

USTUR Newsletter

DIRECT FROM THE DIRECTOR

Dear Registrants and Families:

It is my pleasure to have this opportunity to provide an update on Registries' activities and achievements in 2017. I am glad to tell you that on April 1, 2017, the U.S. DOE renewed the USTUR program for the next 5-years. And even a better news – the USTUR operational budget increased by 20%! This is the first time, in the 50-year history of the program, that the funding has been increased. Clearly, our 2016 special session at Health Physics Annual Meeting attracted a lot of attention and re-emphasized the importance of the USTUR's research, its uniqueness, long history, and important contribution to the science. Last year, we talked about events dedicated to the upcoming 50th anniversary of the Registries in 2018. USTUR team is working hard to prepare a special issue of Health Physics journal and we are planning to publish it in March-April 2018.

During las few years, USTUR team has been involved with Mayak Worker Dosimetry System-2013 (MWDS-2013) project, sponsored by DOE's Russian Health Studies Program and 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 collaboration with scientists from Russia, UK, and US, the Registries published three scientific papers in a MWDS-2013 special issue of the Radiation Protection Dosimetry journal. Findings from this collaboration were adopted by the International Commission on Radiological Protection for better prediction of radiation dose to the lungs in case of exposure to soluble plutonium materials.

More details about Registries progress and discoveries are included elsewhere in this Newsletter. Our thanks goes out to you and we wish you a happy holiday season!

Sergei Tolmachev

INSIDE THIS ISSUE

Direct from the Director.....	1
Funding Increase!.....	2
New Website	3
Presenting the Research.....	3
Q & A: Plutonium in Humans	4
Plutonium in Brain Tissue	4
Welcome!	4
Assuring the Quality of our Measurements.....	4
With Great Sadness	4



FUNDING INCREASE!

The USTUR is pleased to announce that the Department of Energy has increased our funding! Starting April 1st, our yearly operating budget increased from \$900,000 to \$1,100,000. DOE officials recognized that the USTUR had been operating on a “shoestring” budget for some time, and that improved

funding was necessary. This additional funding will allow the Registries to keep up with increasing operational costs (inflation), to continue to learn from former nuclear workers, and to better protect future nuclear workers.

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NEW WEBSITE

Last August, the USTUR launched a new website. The new site is designed to be more user friendly than the previous (10-year-old!) website. The homepage displays “news” related to both the USTUR as an organization, and to faculty activities and achievements. We invite you to check out the site, and we welcome any comments or suggestions that you may have.

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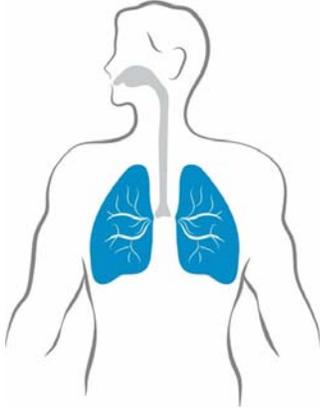


PRESENTING THE RESEARCH

The USTUR recognizes that faculty must present research findings at scientific meetings to maximize the impact of the USTUR’s work (and your generosity). Scientific meetings not only provide an opportunity to promote USTUR’s name and research, they also play a key role in maintaining (and increasing!) DOE grant funding and in forming collaborations with others in the field of radiation protection and research. In 2017, USTUR research was presented ten times at four meetings and two seminars:

- 4** Presentations at the annual Health Physics Society meeting
- 2** Presentations at European Radiation Dosimetry Group (EURADOS) Network on Internal Dosimetry meeting
- 2** Presentations at the Asia-Pacific Symposium on Radiochemistry
- 1** Hour-long seminar for WSU’s College of Pharmacy Graduate Research Seminar Series
- 1** Hour-long seminar for Oregon State University’s School of Nuclear Science and Engineering

Q & A: PLUTONIUM IN HUMANS



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The highest activities (disintegrations per minute) of plutonium are found in our Registrants' lungs, skeletons, and livers. These three tissues contain about 90% of the plutonium in an exposed person's body.

Q: Why is plutonium found in the lungs?

Plutonium is found in the lungs, because most of our Registrants were exposed by inhalation. When plutonium is inhaled, it deposits in the lungs. After that, it is absorbed to the bloodstream and is either excreted in urine/feces, or it is distributed to the rest of the body (mostly to the liver and the skeleton).

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Q: How long does plutonium stay in a person's lungs?

The amount of plutonium that remains in the lungs five, ten, or even fifty years after being inhaled depends upon the chemical makeup of the plutonium. Some plutonium compounds, such as those that are likely to have been encountered by chemists, are easily dissolved (e.g., they are soluble). Highly soluble plutonium is quickly absorbed into the bloodstream, leaving little to no plutonium in the lungs. Other compounds, such as plutonium metals,

are insoluble. Insoluble material is absorbed slowly, and will stay in the lungs of an exposed worker for a long time.

Q: Does uranium concentrate in the same organs?

Inhaled uranium is still found in the lungs, skeleton, and liver; however, the kidneys are the main organ of concern for uranium. This is not due to uranium's radioactivity, but rather due to its chemical toxicity. Animal studies have shown that it can cause kidney damage.

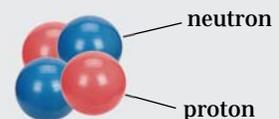
DID YOU KNOW?

Recent USTUR research has found that a small amount of highly soluble plutonium can remain in the lungs 40+ years after a worker inhales plutonium. Previously, it was expected that no highly soluble plutonium would remain after such a long time. ICRP (the International Commission on Radiological Protection) will incorporate this finding into its upcoming report on how to calculate dose to the lung from inhaled soluble plutonium.

PLUTONIUM IN BRAIN TISSUE

USTUR researchers have detected plutonium in brain samples from 66 Registrants. The concentrations (activity per gram of tissue) found in brain tissue are similar to those found in other soft tissues, such as muscle, and are lower than the concentrations found in bone and liver tissues. Still, this came as a surprise to a number of scientists, because it was thought that plutonium could not pass the blood-brain barrier, and therefore would not be found in the brain. This finding is of a particular interest to NASA (National Aeronautics and Space Administration) in their studies of behavioral and cognitive impairments due to effects of space irradiation on the central nervous system. The type of radiation (alpha particles) emitted by plutonium-239 could serve as a surrogate for studying the potential effects of cosmic radiation on astronauts during long term space missions.

ALPHA PARTICLE



An alpha particle is a helium nucleus (2 protons and 2 neutrons)

WELCOME!



We would like to take a moment to welcome Daniel J. Strom as a health physics consultant to the USTUR. Dr. Strom is advising a PhD student, Sara Dumit, who is using USTUR data to study the removal of plutonium from the human body during treatment. He is also an adjunct faculty member, and has extensive experience in radiological sciences.

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ASSURING THE QUALITY OF OUR MEASUREMENTS

High-fired plutonium oxide is an extremely insoluble form of plutonium, which can be generated during a plutonium fire or explosion. Radiochemical laboratories, such as ours, must use proper procedures to detect high-fired oxides. If a laboratory does not use the proper procedures, the amount of plutonium in a sample will be underestimated.

In 2011, the Mixed Analyte Performance Evaluation Program (MAPEP) created a soil sample to which a known amount of high-fired plutonium oxide had been added. The sample was designed to find out if laboratories, such as ours, are able to accurately measure the activity of high-fired plutonium in a sample.



MAPEP soil sample

The USTUR requested that some of the MAPEP soil sample be sent to us. While we believed that our procedures could detect high-fired oxides, this was an excellent opportunity to reconfirm that our methods are valid. We are pleased to say that our radiochemistry laboratory was able to measure the correct amount of high-fired plutonium, as well as the correct amounts of americium and uranium, in the sample. This is good news! Given that human tissues are easier to analyze than soil, we remain confident in our measurements of plutonium, americium, and uranium in tissues donated by USTUR Registrants.

WITH GREAT SADNESS



On September 14, 2017 a former USTUR director, Ronald Filipy, passed away. Ron worked for the Registries for 15 years, and was director for 6 years prior to his retirement in 2005. While at the USTUR, he worked closely with scientists from the Dosimetry Registry of the Mayak Industrial Association (DRMIA), a Russian program that is similar to the USTUR.