

# USTUR Newsletter

## Direct from the Director

### Special points of interest:

- 35 years of data collecting
- we can now estimate the amount of plutonium or americium in the entire skeleton
- we can now determine the relationships between individual bone and skeletal uranium contents

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The official mission statement of the USTUR is as follows: The Registries are a unique human tissue research program studying the deposition, biokinetics, and dosimetry of the actinide elements with the primary goals of providing data fundamental to the verification, refinement, or future development of radiation protection standards for these and other radionuclides, and of determining possible bioeffects on both a macro and subcellular level attributable to exposure to the actinides.

That is quite a mouthful and probably it may not mean much to someone other than a radiation dosimetrist. So, this year, I'd like to use this newsletter to explain what it means in plain English. And, I'll give a few examples of ways that we use the data that the USTUR have been collecting for

the past 35 years. I realize that I run the risk that some of you will think that I'm "talking down" to you with technical backgrounds so I apologize, in advance, to all those folks and I ask you to keep in mind that not all nuclear workers are nuclear engineers.

Most of you have the experience of submitting urine samples to your company dosimetry groups and many of you have spent some time in whole-body counting rooms with radiation detectors over your bodies and soft music playing. Most of you have also worn dosimetry badges containing photographic film and, later, small dosimetry chips in little plastic bubbles. With your permission, we have collected the results of your urinalyses, whole body counts, and radiation dosimetry measurements. The following article describes what we do with all that information as well as with the organ samples that we analyze after an

autopsy.

Last year, we talked a little about the potential health effects of plutonium, americium, and uranium and we gave you a quick summary of what we have learned about the distribution of those elements in the body. We still have a few copies of that Newsletter if you missed it and we also have some extra copies of the USTUR Annual Report that we wrote for the U. S. Department of Energy, if you are interested in seeing that. You can get one or both of those documents, by calling our toll-free telephone number (page 4) or on our website and you are certainly welcome to them.

Our thanks goes out to you for providing us with the information that we use in our work and we wish that you all will have a happy holiday season.

*Dr. Ronald E. Filipy*

## Body Language

*The USTUR - Serving as Resources for R*

The USTUR donors have been invaluable for the determination of the specific distributions of plutonium, americium, and uranium in the human body

*“We are rich only through what we give, and poor only through what we refuse”*

*Anne Swetchine*

The USTUR has received more than a dozen whole body donations during the last 35 years. These donations have been invaluable for determination of the specific distributions of plutonium, americium, and uranium in the human body because all of the body organs were analyzed. We analyzed each bone of the skeleton individually to learn the plutonium, americium, or uranium contents in the entire skeleton.

In a recent research paper, published in the journal Health Physics, we showed the relationships between plutonium and americium contents of individual bones and the contents of the entire skeleton. Because of this work, we can now estimate the amount of plutonium or americium in the entire skeleton if we know the contents of only a few bones collected at an autopsy. We usually collect a rib, a knee cap, or a collar bone at autopsies on non-whole body donors and they are good indicators of the skeletal content of plutonium and americium.

We continue this work because we have analyzed four whole body donations for uranium and we can now determine the relationships between individual bone and skeletal uranium contents. Within a short time, we will be able to estimate the amount of uranium in the entire skeleton, based on a

few bone samples taken at autopsy. The skeleton and the liver are the two organs where most of the plutonium, americium, and uranium goes. This lets us use the estimate of skeletal contents and the measured content of the liver to estimate the systemic content of the three radionuclides. (Systemic content refers to the content of the whole body with the exception of the respiratory tract.) We will add the measured contents of the lungs and associated lymph glands to the systemic content to get reliable estimates of the total amount of plutonium, americium, or uranium in all Registrant cases—even those that donated only a few bones and organs. This means that we can calculate radiation doses for each of the major organs of the body.

### Just Testing

We were able to develop all of these dosimetry methods because of the generosity of the first dozen, or so, whole body donations. The data that we get from the more recent whole body donations will permit further refinements to those methods by increasing the accuracy of the estimates.

When there is a radionuclide such as plutonium in your body, a small fraction of it will be excreted with urine during each day. If there was a sudden in-

crease in the amount of the radionuclide in your daily urinary excretion. It generally means that you had an accidental intake of plutonium, either into your lungs by inhalation or into your system through a contaminated wound. There are mathematical equations (called models) that can be used to relate your daily urinary excretion of plutonium, for example, to your systemic content. Also, there are mathematical models that are used to estimate the amount of a sudden intake, based on an increase of your daily urinary excretion. The internal radiation dosimetrists at nuclear sites that processed radioactive materials, such as Hanford, all used these mathematical models to estimate the amounts of accidental intakes and the amounts present in your body at any given time. Occasionally, those estimates may have caused you to be transferred to a workplace where there was no further risk of your exposure to the radioactive materials.

Not all of the nuclear sites used exactly the same dosimetry models to estimate body contents although all of the models used were based on the same basic ideas that were proposed by the International Commission on Radiological Protection (ICRP). The models used for many years to the present were based on ICRP-30 proposals published in the 1970's and those were largely based on

## Radiation Dosimetry and Biological Effect

experiments with animals. A number of comparison tests were performed, in which sets of made-up bioassay data were sent to the internal dosimetry offices of nuclear sites to see if they could use those data to calculate consistent estimates of the amount of radioactive materials present in the made-up subjects. Generally, their estimates were similar, but with a great deal of site-to-site variation and there was no "correct answer" to compare with because the subjects were not real. During the 1990's, a new set of ICRP (ICRP-66 and -67) proposals were published, still generally based on animal data; however, more data from human experiences were incorporated into the

new dosimetry models. Now, consideration is being given to use the new computerized models at all Department of Energy sites that process radioactive materials. It would be helpful to learn how the new models compare with the old models and how accurate the new models are when compared to the amounts in a body that were actually measured. This is where the USTUR comes in.

The USTUR has initiated a bioassay interpretation project, together with the internal dosimetry groups at Los Alamos, Savannah River, Rocky Flats, and Hanford. We selected 16 USTUR cases for this project. The radiation dosimetrists at each of the four sites will

use the bioassay data of the 16 cases and their respective dosimetry models to estimate the plutonium contents of the lungs, livers, and skeletons in those cases at the time of death. We will compare the estimates from each site to those from the other sites and to estimates made with the new ICRP models. Finally, we will compare the estimates with the plutonium contents of the organs that we measured by analysis of the organ samples obtained at autopsy. This type of exercise is precisely what the founders of the USTUR had in mind when the USTUR was formed 35 years ago.

Furthermore, the European Commission has asked for

our bioassay data to use in bioassay interpretation studies performed by many laboratories throughout Europe. This clearly illustrates the USTUR's recognition as an internationally recognized resource for radiation dosimetry.

All of this is possible because of you Registrants who, long ago, recognized the value of your experiences to your fellow workers and made the commitment to participate in the USTUR program.

## Heads Up

The USTUR will be contacting eighty-eight Registrants starting this month to renew their agreements with the Registries. This coming year, 2004, is a major renewal year for the Registries. The Registries renew

each Registrant every five years to give the Registrants an option to reconsider their donation. If you are up for renewal and receive a renewal packet, please complete your forms, obtain your witness signatures and

return the renewal paperwork in the postage paid envelope provided in your packet to the Registries as soon as possible to ensure that there is no lapse in your participation.

## Associate Director Retires



John J. Russell, Former Associate Director  
United States Transuranium and Uranium

John J. Russell, Curator and Radiobiologist for the National Human Radiobiology Tissue Repository and Associate Director for the Registries retired in July of this year. John and the NHRTR collection came from Argonne National

Laboratory in 1992 after the USTUR program was transferred to WSU from the Hanford Environmental Health Foundation at the Hanford site. John contributed greatly to the Registries and will be dearly missed.

A search to fill the vacant Associate Director position is underway and the position is expected to be filled by early 2004.

## Note From Editor

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Writing and editing this newsletter with the Director every year is a highlight of the year. The Director and I enjoy being able to stay in contact with Registrants and bring interesting articles and facts about the research that the Registries are able to achieve due to the generous donations of our Registrants.

If you have an idea of something that you would like to see featured in our next newsletter, please feel free to contact us and let us know. We enjoy hearing from our Registrants and would love to receive your feedback as to

how valuable this newsletter is to you or how we may improve on it.

So lets hear from you!

Sincerely,

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## From Our Family to Yours

The United States Transuranium and Uranium Registries would like to thank you and your family for your participation in the program. We wish you all a happy holiday season and best wishes for the new year!

### Check Us Out On The Web

The USTUR website is constantly changing and things are being added throughout the year. If you have access to the Internet and would like to learn more about the research of the United States Transuranium and Uranium Registries and what the data have shown, log on and check us out!

[www.ustur.wsu.edu](http://www.ustur.wsu.edu)

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