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

Research & Operation Plan for FY2015

Sergei Y. Tolmachev, *PhD*

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"Learning from Plutonium and Uranium Workers"

WASHINGTON STATE UNIVERSITY
World Class. Face to Face.

Research & Operation Concept

USTUR Research Center: Intramural Project

Sergei Y. Tolmachev, PhD, PI & Director, *Associate Research Professor*

Radiochemistry & Mass Spectrometry

Sergei Y. Tolmachev, PhD

- Expeditious Analysis of Donated Tissues
- Application of New Actinide Separation Techniques
- Application of Advanced Measurement Techniques

Tissue Repository & Databases

Stacey L. McComish, MS & Maia Avtandilashvili, PhD

- National Human Radiobiological Tissue Repository (NHRTR)
- Health Physics, Pathology
- Radiochemistry

Extramural Projects/Collaborations

- AREVA, Richland, WA
- MSU, Denver, CO
- NWU, Chicago, IL
- U. Laval, Quebec, Canada
- Health Canada, Ottawa, Canada
- SUBI, Ozyorsk, Russia

"Work for Others"

Pacific Northwest National Laboratory

- **Radiological Science** — Bruce Napier, *Manager*
- **Radiation Biology** — William Morgan, *Director*

Washington State University, Tri Cities

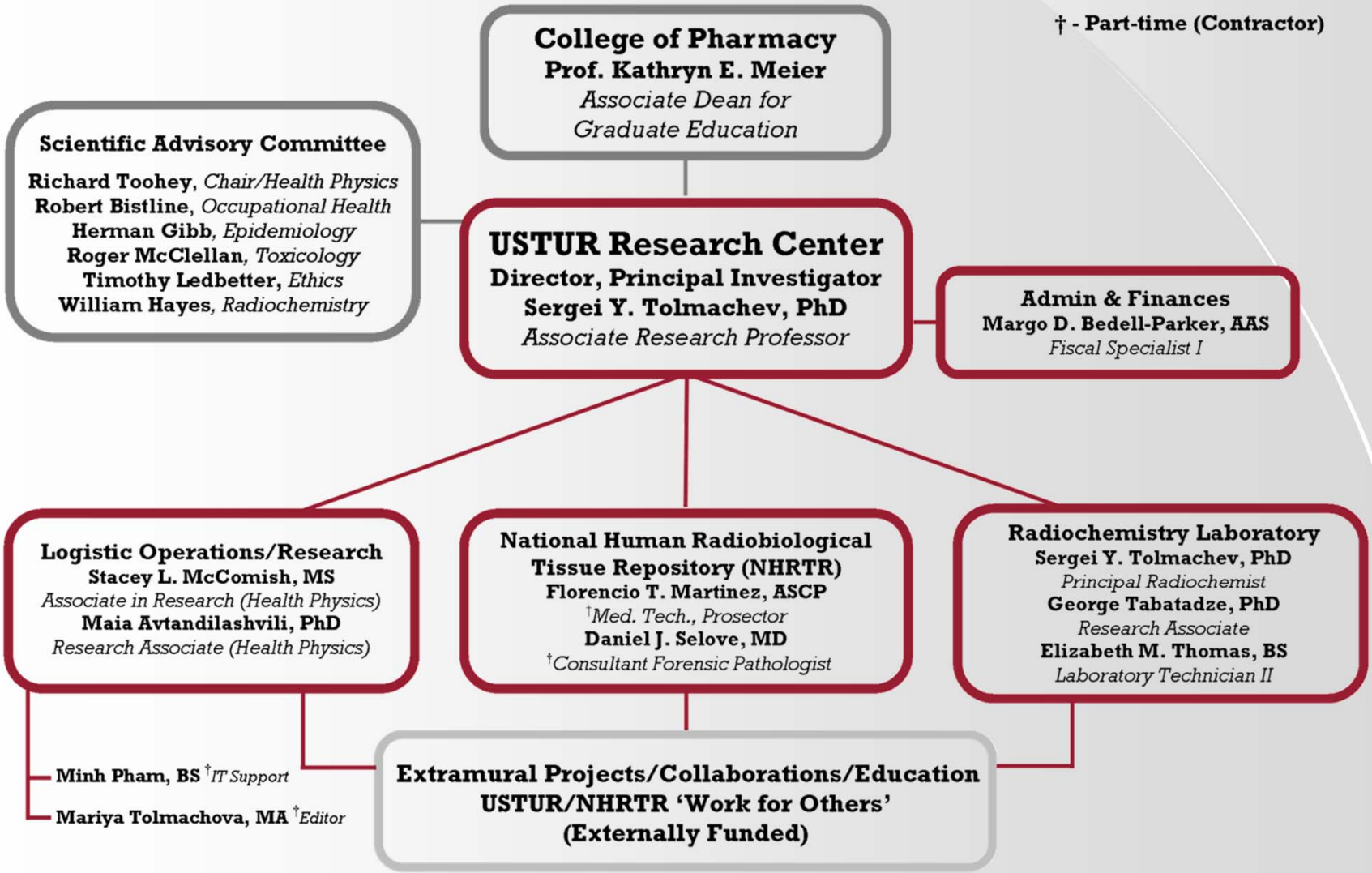
- **GCP in Radiation Protection** — James Pratt, *Chair*
- **College of Nursing** — Susan Campbell, *Director*

Public Health England
John Harrison, *Coordinator*

EURADOS: WG7/WG10
Maria Lopez, *WG7 Chair*
Clemens Woda, *WG10 Chair*

KIT/Radioanalytical Lab
Bastian Breustedt, *Head*

Organization Structure



FY2015 Budget

- Agency: U.S. Department of Energy
- Office: Domestic and International Health Studies (AU-13)

  Management and Operation of the United States Transuranium and Uranium Registries (4/1/2014 – 31/3/2015)
- Awarded budget: $900,000
- Operational budget: $900,000

- U.S. DOE Joint Coordinating Committee for Radiation Effects Research (JCCRER Project 2.4)

  Characterization of 'Bound' Plutonium Retention in the Human Respiratory Tract (Plutonium Oxide)
- Anticipated budget: $25,000

Research & Operational Tasks

- Accept Registrants' tissue donations
- Analyze donated tissues
- Populate Health Physics database
- Involve in academic activities
- Continue scientific research/collaboration
- Publish results
- Continue NHRTR inventory

Registrant Donations

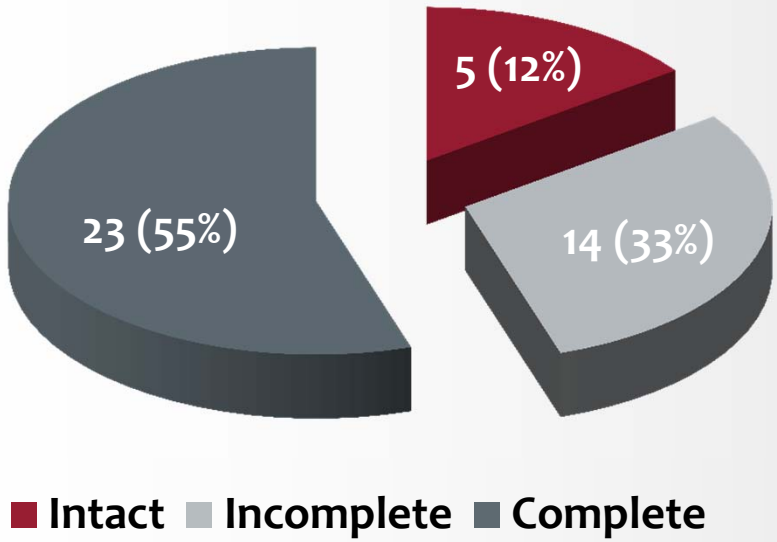
Stacey L. McComish & Sergei Y. Tolmachev

Radiochemistry FY2015

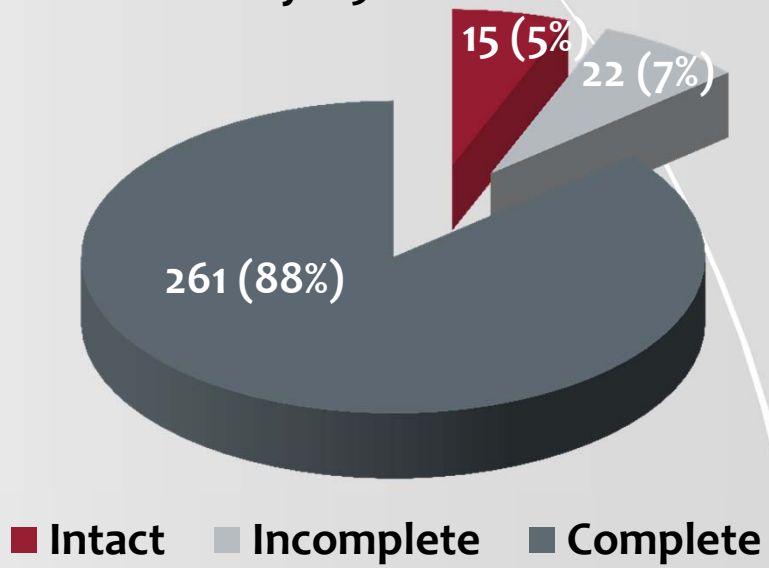
Elizabeth M. Thomas, George Tabatadze & Sergei Y. Tolmachev

Tissue Analysis Status 2014

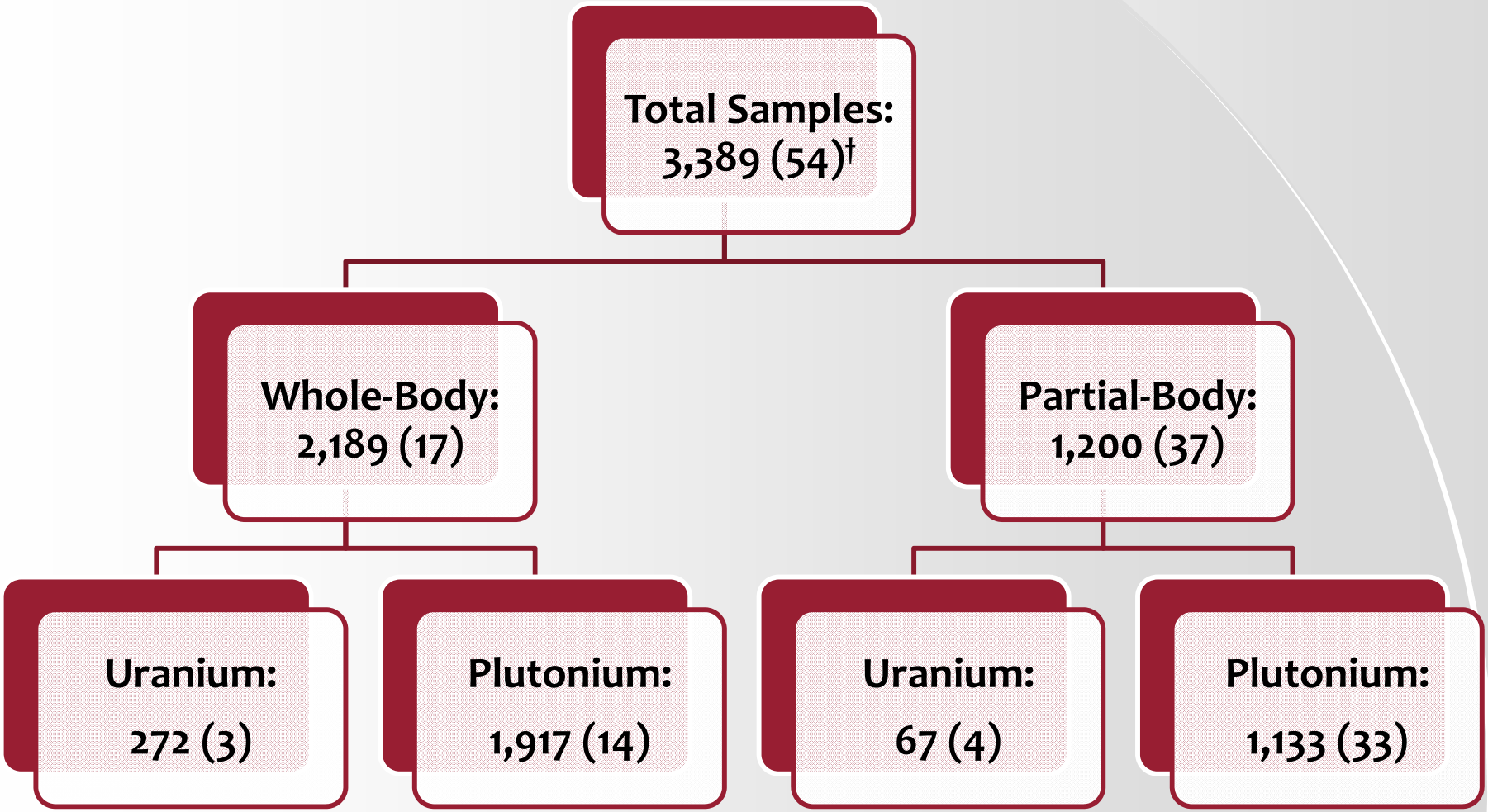
Whole-Body: 42



Partial-Body: 298



Tissue Sample Backlog

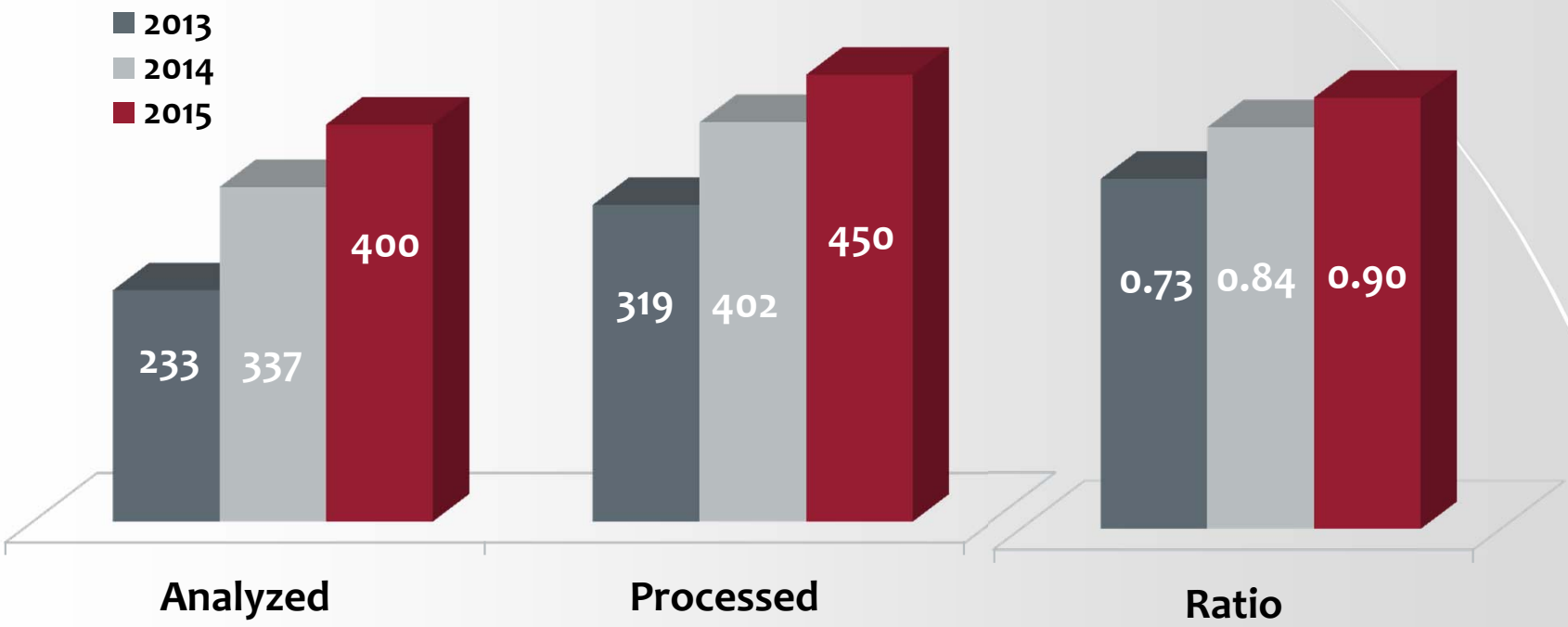


† - number of cases excluding Thorotrast cases

Ultimate Goal

- Analyze new cases as received
- Eliminate:
  - ✓ Tissue sample backlog: 3,389
  - ✓ Intact cases: 4 (whole-body) + 15 (partial-body)
  - ✓ Incomplete case: 13 (whole-body) + 22 (partial-body)

Tissue Analysis Goal 2015



To Achieve Ultimate Goal

- Eliminate backlog: 3,389 / 450 = 7.5 y
  - ✓ No new donations

2015 Donation Analysis

- Complete (survey) analysis of 10 (19) intact donations
- Complete analysis of all 'old' intact cases:

  0430 (partial-body, 2005, ROC)

  0837 (partial-body, 2003, ROC)

  0990 (whole-body, 2005, ROC)

Survey analysis (whole-body donations): analysis of 25 – 35 tissue samples to obtain key initial scientific information

2015 Tasks

- Perform in-house tissue analyses
- Report to the Families
- Standard operation procedures update/publication
- DQO implementation
- Method development/optimization (as needed)
- Application of ICP-MS (external) for U/Pu analysis

Family Report: *Analysis Results*

USTUR Case #0861: Partial-Body Analysis

Table 1. The Results of Tissue Radiochemical Analyses and Activity Calculations for Case 0861

Tissue description	Isotopic activity concentration, Bq kg^{-1} wet						Total activity in organ/tissue, Bq					
	$^{239+240}$Pu		^{238}Pu		^{241}Am		$^{239+240}$Pu		^{238}Pu		^{241}Am	
	Value	±SD†	Value	±SD	Value	±SD	Value	±SD	Value	±SD	Value	±SD
Respiratory												
Lung (R)	78.2	5.4	1.30	0.12	26.3	1.7	45.5	3.1	0.75	0.07	15.3	1.0
Lungs	**78.2**	**5.4**	**1.30**	**0.12**	**26.3**	**1.7**	**93.9**	**6.5**	**1.6**	**0.1**	**31.5**	**2.0**
Larynx	0.81	0.11	0.007	0.016	0.36	0.08	0.037	0.005	0.0003	0.0007	0.017	0.003
Trachea	0.81	0.32	0.03	0.05	0.4	0.2	0.019	0.008	0.00064	0.00132	0.010	0.005
Bronchial Tree	4.12	0.72	0.23	0.36	1.7	0.5	0.037	0.007	0.002	0.003	0.015	0.005
Lymphatic												
Parabronchial (R) LN	4,074	145	65.5	7.0	1,141	44	3.6	0.1	0.058	0.006	1.00	0.04
Pulmonary (R) LN	5,613	382	86.9	9.6	1,652	104	22.2	1.5	0.34	0.04	6.5	0.4
Mediastinal (R) LN	905	36	13.7	2.5	246	13	1.12	0.04	0.017	0.003	0.31	0.02
Glands												
Thyroid	0.31	0.17	-0.022	-0.071	0.028	0.08	0.003	0.002	-0.0002	-0.0007	0.00026	0.00075
Prostate	0.05	0.04	0.006	0.023	0.03	0.03	0.002	0.001	0.00019	0.0008	0.001	0.001
Adrenal (R)	0.16	0.03	-0.014	0.015	-0.02	0.01	0.0018	0.0004	-0.0002	0.00017	-0.0002	0.00017
Urinary Sytem												
Kidney (R)	0.081	0.009	0.004	0.002	0.058	0.008	0.0062	0.0007	0.0003	0.00018	0.0044	0.00059
Kidneys (R+L)	**0.081**	**0.009**	**0.004**	**0.002**	**0.058**	**0.008**	**0.025**	**0.003**	**0.0012**	**0.0007**	**0.02**	**0.00**
Brain												
Cerebral Lobe (R)	0.041	0.003	-0.0002	-0.0004	0.008	0.001	0.023	0.002	-0.0001	-0.0002	0.00468	0.00076
Gential												
Testis (R)	0.12	0.02	0.00	0.00	0.03	0.01	0.0024	0.0004	0.00	0.00	0.00057	0.00026
Circulatory												
Heart	0.21	0.02	0.002	0.002	0.07	0.01	0.069	0.007	0.00068	0.0008	0.024	0.004
Spleen	3.16	0.32	0.04	0.03	0.8	0.1	0.17	0.02	0.002	0.002	0.040	0.006
Hepatic												
Liver (Partial)	6.5	0.5	0.10	0.03	0.60	0.08	2.27	0.18	0.03	0.01	0.21	0.03
Liver (Whole)	**6.5**	**0.5**	**0.10**	**0.03**	**0.60**	**0.08**	**11.7**	**0.9**	**0.18**	**0.05**	**1.1**	**0.2**
Selected Bones												
Thoracic 5 - Arch	1.65	0.10	0.04	0.01	0.66	0.07	0.043	0.003	0.0011	0.0003	0.017	0.002
Thoracic 5 - Body	1.66	0.09	0.04	0.02	0.60	0.07	0.045	0.003	0.0011	0.0004	0.016	0.002
Rib 5 (R)	1.91	0.10	0.05	0.02	0.93	0.09	0.089	0.005	0.0022	0.0007	0.043	0.004
Femur: Mid Shaft (R)	0.75	0.08	0.01	0.02	0.64	0.08	0.089	0.009	0.0012	0.0023	0.076	0.009
Patella (R)	1.02	0.07	0.03	0.01	0.60	0.06	0.043	0.003	0.0013	0.0005	0.026	0.002
Skeleton (Total)	**1.18**	**0.04**	**0.03**	**0.01**	**0.68**	**0.04**	**13.1**	**3.3**	**0.29**	**0.07**	**7.6**	**1.9**

† - 1 sigma measurement uncertainty
Values in green - Calculated for the entire organ/tissue
Values in red - Below minimum detectable activity (MDA)

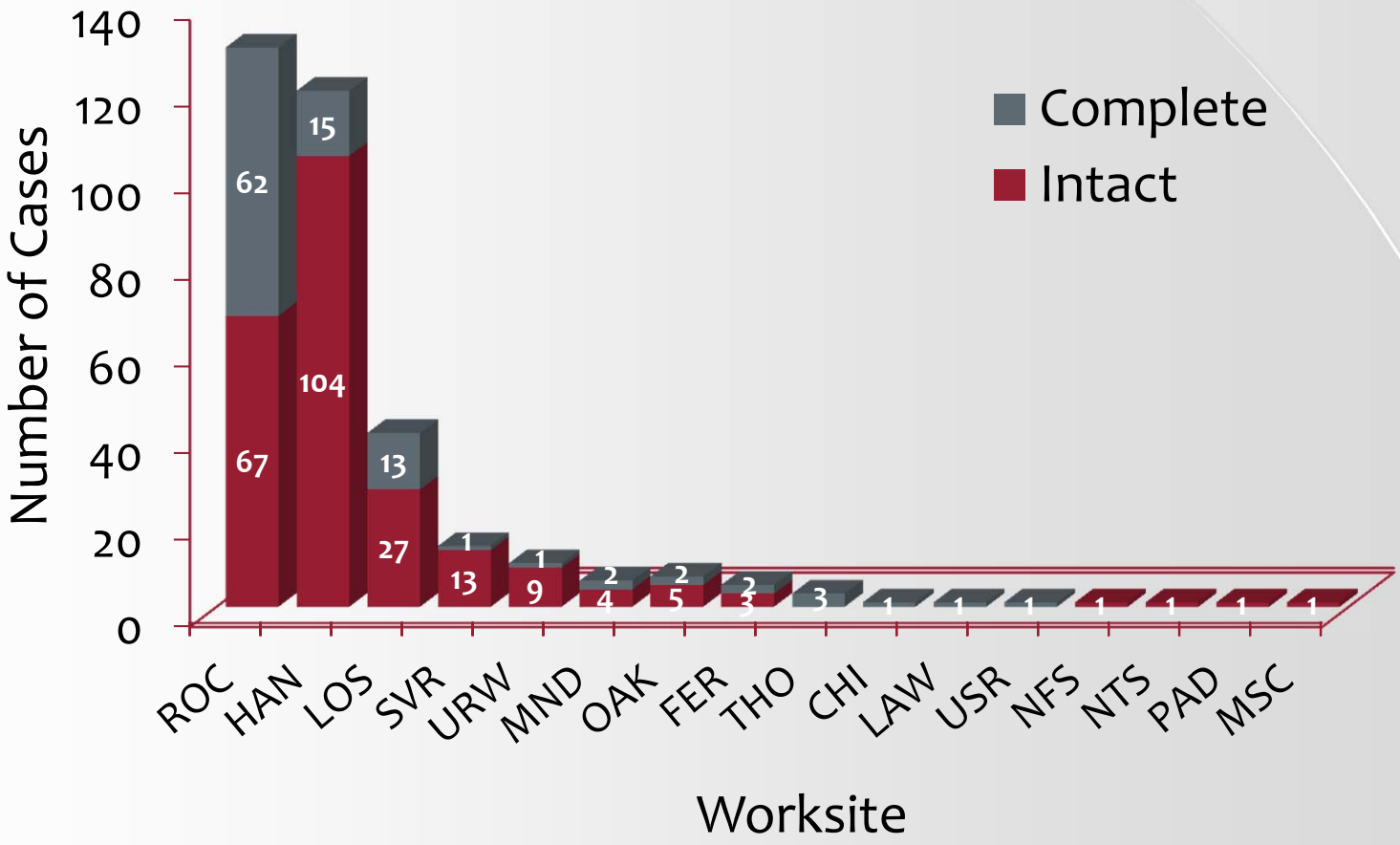
Health Physics Database

Maia Avtandilashvili

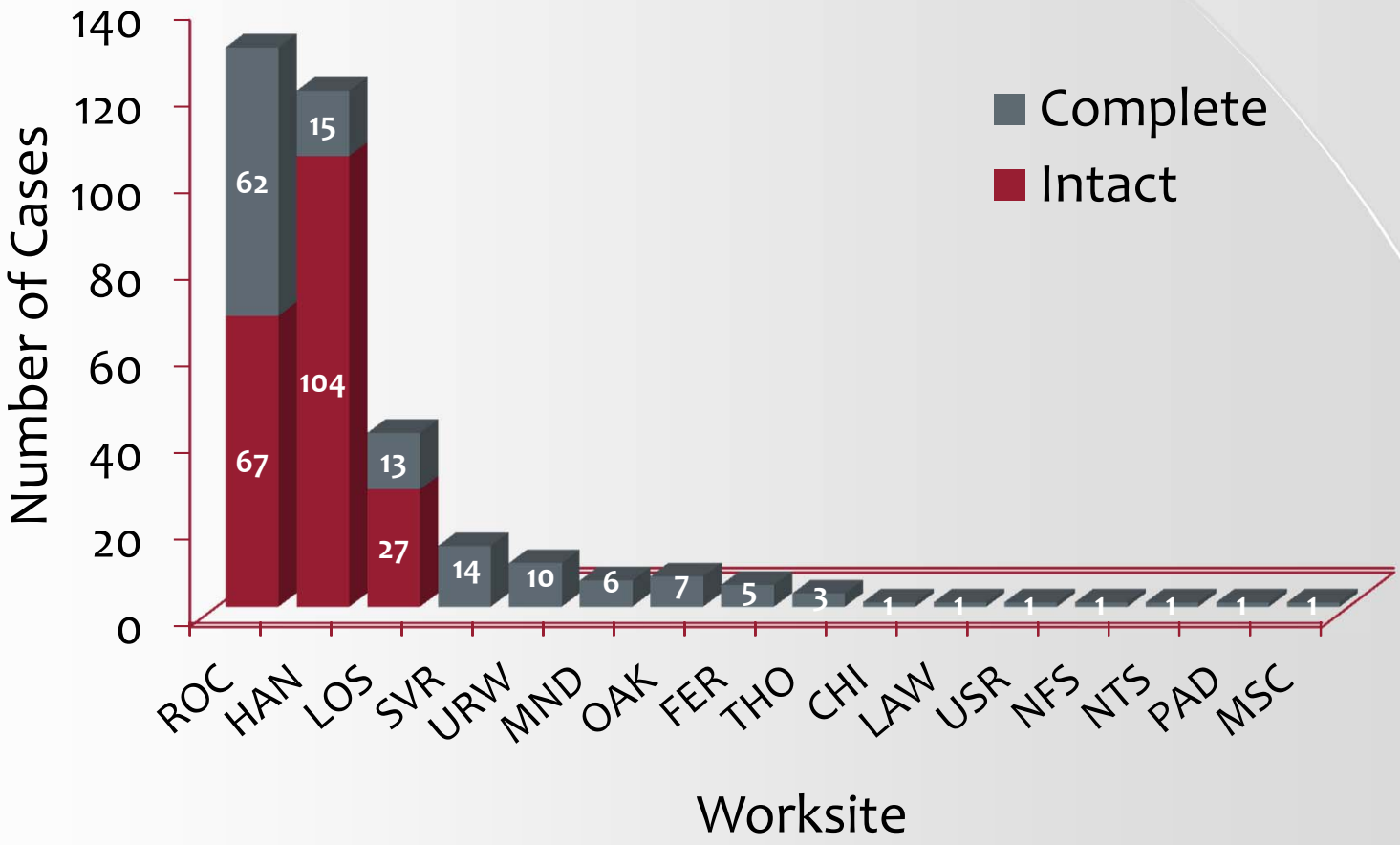
Goal 2015

- Complete:
  - ✓ New donations as received
  - ✓ Total of 40 - 45 cases

Health Physics Database: *2014*



Health Physics Database: *2015*



National Human Radiobiological Tissue Repository (NHRTR)

Stacey L. McComish & Sergei Y. Tolmachev

NHRTR Inventory

- Continue inventory of acid solutions
- Complete inventory of frozen tissues from radium dial painters
- Complete inventory of planchets
- Estimate the total 'RAM' holding of the NHRTR

Material Ownership: What is Next?

- Work with WSU Office of Grant and Research Development (OGRD) on modification of the USTUR grant agreement to implement material ownership in main part of the grant description

Registrant's Files Digital Backup

- Files were last backed up in 2006
- Scan quality has improved considerably since that time
  - Black and white vs. full-color scanning

(example images removed)

Academic Involvement

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

Work Together

- College of Pharmacy

  Biophysical Methodologies in Research (lectures)
- Graduate Certificate Program in Radiation Protection

  Alpha Spectrometry (practicals)
- College of Nursing

  Autopsy (practicals)

Work Towards

- Adjunct Professor

  Alan Birchall (Public Health England, UK)

  Daniel J. Strom (Pacific Northwest National Laboratory)

- Research Professor

  Sergei Y. Tolmachev (College of Pharmacy)

Research Collaborations

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

FY2015 Scientific Collaborations

- JCCRER Project 2.4/PNNL/SUBI
  - ✓ 'Bound' plutonium characterization
  - ✓ Plutonium body content
- PNNL National Security Directorate
  - ✓ Digital autoradiography
- EURADOS WG7/WG10
  - ✓ DTPA therapy model
  - ✓ Wound model
  - ✓ Retrospective biodosimetry

Upcoming Publications/Presentations

- Journal
  - *J of Radiological Protection* 1
  - *Health Physics* 1
  - *Radiation Protection Dosimetry* 3
  - *Environmental Science & Technology* 1
- Podium
  - *60th Annual Conference of the Radiation Research Society (invited)* 1

Questions?