2013 Scientific Advisory Committee Meeting
Courtyard Marriott Hotel, Richland, WA
September 6 – 7, 2013

2012 SAC Recommendations and 2013 Overview

Sergei Y. Tolmachev, *PhD*

USTUR Director
Associate Research Professor, College of Pharmacy
Washington State University

stolmachev@wsu.edu

"Learning from Plutonium and Uranium Workers"

WASHINGTON STATE UNIVERSITY
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2012 Family Representative's Concerns

- Lack of progress in the analytic study of father's tissue donations
- Lack of communication from the USTUR regarding results from related scientific studies to donors/ families
- Limited "PR" from USTUR to donors/families about program status

2012 Family Representative's Positives

- Favorable impression of the USTUR staff, mission, facilities – overall professionalism
- Commitment from DOE for continued funding at adequate levels – 5-year grant
- Increased research efforts and 'visibility' through presentations, publications, and participation in various conferences
- Expanded roles for USTUR building on current scientific, technical, administrative strengths

2012 SAC's Comments/Recommendations

- Following the 2012 Annual Meeting, the SAC made 7 comments and 8 specific recommendations

2012 SAC's Comments

- Excellent progress on the Radiochemistry and Health Physics database
- Excellent collaboration with PNNL and others
- High productivity was achieved on limited funding
- The USTUR staff is self-motivated, qualified, and capable
- Continue developing mechanisms for being a resource for other research
- 2012 SAC Annual Meeting was very useful, and better than the teleconferences
- Encourage progress toward understanding of the ownership of USTUR samples

Recommendation #1

Improve communication with Registrants and their Families

2013 Registrant Newsletter

June 2013 USTUR-0346-13, Issue 19

USTUR Newsletter

Direct from the Director

It is my pleasure to have this opportunity to keep in touch with you and provide you with our recent updates.

Previously, our readers used to receive this newsletter around the Christmas/New Year holidays; now, it is almost summer. This is because the beginning of our fiscal year was changed from October to April. Thus the holiday season has become very busy with preparing new grant proposals. As such, you can expect to receive future Registrant newsletters during late spring or early summer. As a side note, our grant proposal was successfully submitted to the DOE. For the current 5-year grant period, we were awarded 4.5 million, which is lower than the 6 million we requested. We wish our request had been granted; however, given our hard financial times, receiving this substantial amount is advantageous and we will do everything in our power to spend the allocated funds with the utmost benefit for the Registries.

Now I would like to proceed to scientific as well as practical affairs, providing you with several highlights.

First, I would like to welcome our new Scientific Advisory Committee Chairman – Dr. Richard Toohey and our new radiochemist – Ms. Elizabeth Thomas. With Ms. Thomas' arrival, I look at radiochemistry with redoubled optimism – now we have two radiochemists on board.

In March, the 2012 USTUR Annual Report was published; it includes our progress reports from October 2010 to March 2012. This report was widely distributed nationally and internationally. You can download it from our website or call to request a copy.

In addition, I would like to emphasize the publication of papers on such topics as mesothelioma and radiation, and validation of the plutonium lung model in leading international journals.

You will read about these highlights and more in this newsletter. This year, following recommendations from our Scientific Advisory Committee – who stated that our language was too scientific, we made all efforts to write in plain, clearly understandable language. We hope our attempts were successful.

To conclude, I want to underscore that all of our accomplishments could happen only because of our donors – without our Registrants, nothing would be possible.

Best wishes,

Sergei Y. Tolmachev

Inside this Issue

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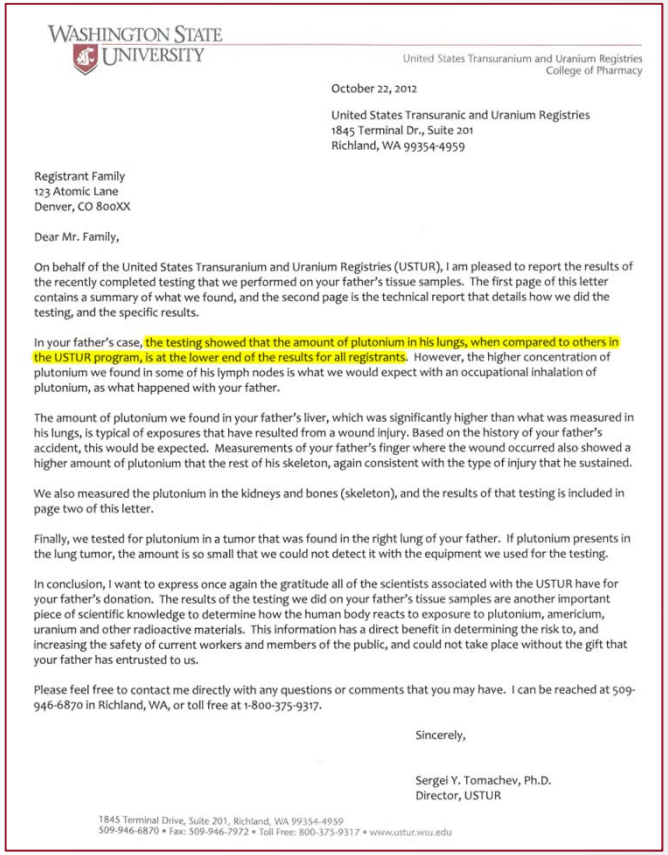
- Published: June 2013
- Distributed:
  - ✓ 70 Registrants
  - ✓ 112 Families
- Efforts:
  - ✓ Less technical
  - ✓ Simple language
  - ✓ Next-of-kin article

Reporting Results to the Families



WASHINGTON STATE UNIVERSITY

United States Transuranium and Uranium Registries
College of Pharmacy

October 22, 2012

United States Transuranic and Uranium Registries
1845 Terminal Dr., Suite 201
Richland, WA 99354-4959

Registrant Family
123 Atomic Lane
Denver, CO 80OXX

Dear Mr. Family,

On behalf of the United States Transuranium and Uranium Registries (USTUR), I am pleased to report the results of the recently completed testing that we performed on your father's tissue samples. The first page of this letter contains a summary of what we found, and the second page is the technical report that details how we did the testing, and the specific results.

In your father's case, the testing showed that the amount of plutonium in his lungs, when compared to others in the USTUR program, is at the lower end of the results for all registrants. However, the higher concentration of plutonium we found in some of his lymph nodes is what we would expect with an occupational inhalation of plutonium, as what happened with your father.

The amount of plutonium we found in your father's liver, which was significantly higher than what was measured in his lungs, is typical of exposures that have resulted from a wound injury. Based on the history of your father's accident, this would be expected. Measurements of your father's finger where the wound occurred also showed a higher amount of plutonium that the rest of his skeleton, again consistent with the type of injury that he sustained.

We also measured the plutonium in the kidneys and bones (skeleton), and the results of that testing is included in page two of this letter.

Finally, we tested for plutonium in a tumor that was found in the right lung of your father. If plutonium presents in the lung tumor, the amount is so small that we could not detect it with the equipment we used for the testing.

In conclusion, I want to express once again the gratitude all of the scientists associated with the USTUR have for your father's donation. The results of the testing we did on your father's tissue samples are another important piece of scientific knowledge to determine how the human body reacts to exposure to plutonium, americium, uranium and other radioactive materials. This information has a direct benefit in determining the risk to, and increasing the safety of current workers and members of the public, and could not take place without the gift that your father has entrusted to us.

Please feel free to contact me directly with any questions or comments that you may have. I can be reached at 509-946-6870 in Richland, WA, or toll free at 1-800-375-9317.

Sincerely,

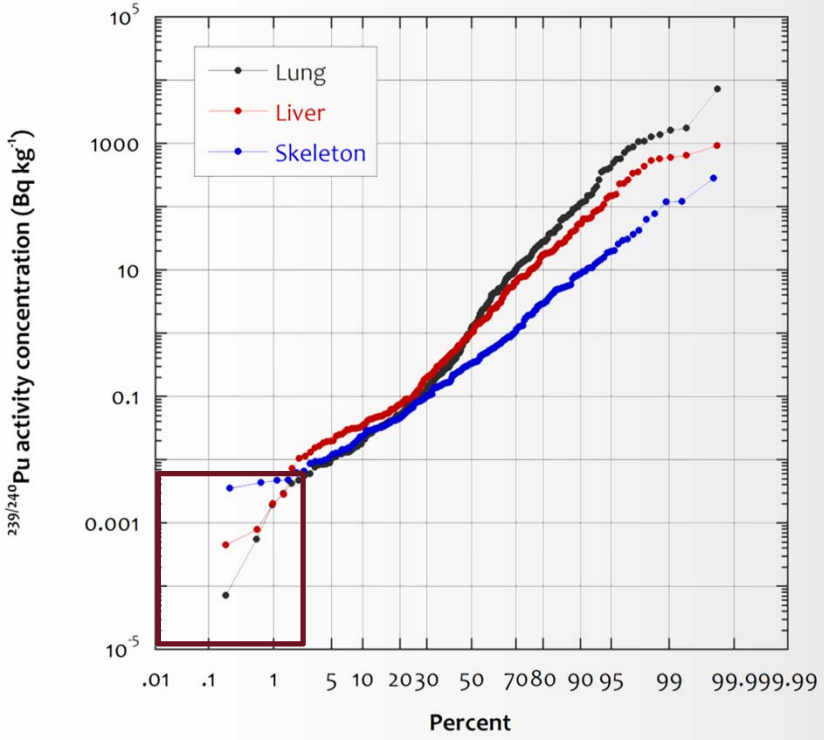
Sergei Y. Tomachev, Ph.D.
Director, USTUR

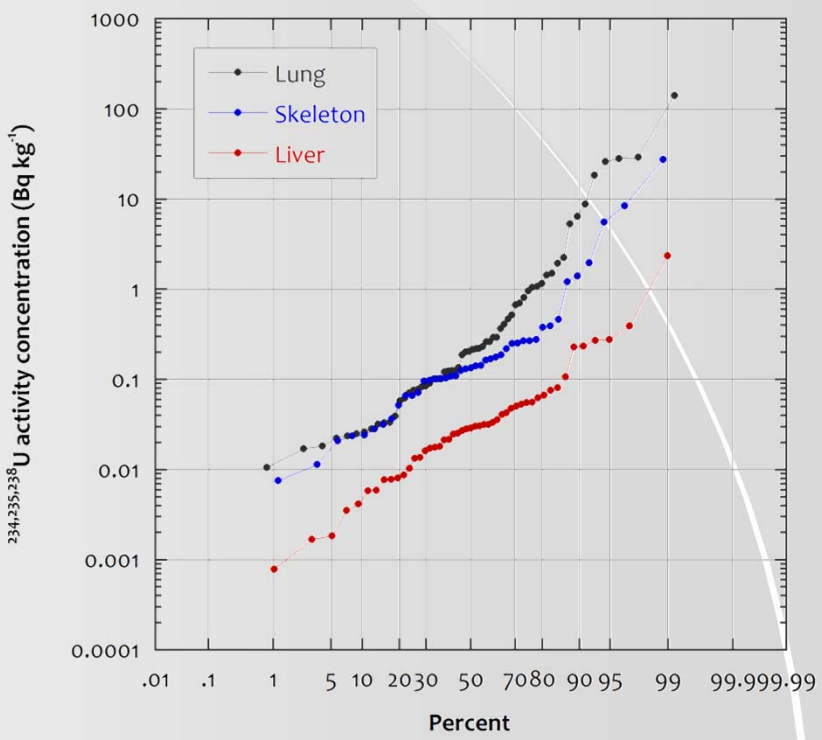
1845 Terminal Drive, Suite 201, Richland, WA 99354-4959
509-946-6870 • Fax: 509-946-7972 • Toll Free: 800-375-9317 • www.ustur.wsu.edu

- Simplified (less technical) cover letter to the Families

"…the testing showed that the amount of plutonium in his lungs, when compared to others in the USTU R program, is at the lower end of the results for all registrants…"

Plutonium and Uranium in 'Critical' Organs





~3% of Registrants have environmental concentration of $^{239/240}$Pu

Recommendation #2

Improve the recruitment of new donors

Donor Recruitment

- 'Passive' recruitment:
  - ✓ Direct contacts from individuals/families
  - ✓ Contact through DOE
  - ✓ Professional communication through work-sites
- 'Reactivation' through Homesteader's newsletter
- 'Active' recruitment needs IRB changes and extra $$$
- DOE agreement?

One new Registrant (partial-body) enrolled in to the Program

Recommendation #3

Modify the prioritization plan for radiochemical analyses so that older tissue samples are of a higher priority

Prioritization Plan

- Avoid accumulation of intact cases
- Elimination of old intact cases
  - ✓ 'Old' : 1992 – 2005
  - ✓ 'New' : 2006 – present
- 'Old-to-New' frequency (2012)
  - ✓ Whole-body – 1:5 (17%)
  - ✓ Partial Body – 3:12 (20%)

Analyzed 1 'old' case per every 3 'new' (25%) cases in 2013

Recommendation #4

Provide radioanalytical progress reports that show the backlog, types of samples, and percentage of progress toward eliminating the backlog

Recommendation #5

Promote, and report on, USTUR data users: external users

USTUR Data/Materials Users

- Idaho State University (Pocatello, ID)
  - ✓ Radiochemistry Data – Various Cases
  - ✓ Health Physics Data – Chelation Therapy Cases
- South Urals Biophysics Institute (Ozyorsk, Russia)
  - ✓ Radiochemistry Data – Skeletal Concentrations
- European Radiation Dosimetry Group (EURADOS, EU)
  - ✓ Health Physics Data – Wound Cases
  - ✓ USTUR Calibration Phantom

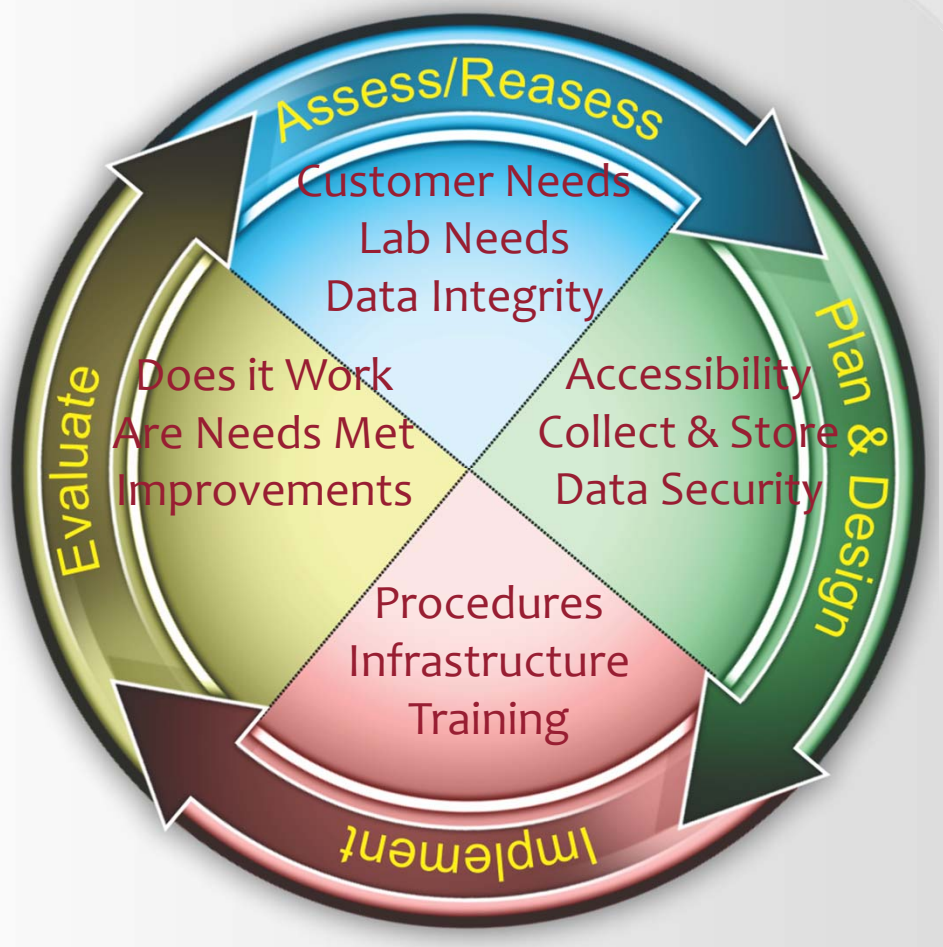
Data Users Publications

- Idaho State University (Pocatello, ID)
  - ✓ Tabatadze, G., *et al.* (2013) Health Phys 104(1): 9-14
  - ✓ Khalaf, M., *et al.* (2013) Health Phys 104(1): 51-56
  - ✓ Khalaf, M., *et al.* (2013) Health Phys 104(1): 57-62
  - ✓ Khalaf, M., *et al.* (2013) Health Phys 104(4): 405-412
- Southern Urals Biophysics Institute (Ozyorsk, Russia)
  - ✓ Suslova *et al.* (2013) In preparation

Recommendation #6

Establish Data Quality Objective (DQO) requirements. Specifically, address quality assurance requirements, required records, data maintenance and archiving, and 'raw data' availability (data sources provided)

Data Quality Cycle



Establishing DQO Requirements

- DQO *vs* Other Standards
  - ✓ Finding best fit: DOELAP, MARLAP, ISO-9001, *etc*
  - ✓ Adequate performance
  - ✓ Administrative burden
  - ✓ Return on investment
- Elements of Implementation
  - ✓ Determining what data is necessary
  - ✓ Data availability
  - ✓ Data integrity
  - ✓ Policies and procedures
  - ✓ Archiving data

Implementation Schedule

- Identification of appropriate DQOs
  - ✓ Review of USEPA's DQO guidance documents (7/2013)
  - ✓ Evaluation of USTUR policies and procedures (2/2014)
- Internal document review (4/2014)
- Data maintenance procedures (5/2014)
- Document the process (9/2014)

Recommendation #7

Continue to develop research collaborations

Active Collaborations

EURADOS

Pacific Northwest
NATIONAL LABORATORY

Health Canada

AREVA

ЮУрИБФ

KIT
Karlsruhe Institute of Technology

UNIVERSITÉ LAVAL

Public Health England

Recommendation #8

Expand academic involvement with College of Pharmacy Dean and WSU. Incorporate graduate students and continue involvement with the Certificate Program in Radiation Protection

WSU College of Nursing

- Student clinical research: Ms. Becky Phillips performed 45-hour research project as a part of MS degree program
- Autopsy: Ms. Jessica Harper and Mr. Scott Roberts

- Part-time laboratory assistant: Ms. Nelli A. Zavalnyuk

Graduate Certificate Program in Radiation Protection

- Program starts Fall 2013 at WSU Tri-Cities campus
- Laboratory courses start Spring 2014: "Alpha Spectrometry" practice at the USTUR laboratory facility

http://www.ortec-online.com/Solutions/alpha-spectroscopy.aspx

- Alpha Ensemble (ORTEC)
  - ✓ 4-detector α-spectrometry system purchased by WSU/GCPRP
  - ✓ Installed at the USTUR

WSU School of Earth and Environmental Science

- PhD research: Mr. Chris Nielsen – *"Retention of Soluble Plutonium in the Human Respiratory Tract"*

Pacific Northwest NATIONAL LABORATORY

Public Health England

2013 Activities Overview

USTUR Core Functions (DOE)

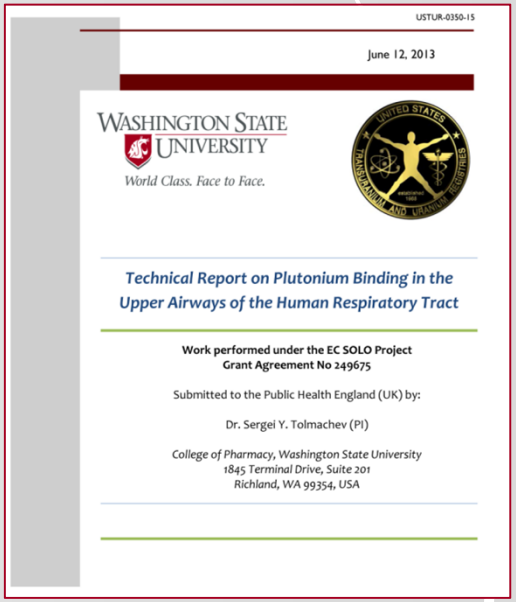
- Accepting and processing future Registrant donations
- Completing radiochemical analysis of previous Registrant donations
- Completing the development and population of USTUR databases

FY2014 DOE Grant Renewal

- Grant proposal to manage and operate the USTUR Research Center in FY2014 was submitted to DOE/HS-13
- Period: 4/1/ 2013 – 3/31/2014 (Year 2)
- Requested budget: $900,000
- Granted budget: $900,000

External Funding: Work for Others

- PI: Sergei Tolmachev
- Health Protection Agency (UK): *Plutonium Binding in the Upper Airways of the Human Respiratory Tract*
- Period: 10/1/2012 – 3/31/2013 (FY2013)
- Extension: 4/1/2013 – 5/31/2013 (FY2014)
- Budget: €16,000 ($20,992)
- Status: Funded
- Report: Completed


USTUR-0350-15

June 12, 2013

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Technical Report on Plutonium Binding in the Upper Airways of the Human Respiratory Tract

Work performed under the EC SOLO Project Grant Agreement No 249675

Submitted to the Public Health England (UK) by:

Dr. Sergei Y. Tolmachev (PI)

College of Pharmacy, Washington State University
1845 Terminal Drive, Suite 201
Richland, WA 99354, USA

External Funding: Additional Grant

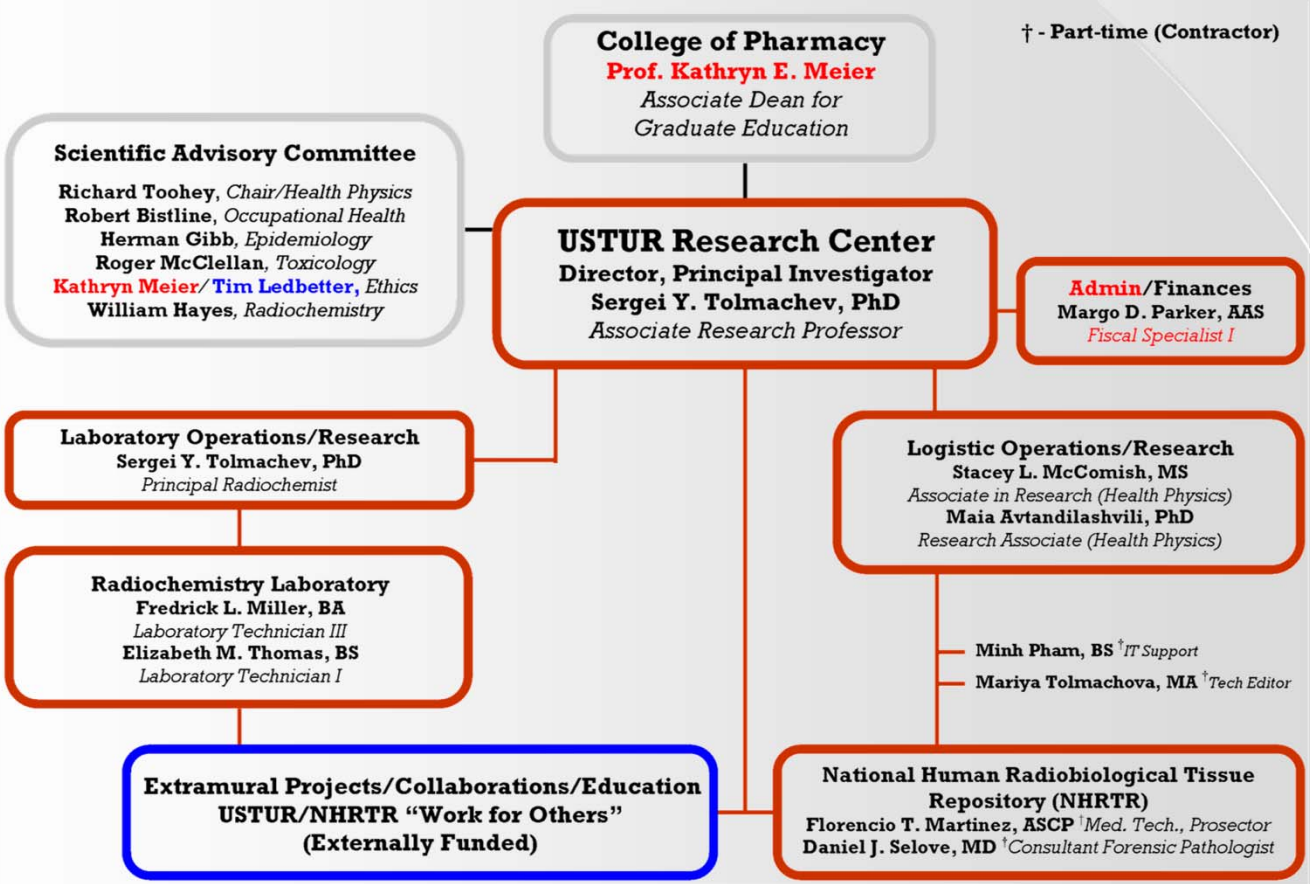
- PI: Maia Avtandilashvili
- WSU 2013 New Faculty Seed Grant Program: "*Uncertainty Analysis on Lung Doses for the US Nuclear Workers*"
- Period: 5/16/2013 – 10/15/2014 (FY2014/FY2015)
- Budget: $24,779
- Status: Not funded

FY2011/2012 Annual Report

- Period: 10/1/2010 – 3/31/2012
- Published: 300 copies
- Distributed: 20 countries
- Nationally: 153 copies
- Internationally: 98 copies
- Available at:

http://www.ustur.wsu.edu/

USTUR Organization Structure



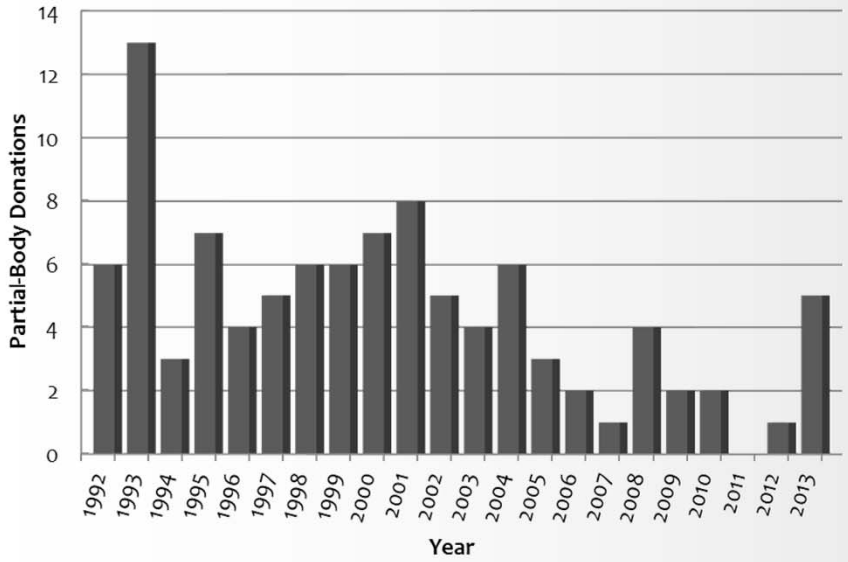
Accepting Registrant Donations

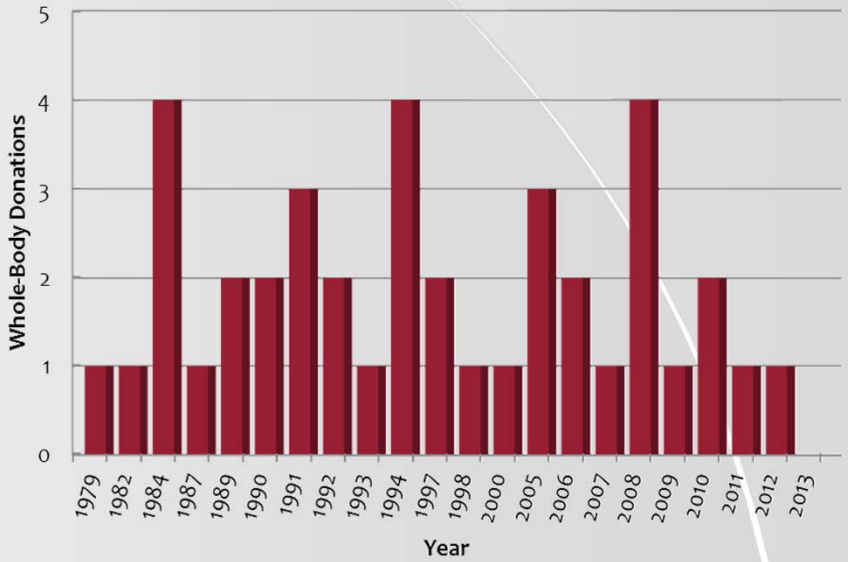
Stacey L. McComish

New Registrants

- Case 0757 (whole-body, 2012) – $^{239/240}$Pu (CHI)
- Case 0803 (partial-body, 2013) – $^{239/240}$Pu (HAN)
- Case 0272 (partial-body, 2013) – $^{239/240}$Pu (HAN)
- Case 0743 (partial-body, 2013) – $^{239/240}$Pu (ROC)
- Case 0861 (partial-body, 2013) – $^{239/240}$Pu (ROC)
- Case 0691 (partial-body, 2013) – ^{238}Pu (MND)

Registrant Donation Profiles





Since 1992: 100 partial-body donations

Total: 40 whole-body donations

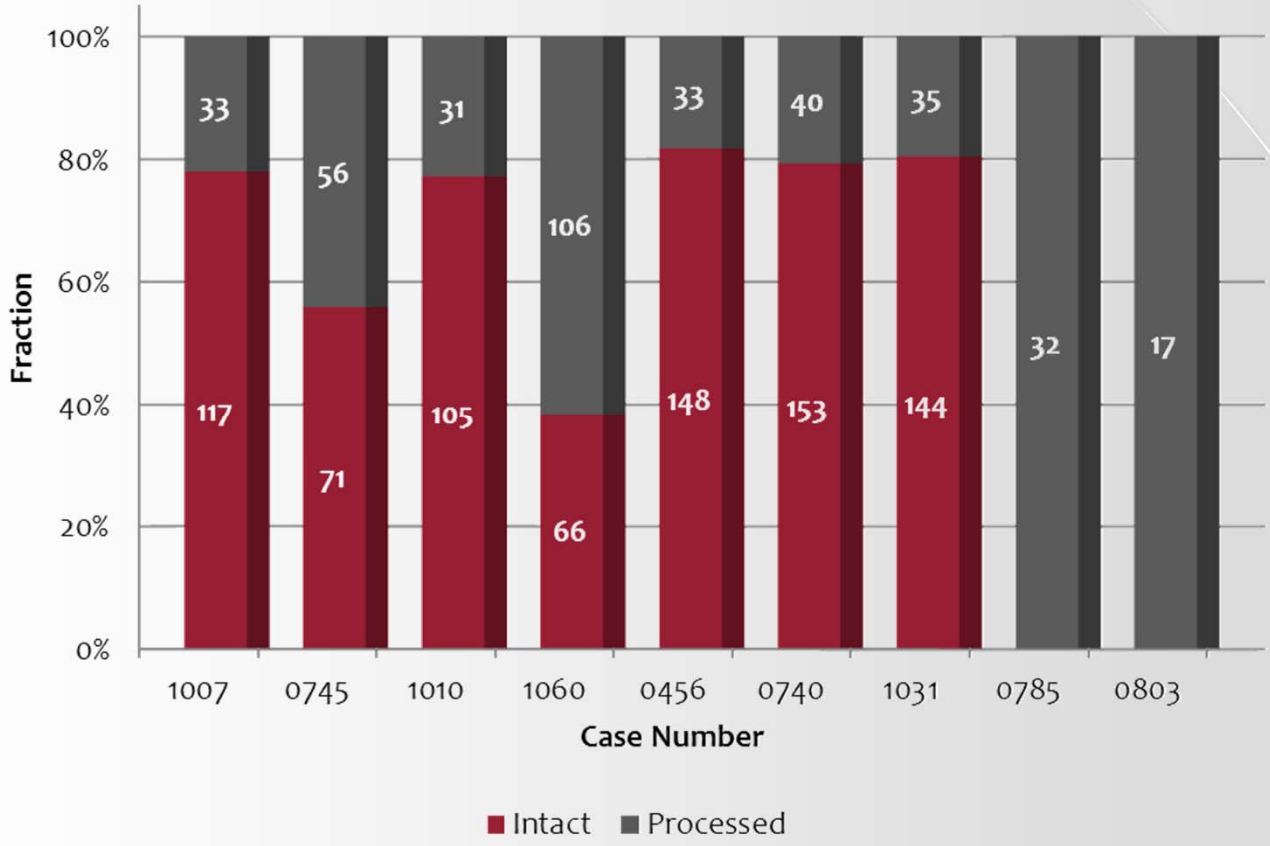
In-house Radiochemistry

Elizabeth Thomas & Fredrick Miller

Radiochemical Analysis

- Number of cases: 10
  - ✓ 1991 – 2005: 3
  - ✓ 2006 – 2013: 7
- Whole-body: 1007,0269, 0745, 1010, 1060, 0456, 0740, 1031
- Partial-body: 0785, 0803
- Analyzed by: AS (9)/ICP-MS (1)
- Number of samples: 319
  - ✓ Soft tissues: 132
  - ✓ Bones: 187

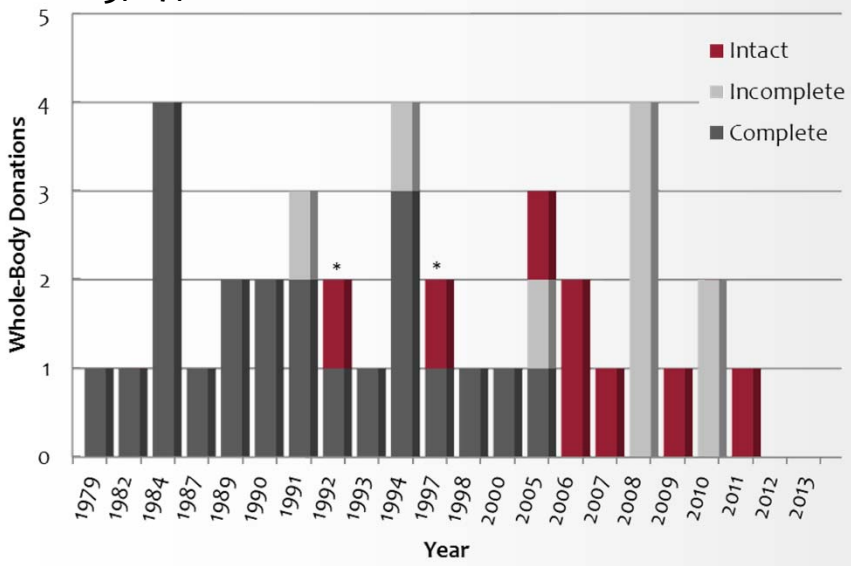
Radiochemical Analysis Progress



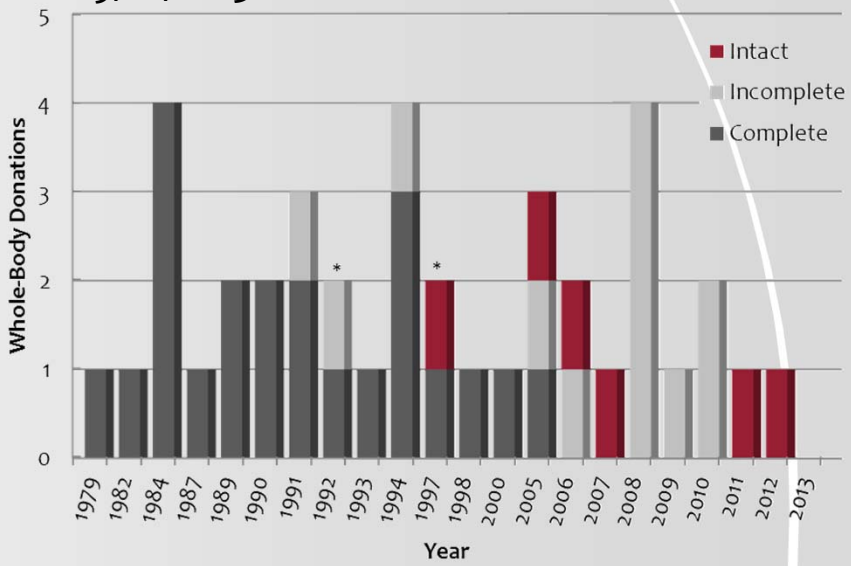
Analysis Status Change: Whole-Body

- Case 1010 (2005): intact → *survey analysis* → incomplete
- Case 0456 (2009): intact → *survey analysis* → incomplete
- Case 1054 (1992): intact → *data evaluation* → incomplete

9/07/2012

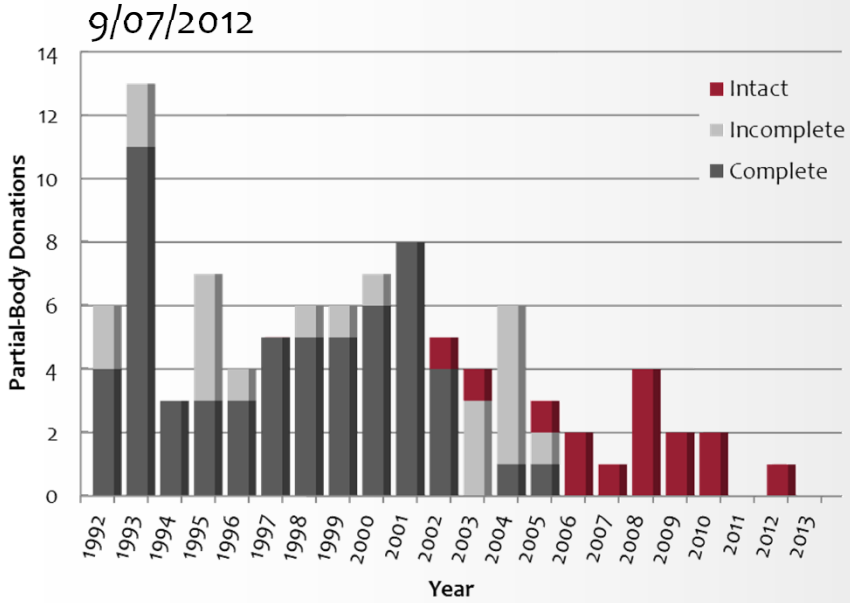


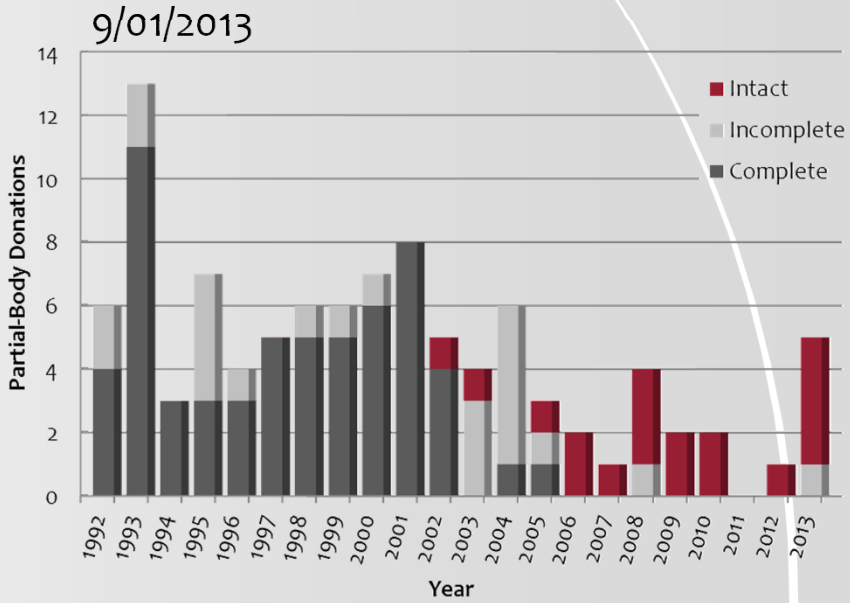
9/01/2013



Analysis Status Change: Partial-Body

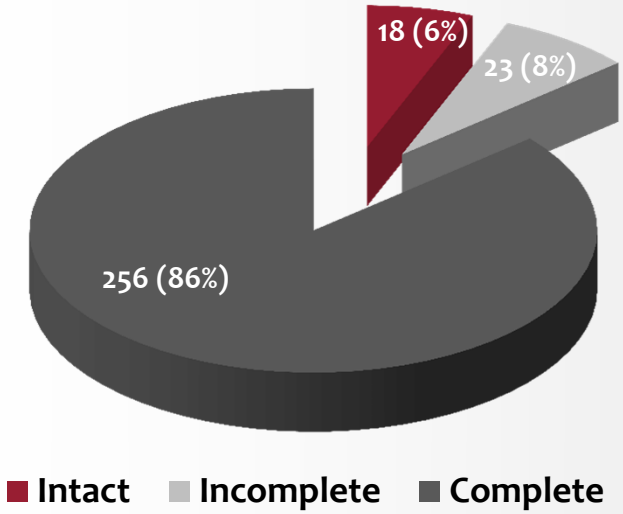
- Case 0785 (2008): intact → *in progress* → incomplete
- Case 0803 (2013): intact → *in progress* → incomplete



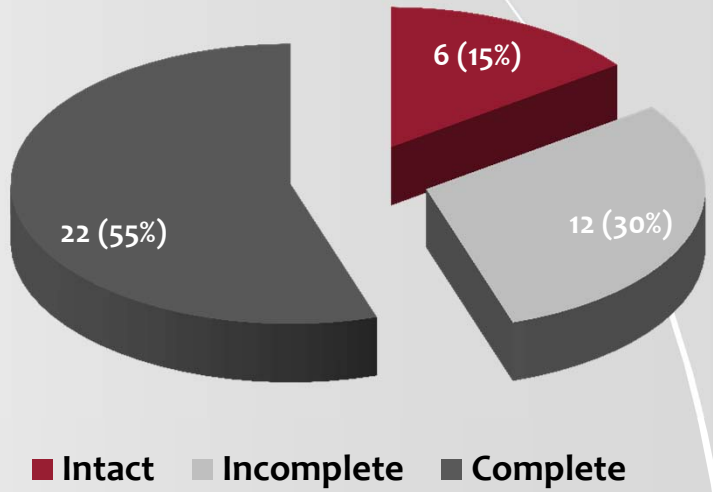


Radiochemical Analysis Summary

Partial-Body: 297



Whole-Body: 40

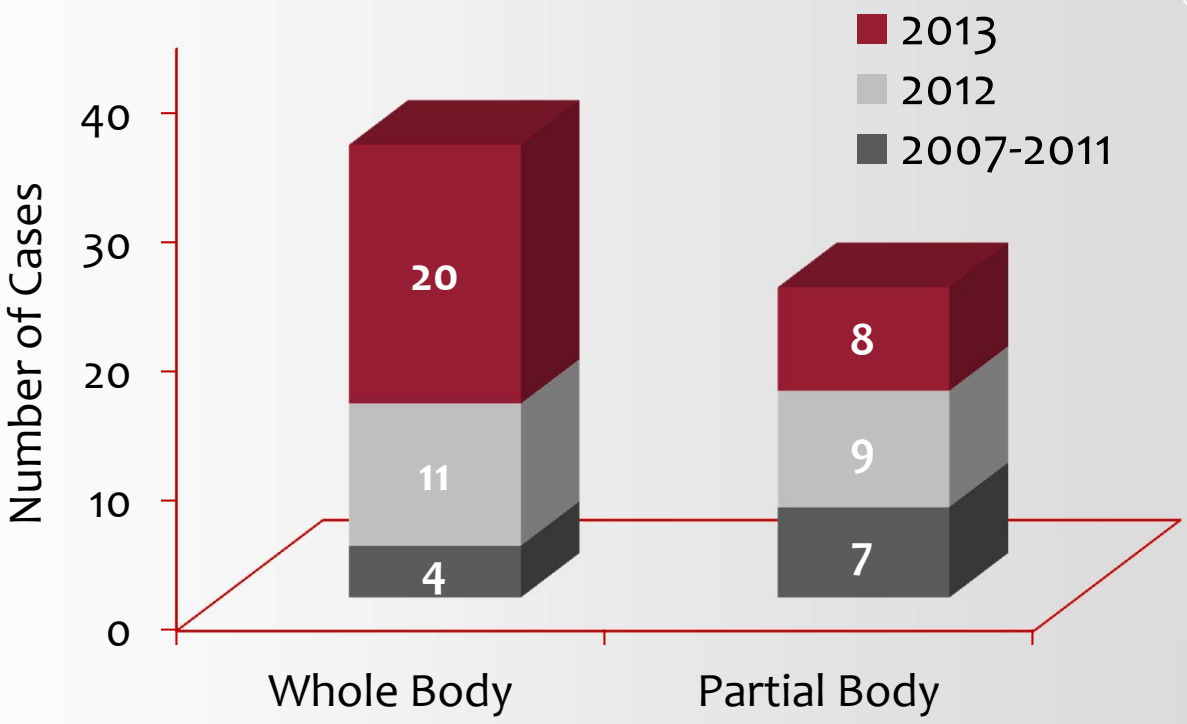


Health Physics Database

Maia Avtandilashvili

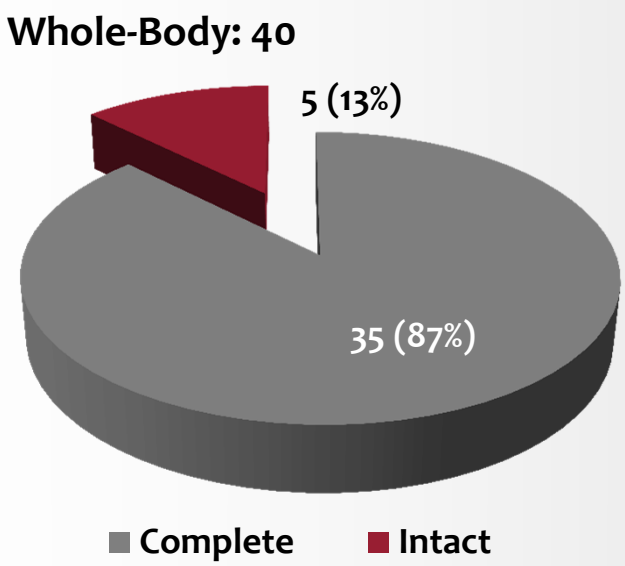
Database Development Progress

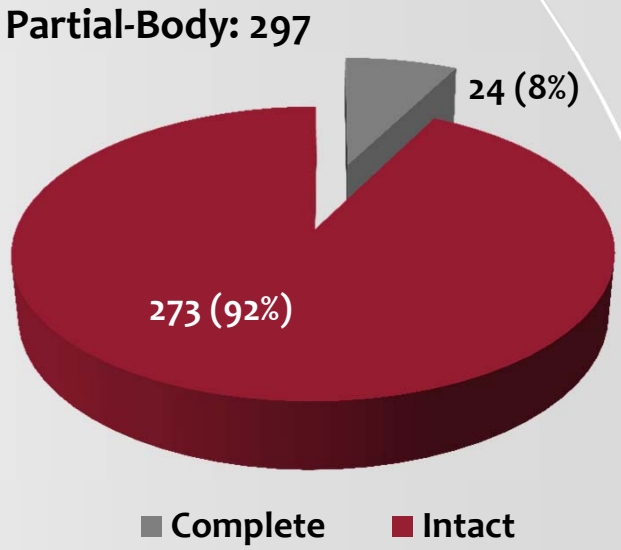
2013 Completed Cases: 28

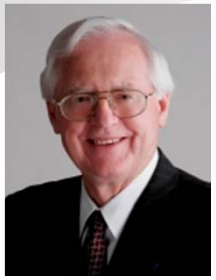


Summary 2013

- As of Sept 1, 2013, data entry completed for 59 (17.5%) of 337 cases







USTUR Materials Ownership

"…since the grant did not specify in the General or Specific Terms and Conditions of the grant that ownership would transfer to WSU, DOE inherently retained the ownership of these samples."

General Attorney
Office of Chief Counsel
Department of Energy
8/16/2013

Internal Research: Case 1031

Maia Avtandilashvili, Stacey L. McComish & Sergei Y. Tolmachev

Case 1031: Narrative

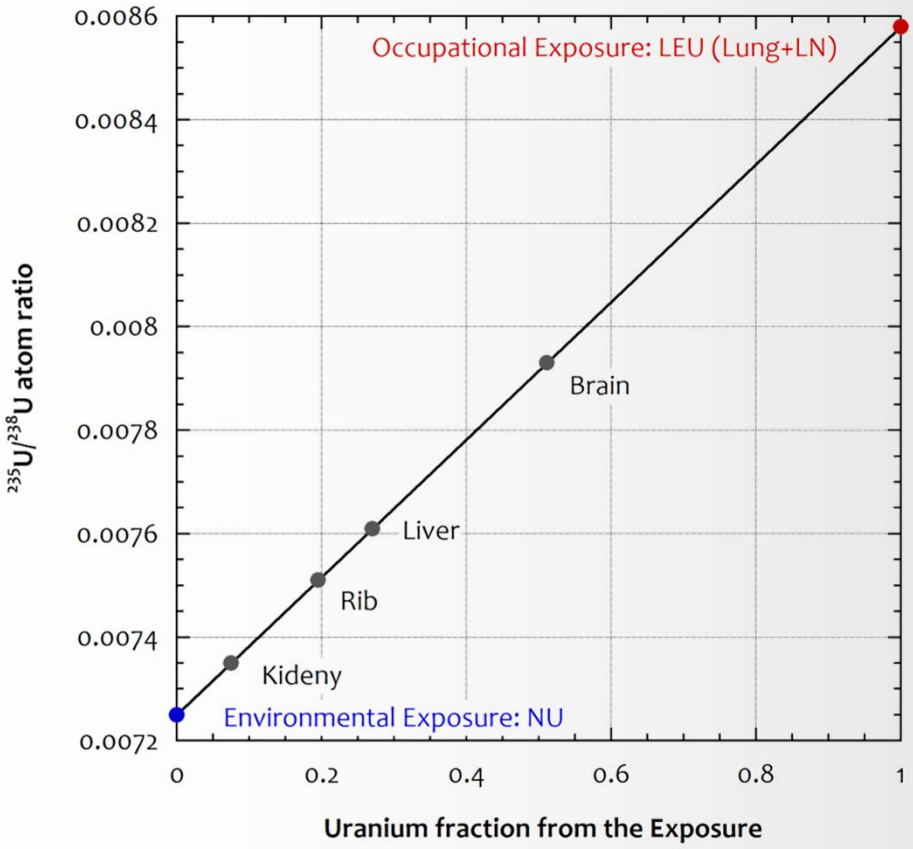
- Donation type: Whole-body
- Age: 87 y
- Intake type: Acute inhalation
- Material: UF_6 (UO_2F_2/HF – hydrolysis products)
- Composition: Low-enriched uranium (LEU, 0.85%)
- Post-intake: 65 y

ICP-MS Tissue Analysis Results

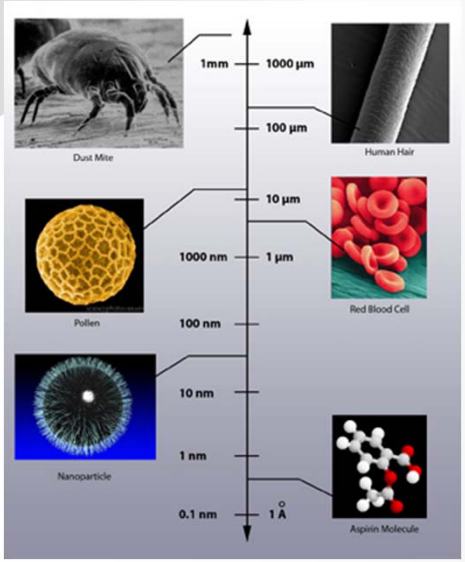
Tissue	$^{235}U/^{238}U$ atom ratio	Concentration, μg kg^{-1}
Lung (R)	0.00854 ± 0.00004	0.580 ± 0.001
Thoracic Lymph Nodes	0.00859 ± 0.00006	44.82 ± 0.090
Liver	0.00761 ± 0.0002	0.505 ± 0.003
Kidney (R)	0.00735 ± 0.0002	23.56 ± 0.090
Brain	0.00793 ± 0.0001	0.289 ± 0.001
Rib 5 (R)	0.00751 ± 0.0002	7.536 ± 0.005

- **LEU (max 0.85% ^{235}U)** **0.00861**
- **Natural U (0.72% ^{235}U)** **0.00725**

Uranium: Natural *vs* Occupational



- Assumption: material (LEU) composition (100%) = Lung/LN
  - ✓ Kidney: 7.5% + 92.5%
  - ✓ Rib: 19.6% + 80.4%
  - ✓ Liver: 27.2% + 72.8%
  - ✓ Brain: 51.3% + 48.7%
- 65 years post-intake



External Collaboration: PNNL

Michelle L. Johnson, Steven C. Baker & Tristan R. Hay

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External Collaboration: EURADOS

Pedro M. Nogueira & Maria Antonia Lopez

^{241}Am Skull Measurements Intercomparison

- Coordinator
  - ✓ Institute of Radiation Protection (BfS, Germany)
- Participants
  - ✓ 13 in-vivo counting laboratories from 11 countries
- Phantoms
  - ✓ BfS Phantom (Germany) – artificial
  - ✓ SÚRO Phantom (Czech Republic) – artificial
  - ✓ USTUR Skull Phantom (USA) – 'natural'

Biodosimetry of Internal Radionuclides

- Facilitator:
  - ✓ Multidisciplinary European Low Dose Initiative (MELODI)
- Coordinator:
  - ✓ Public Health England (PHE, UK)
- Developers:
  - ✓ EURADOS WG10 (Retrospective Dosimetry) and WG-7 (Internal Dosimetry)

Professional Activities/Services

- WSU Graduate Committee, *Member*
- WSU Graduate Certificate Program in Radiation Protection, *Advisory Board Member*
- Laval University, Department of Chemistry, *Adjunct Professor*
- European Radiation Dosimetry Group (EURADOS) WG7 on Internal Dosimetry, *Member*
- Japanese Journal of Health Physics, *Editorial Board Member*
- Radiation Protection Journal, *Ad-hoc Reviewer*

Publications/Presentations

- Journal
  - ✓ Am J Public Health 1
  - ✓ Cancer Research 1
  - ✓ Health Physics 1
- Podium
  - ✓ Plenary Meeting: EURADOS WG-7 1
  - ✓ 58th Annual Conference: Radiobioassay and Radiochemical Measurements 1
- Poster
  - ✓ 58th Annual Meeting: Radiation Research Society 2
  - ✓ 140th Annual Meeting: American Public Health Association 1

Questions?