USTUR NEWSLETTER

DIRECT FROM THE DIRECTOR

Dear Registrants and Families:

I am very pleased to have this opportunity to get in touch with you again and talk about the Registries' activities and achievements during the ongoing year.

The year 2023 is the 55th year of Registries operations, and the impact of the USTUR's research on the field of radiation worker protection is difficult to overestimate. Last year, I was approached by the Health Physics Society (HPS) to organize a special session dedicated the USTUR. This year, ten talks were given during 2023 HPS Workshop on Internal Dosimetry, and the Registries' recognition did not stop there. The Registries continued to publish its research findings in scientific literature; Dr. Avtandilashvili was elected as a council member of the National Council on Radiation Protection and Measurements; and Dr. Tabatadze was nominated for the HPS Board of Directors. Clearly, the USTUR is a small program with a big impact.

Last year, I told you that we had renovated our radiochemistry laboratory by replacing the three original metal fume hoods with new plastic hoods, which are used for sample digestions with acids and plutonium chemical separations. That was done using funds not spent due to pandemic restrictions during 2020-2021. Early this year, we received extra (one-time) funding from the Department of Energy to "increase laboratory operation and research outcomes." With this funding, two additional plastic hoods were purchased and installed in the laboratory. This is the largest improvement since we built the laboratory in 2009. Having five operational hoods will help our radiochemistry team to increase the number of samples analyzed each year.

More details about Registries progress and discoveries are included elsewhere in this Newsletter.

I am honored to thank every Registrant for your continued participation in the USTUR's research and wish you and your families good health and joy in 2024.

Dr. Sergey Tolmachev

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Summaries of the presentations from the USTUR's special session at the 2023 HPS mid-year workshop provide a glimpse of the impact that USTUR donations are making in the field of radiation protection.

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Two aspects of USTUR operations that were restored after pandemic disruptions are discussed: sample inventory and in-person advisory committee meetings.

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Front: Daniel Strom, Elizabeth Thomas, Stacey McComish, Maia Avtandilashvili, Florencio Martinez. Back: Sergey Tolmachev, Martin Šefl, George Tabatadze, Margo Bedell. Inset: Xirui Liu.

A DEEP AND
HEARTFELT
THANK YOU
TO OUR
REGISTRANTS
AND THEIR
FAMILIES!



USTUR SPECIAL SESSION

At the Health Physics Society Midyear Workshop

The 2023 HPS midyear workshop was devoted to the topic of internal dosimetry. Presentations at the meeting covered a wide variety of subjects related to calculating radiation doses from radionuclides that have been deposited inside the human body. Among them was a session organized by the USTUR called, “U.S. Transuranium and Uranium Registries Research.” The presentations given during this session provided a glimpse of the wide variety of topics studied at the USTUR, and with words like “unique resource” and “golden nugget,” it is clear that the scientific community very much appreciates the generosity of our Registrants. Below are summaries of the topics presented at the workshop.



55 years of the United States Transuranium and Uranium Registries: History, contributions, and impact on radiation protection

Sergey Tolmachev (USTUR, Director) opened the special session with a look back to when the Registries was established in 1968. He went on to discuss the ways in which donations to the USTUR have influenced, and continue to influence, our understanding of actinides (such as plutonium, uranium, and americium) in the human body.

Uncertainty in plutonium internal dose estimates for Rocky Flats workers

Martin Šefl (USTUR) used data from nine Rocky Flats workers to determine the level of uncertainty in typical estimates of organ doses based on urinary excretion of plutonium. To do this, he estimated the activity concentrations in the lungs, liver, and skeleton at the time of death based on urine data alone, and compared them to the activity concentrations actually measured in those organs post-mortem.

Unique resources available through collaboration with the USTUR

Nicole Martinez (Clemson University) summarized the types of materials available at the USTUR. From tissue samples to detailed records, the National Human Radiobiology Tissue Repository, located at the USTUR, houses materials associated with USTUR donors as well as individuals who were involved in historical studies such as the radium studies carried out at Argonne National Laboratory.

ICP-MS measurement of plutonium, uranium, and americium in the hair and nail samples of former nuclear workers

John Brockman (University of Missouri) discussed the results of inductively-coupled plasma mass spectrometry (ICP-MS) measurements of plutonium, uranium, and americium isotopes in hair and nail samples from USTUR Registrants. Ultra-trace levels of actinides could be detected in these samples, and an elevated $^{236}\text{U}/^{238}\text{U}$ ratio was measured in two individuals, indicating exposure to re-processed uranium.

Applicability of a unique USTUR dataset: Female nuclear worker treated with chelation therapy after plutonium exposure via inhalation

Sara Dumit (Los Alamos National Laboratory) discussed an opportunity to learn more about chelation biokinetics in a female worker who was exposed to plutonium. Most of the information about plutonium in humans is from male workers, so this presents a unique opportunity.

Hematology profile of a radium dial painter cohort

Ronald Goans (MJW Corporation/REAC/TS) evaluated residual anemia in radium dial painter survivors using archived complete blood count (CBC) results from the historic radium studies conducted at Argonne National Laboratory. Preliminary hematology findings were consistent with microcytic anemia and chronic inflammation in dial painters who had been previously treated for osteosarcoma. These initial conclusions suggest that an analysis of the entire sarcoma cohort would be valuable.

Taurus Advanced – Internal dosimetry software for research

Anthony Riddell (UK Health Protection Agency) provided an overview of the new Taurus Advanced software that is being developed by the UK Health Security Agency. Taurus Advanced is a tool for performing internal dose calculations for research purposes. It has been provided to USTUR faculty free of charge, allowing the USTUR to both use this tool for analysis of Registrant data, and provide feedback on how it can be improved.

Is the autopsy report a “gold standard”?

Xirui Liu (USTUR) discussed the limitations of autopsy reports as a gold standard for cause of death information. Autopsy reports from USTUR Registrants didn’t always include summaries of findings, which made the process of identifying the cause of death more subjective. Additionally, autopsy reports that did not mention clinical information were less likely to match the death certificates. Despite their limitations, autopsy reports remain the best available source of information about why a person died.

USTUR – A golden nugget among DOE resources

John Boice (NCRP, Vanderbilt University) described the USTUR as a “shining light” that has made substantial contributions to the field of radiation protection. The USTUR’s often behind-the-scenes contributions to the Million Person Study “allow the epidemiologist to accurately incorporate organ doses from intakes of radionuclides and conduct dose-response analyses.”

“A truly golden nugget in the DOE system, that adds substantial value to our understanding of the late health effects following intakes of radioactive elements”

~John Boice

A RETURN TO NORMAL

During 2023, our annual advisory committee meeting was held in person, and the USTUR hired a WSU nursing student to inventory samples at our laboratory. This represents the restoration of two important aspects of the USTUR's operations that were disrupted during the pandemic.

SAMPLE INVENTORY RESUMED

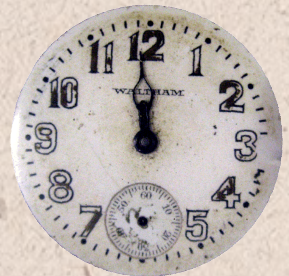
The USTUR has long collaborated with the WSU Tri-Cities' nursing program. Nursing students volunteer their time to assist with autopsies, and they are hired to inventory samples at our laboratory. This mutually beneficial arrangement provides students with unique experiences that shape them as nurses, and it has allowed the USTUR to create a detailed inventory of tissues materials. In 2023, Seokyoung Kim was hired to inventory samples. Her primary responsibility is to maintain an accurate inventory of USTUR samples. However, she is also inventorying a collection of samples from studies carried out at Argonne National Laboratory. This collection, which includes the radium dial painters, has been held at the USTUR's National Human Radiobiology Tissues Repository since the 1990s.

MEETING IN PERSON

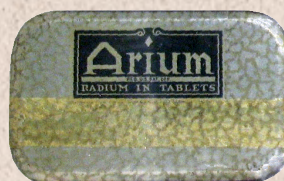
April marked the USTUR's first in-person scientific advisory committee meeting since 2019. USTUR staff along with its scientific advisory committee, Department of Energy program director, and others associated with the program gathered in Richland, WA to discuss the USTUR's activities during the past year. Additionally, collaborators and interested scientists from around the world joined the meeting virtually. This hybrid format facilitated valuable professional connections and informal conversations about the Registries that will enhance the quality of our research. A strong professional network is vital to maintain both the quality and the amount of research that can be accomplished each year. It also ensures that experts in the radiation protection field are aware of the research carried out at the USTUR such that it can be incorporated into radiation protection guidelines.

RADIUM DIAL PAINTERS: What were the radium studies?

In the early 1900s, it was found that objects painted with radioluminescent paint were visible in the dark. Radium was combined with a phosphorescent material like zinc sulfide to create this paint, which was applied to objects such as watch dials



and military instruments. The women who worked in the dial factories painting these dials often tipped the brushes in their mouths to obtain a finer point, and many ingested significant amounts of radium. In addition to the occupationally exposed dial workers, numerous people ingested radium for therapeutic purposes. Products such as Radithor (radium spiked water) and Arium (radium tablets) were touted as a cure for a wide range of ailments. Studies of people who had intakes of radium were carried out at Argonne National Laboratories and other institutions. As a result of the unfortunate experiences of these individuals, intake limits were set not



only for radium workers, but also for plutonium workers. The earliest protection standards for plutonium workers were based on these radium studies.

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