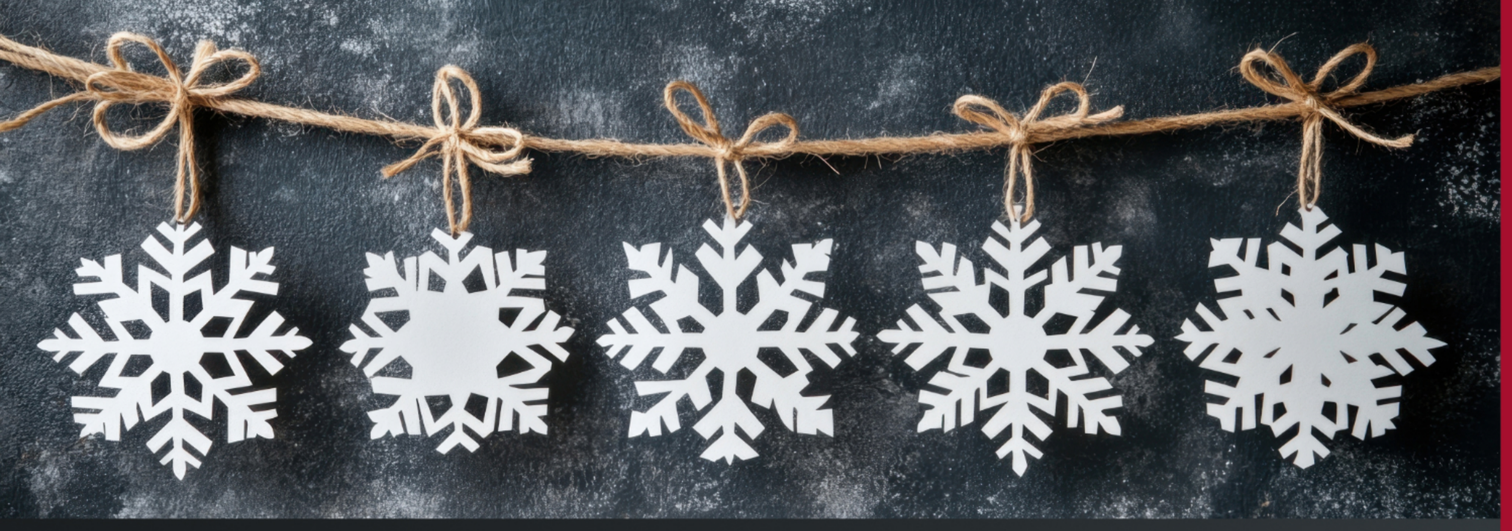


USTUR Newsletter

Issue 30 • December 2024
USTUR-0689-24

A sincere **Happy Holidays**
from all of us at the USTUR!

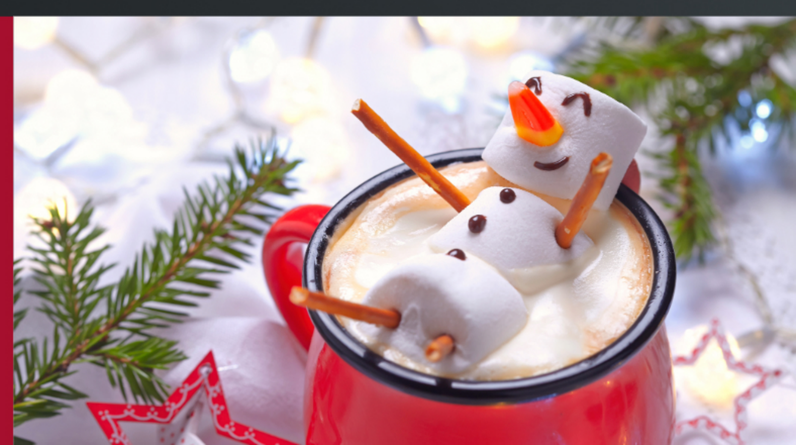
Direct from the director

Dear Registrants and Families:

For the last three years, I have been updating you on progress we have made to bring our Radiochemistry laboratory to a new level. While radiochemical analyses are important, they are not the only thing that makes the USTUR a unique research program. Some of you probably are familiar with the term *health physics records*. It is a 'collection' of records that we received from the worksites for each of our Registrants. This typically includes occupational and exposure records, bioassay (urine and/or fecal) analyses results, in-vivo (whole-body) counting results, and information on medical procedures performed to reduce radiation dose (decorporation or surgical treatment). Knowledge about what happened, when it happened, and what has been done is as important as the final radiochemistry results for conducting high-quality research in radiation protection. *Two halves make a whole.* When I began working at the Registries in 2007, all health physics records were on paper. There was (and still is) an entire room full of file cabinets that are filled with hundreds of files, which are hundreds of pages each. Anthony James (USTUR director in 2005–2010) used to call this room a 'gold mine' – the scientific information in those paper files is highly valuable, but, at the time, it required a lot of effort to find out what information was there. The need for a health physics database – where records would be stored in a uniform, standardized, and searchable format – was rather obvious. On December 12, 2008, Stacey McCord (now McComish) completed standardization of Case 0202 from Rocky Flats. The health physics database was born! Since Stacey had many other duties and responsibilities, it was a slow process. On January 23, 2012, Maia Avtandilashvili joined the USTUR as a health physicist and took the lead role in database development and population. Case by case, file by file, page by page, and record by record, in punctilious detail, Maia went through the documents. On August 15, 2024, standardization of exposure and bioassay records for USTUR Registrants was completed! Over 16 years, a total of 191,961 records from 395 individuals was entered into the database. It was an excellent 'birthday present' to the Registries, which was established on August 16, 1968. More details about our progress in 2024 are included elsewhere in this newsletter. With this, I would like to thank all of you who have remained with the Registries for so many years and wish you and your families good health and joy in 2025.

~Sergey Tolmachev

THIS ISSUE



How accurate are death certificates?

The USTUR has both death certificates and autopsy reports for most of its Registrants. This has offered a unique opportunity to determine how accurate death certificates are among this population of former nuclear workers. It turns out that, for USTUR Registrants, the underlying causes of death on death certificates match the autopsy reports 75% of the time, at a broad disease level. This means that both the death certificate and the autopsy report agreed about the type of disease a person died from, such as cancer or circulatory disease; however, the two documents may not have agreed on the specific type of cancer or circulatory disease. While a misclassification rate of 25% is surprisingly high (at least it was to me!), it is consistent with the findings of other studies. The type of disease has a big impact on the likelihood that a death certificate will match the autopsy report. Cancer is most likely to agree with the autopsy report (90% of the time), while respiratory disease is least likely to match the autopsy report (39%). It seems likely that low rate of agreement for respiratory disease is due to the prevalence of multiple conditions at the time of death. For example, an individual may have had chronic obstructive pulmonary disease (COPD), diabetes, hypertension, and pneumonia at the time of death, all of which may have contributed to death, making it difficult to choose just one underlying cause of death.

Death certificates can list multiple diseases that contribute to death, but epidemiological studies often rely on a single **underlying cause of death** to look for associations between dose and disease. The underlying cause of death is the disease (or injury) that started the chain of events that led to death. So, if a person died from pneumonia as a consequence of another disease, such as cancer, the other disease would be considered the underlying cause.

Does this change epidemiology studies?

The next natural question is, how do these death certificate inaccuracies impact epidemiological studies, which often rely on death certificate data? The good news is that the rate of misclassification among USTUR Registrants was the same for those who were exposed to high doses of radiation as it was for those who were exposed to low doses of radiation. Traditionally, it is believed that this kind of misclassification adds noise to an epidemiological study, potentially making it more difficult to detect a true disease effect. It also implies that if a statistically significant association between dose and disease is observed, it would still have been observed if the researcher had been able to correct for misclassification. Often, this is the case; however, simulation studies suggest that it is possible for misclassification to have the opposite effect, such that the study concludes that there was a significant association between radiation and disease, when in fact there was none. The reason for this comes down to the nature of random chance. Just as it is possible, that one could toss six quarters and have more than three land heads up, it is also possible that proportionally more non-cancer cases could be misclassified as cancer in the high radiation dose group than in the low dose group. The chances that this will lead to incorrect conclusions in epidemiological studies is greatest for studies where the association between dose and disease is barely significant, and for misclassification rates that are low.

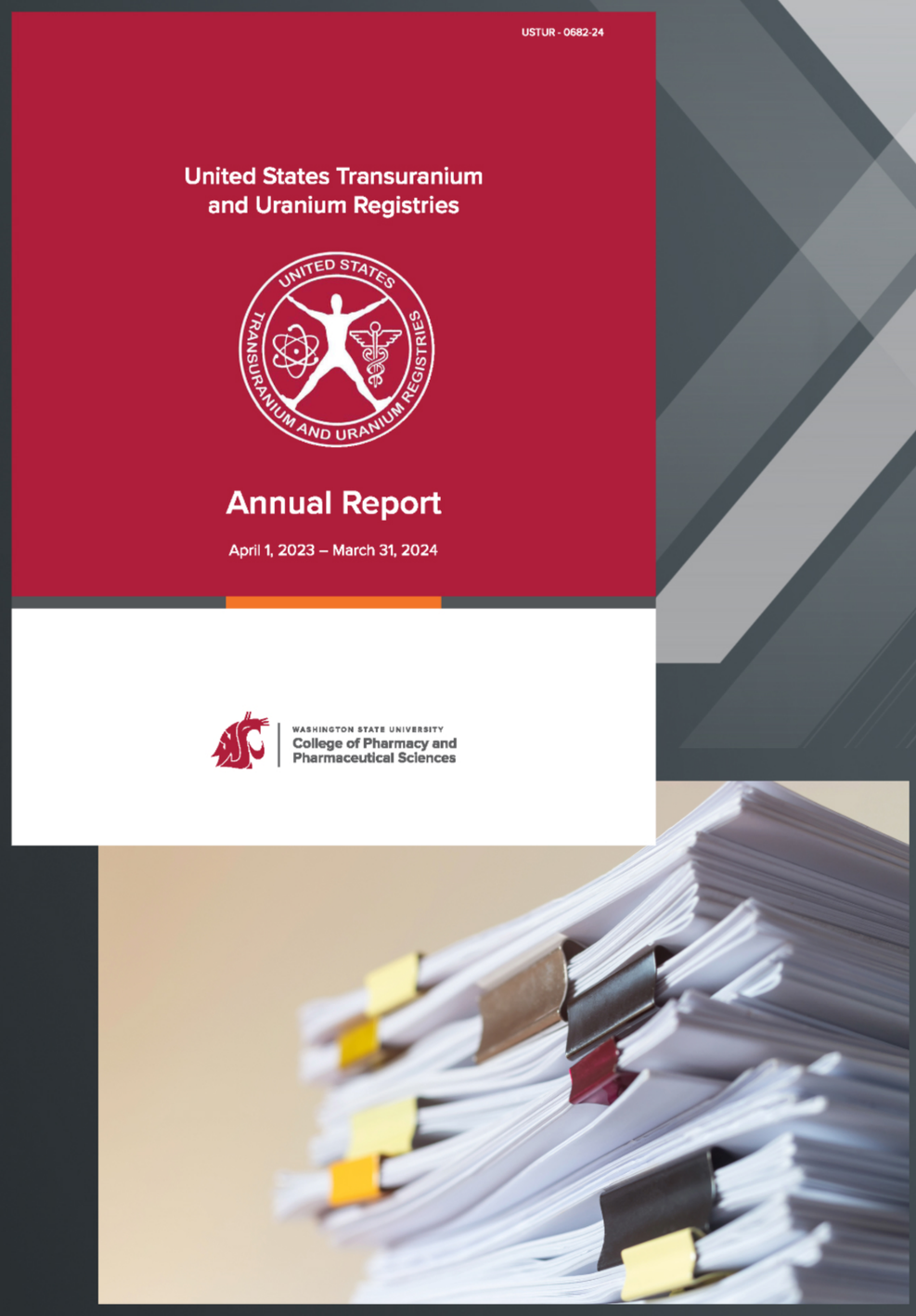
Download our Annual Report

Do you want to learn more about the work carried out at the USTUR? You may like to take a look at our annual reports. They provide summaries of both research and the more operational aspects of the Registries.

https://ustur.wsu.edu/publications/annual-reports/

Topics in our most recent report include:

- uncertainties in plutonium organ doses,
- distribution of plutonium and radium in the human heart, and
- operational topics such as: radiochemistry, finances, and standardization/digitization of health physics records.

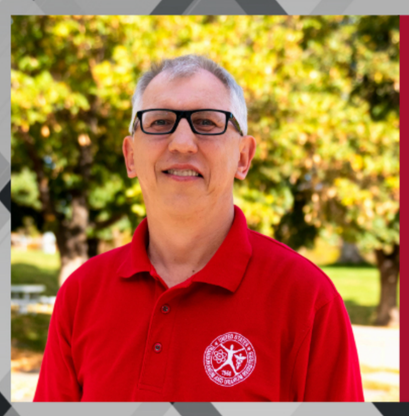


Characterizing plutonium solubility for worksite-specific dose assessments

Information about the solubility of inhaled plutonium is critical to making accurate estimates of doses to workers. This is because soluble and insoluble plutonium behave differently in the human body. Soluble plutonium is dissolved in the lungs, absorbed into the bloodstream, and either excreted in urine or deposited in the liver and skeleton. Conversely, insoluble plutonium tends to stay in the lungs for long periods of time, where a portion of it is cleared to lymph nodes in much the same way that the lungs clear cigarette residues to the lymph nodes. Thus, inhaled insoluble plutonium results in higher lymph node-to-lung concentration ratios and lower liver-to-respiratory tract content ratios than would be seen with soluble plutonium, where the respiratory tract includes both lung tissue and respiratory tract lymph nodes. We recently compared these ratios for 291 Registrants who worked at Hanford, Los Alamos, and Rocky Flats - in order to characterize the solubility of plutonium at each of these worksites. The lymph node-to-lung ratios did not vary significantly among the three worksites; however, the lymph node-to-lung ratios were significantly lower for smokers than for non-smokers. This indicated that smoking impaired the lung's ability to clear plutonium to the lymph nodes. A comparison of liver-to-respiratory tract ratios indicated that Registrants were typically exposed to a mixture of soluble and insoluble materials. The material type at Hanford was most soluble, Rocky Flats material type was least soluble, and Los Alamos material type fell somewhere in between.

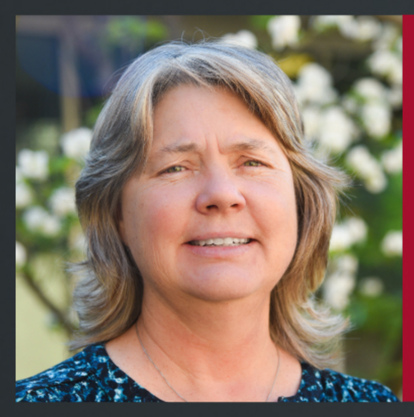
MEET THE TEAM

DIRECTOR

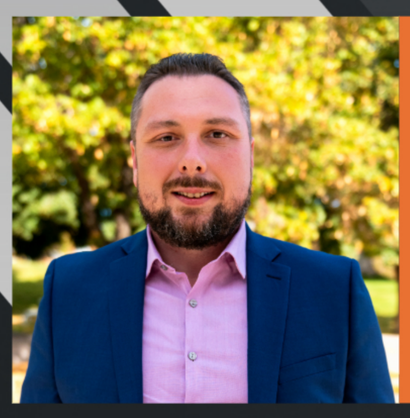


Sergey Tolmachev
Principal Investigator
Radiochemistry

ANSWERS PHONES - YOU'VE PROBABLY TALKED TO MARGO IF YOU'VE CALLED US

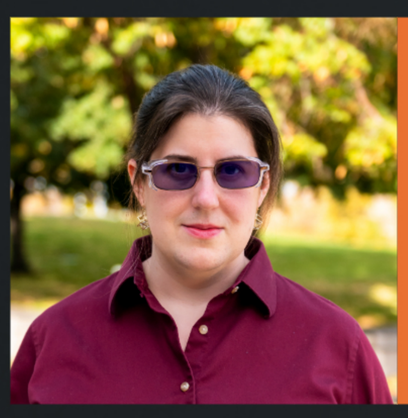


Margo Bedell
Program Specialist
Accounting

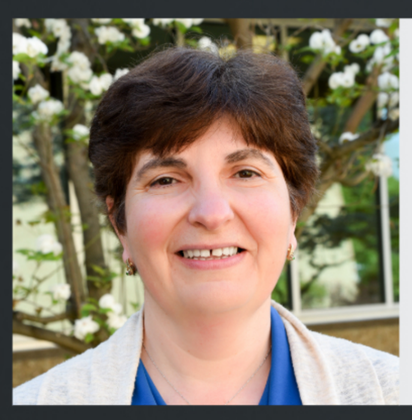


George Tabatadze
Associate Professor
Radiation Measurements

SAMPLE ANALYSIS

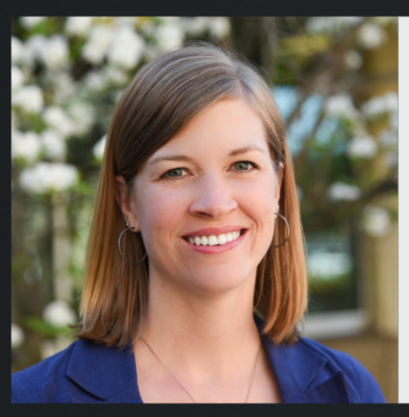


Elizabeth Thomas
Laboratory Technician
Radiochemistry

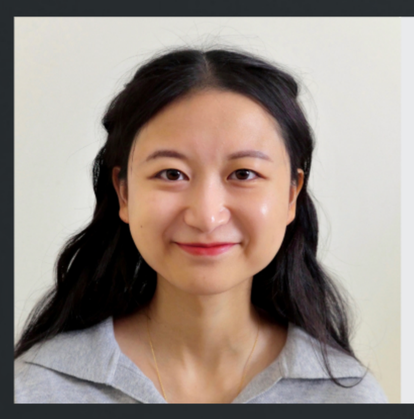


Maia Avtandilashvili
Associate Professor
Health Physics

RESEARCH



Stacey McComish
Associate in Research
Health Physics



Xirui Liu
Associate in Research
Public Health

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