



2010 SAC Recommendations & 2011 Overview

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***“Learning from Plutonium and Uranium
Workers”***

SAC's 2010 Recommendations

Following the 2010 Annual Meeting, the SAC made 11 specific recommendations/comments:

#	Subject	#	Subject
1	Maintain focus on research. "He should be given the opportunity to continue the reputation of the Registries"	6	Use of the USTUR data to study synergistic effects
2	Goals for the USTUR need to maintain a focus that is stimulating to the staff	7	Radiochemistry must continue at the rate that budgets allow
3	Not only on modeling dose and uptake but recommendations on limits and controls	8	Though priorities should be maintained, donations should be encouraged
4	Expediently getting data out and making available	9	Efforts should be made to address final objectives for the Program
5	Expanding the scope of the Registries. Database expansion to Be/Asbestos	10	Long-term storage of samples/ plan to maintain a tissue bank
		11	



#1: Maintain focus on research. Continue the reputation of the Registries

Intramural Projects:

- Expeditious Analysis of Donated Tissues (Radiochemistry)
- Occupational Exposure/Industrial Hygiene (Mesothelioma Study)

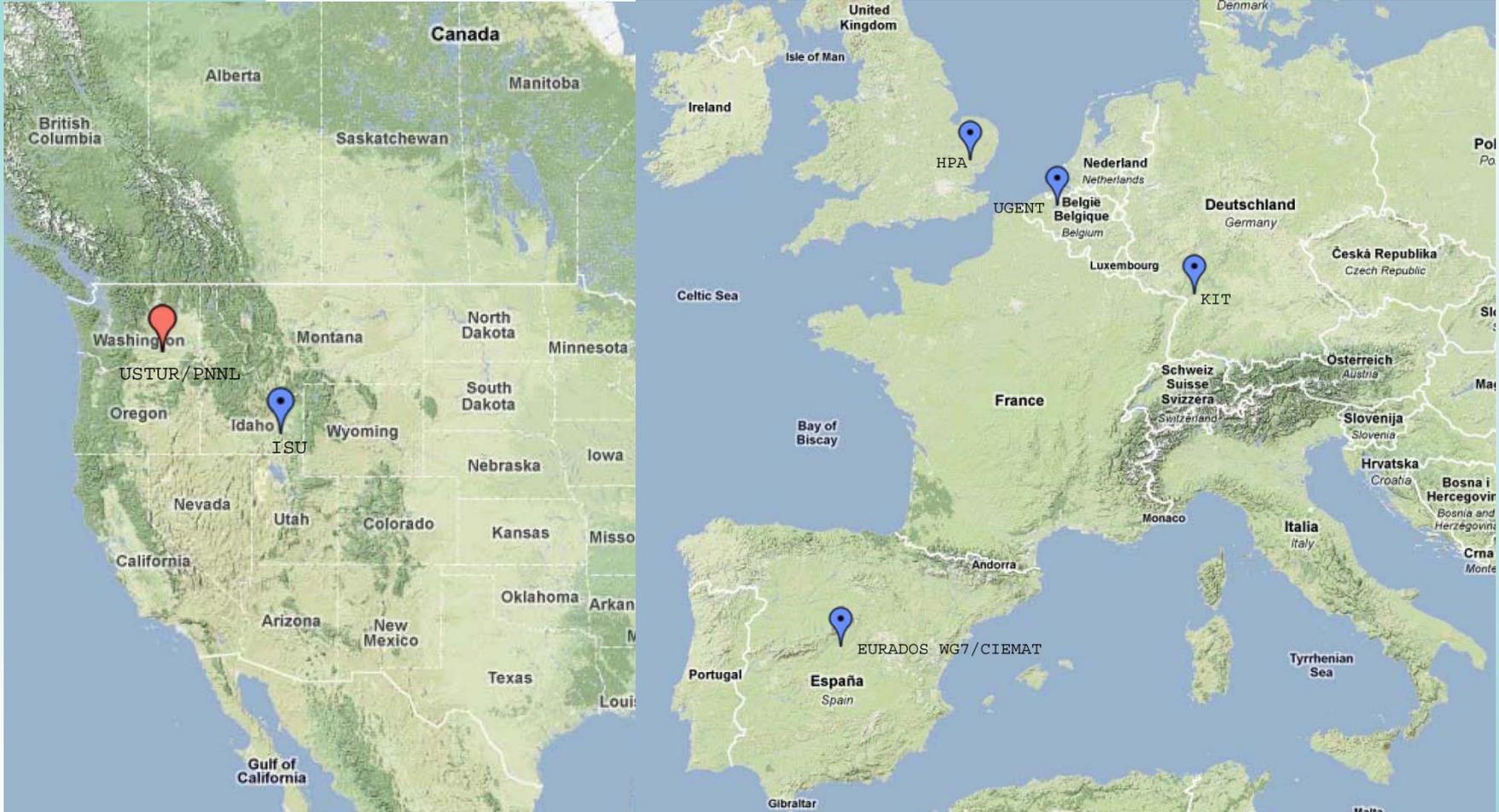
Extramural Collaboration:

- Mesothelioma Study(Tetra Tech Sciences)
- Distribution /Retention of Pu-nitrate in Lung (WSU/PNNL/HPA)
- Biokinetic Modeling of Chelation Therapy (KIT/EURADOS WG7)
- Health Physics Program (ISU)
- Measurements and Monte Carlo Modeling (Health Canada/EURADOS WG7)
- Elemental Distribution with SR- μ XRF (UGent)
- Actinide Mass Spectrometric Measurements (Health Canada)
- Beryllium Analysis (Laval University)

Geography of the Collaborations



Geography of the Collaborations



Publications/Presentations

Peer-review Journals

- Radiation Protection Dosimetry: 2
- Health Physics: 1
- Radiochimica Acta: 1
- J. Analytical Atomic Spectrometry: 1

Conference Presentations

- 56th Radiobioassay & Radiochemical Measurement Conference: 1
- Annual Meeting of the European Dosimetry Group (EURADOS): 1
- 56th Annual Health Physics Society Meeting: 5
- Int. Conference on Radioecology & Environmental Radioactivity: 1



Professional Services

- **Corresponding Member**

European Dosimetry Group (EURADOS) WG7 on Internal Dosimetry

Stacey McCord and Sergei Tolmachev

- **Member of Editorial Board, Japanese Journal of Health Physics**

Sergei Tolmachev

- **Adjunct Professor**

Department of Chemistry, Laval University (Quebec, QC, Canada)

Sergei Tolmachev

- **Ad-hoc Reviewer, Radiation Protection Journal**

Sergei Tolmachev



#4: Expeditious data report

Expedite tissue analysis:

- Implementation of microwave technology
- Vacuum-assisted extraction actinide separation
- Inductively coupled plasma mass spectrometry (ICP-MS)

Reporting results:

- Reducing numbers of intermediate report forms
- Developing of a generic template/templates

#5: Expanding the scope of the Registries

Tissue Actinide Analysis:

- From elemental to isotopic
- From dissolution to distribution

Industrial Hygiene:

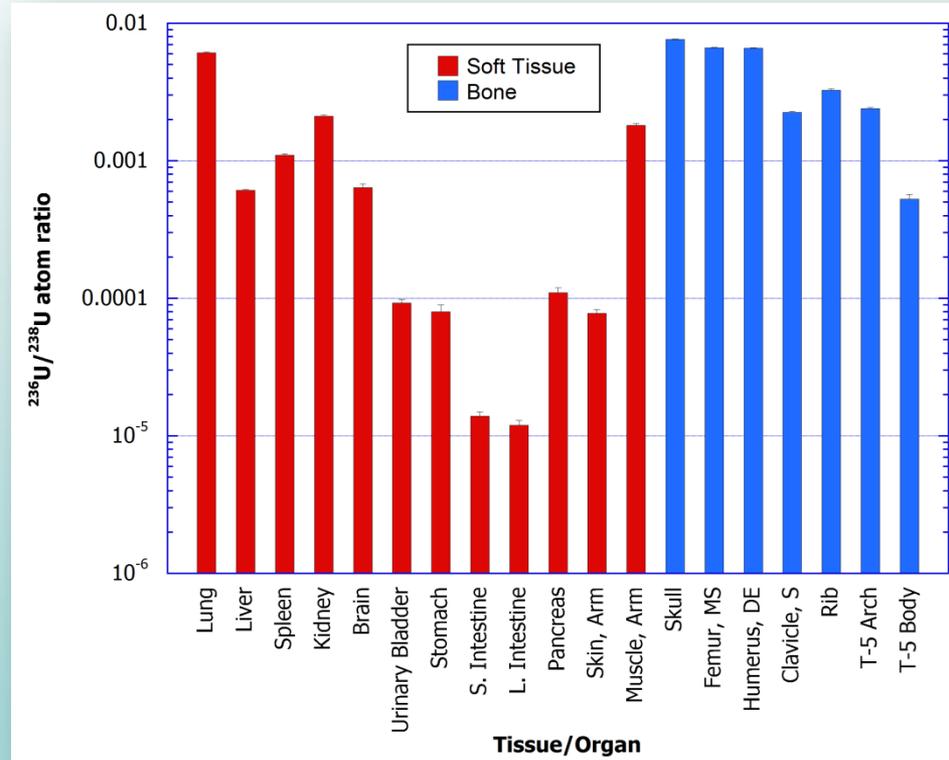
- Analysis for beryllium and asbestos

Molecular Biology:

- Polymerase chain reaction (PCR) method

From elemental to isotopic: ICP-MS/TIMS

- Radiation Protection Bureau, Health Canada, Ottawa
- Chalk River Laboratories, Atomic Energy of Canada, Chalk River



$^{236}\text{U}/^{238}\text{U}$ atom ratio in tissue samples from Case 1028 (HEU exposure)

From dissolution to distribution: SR- μ XRF

- Dept. of Analytical Chemistry, Ghent University, Belgium



M.S. Project: *Imaging of the distribution of actinides in human tissues using LA-ICP-MS and synchrotron radiation micro X-ray fluorescence*

Ms. Eva Vergucht



Prof. Dr. Frank Vanhaecke



Dr. Andrei Izmer

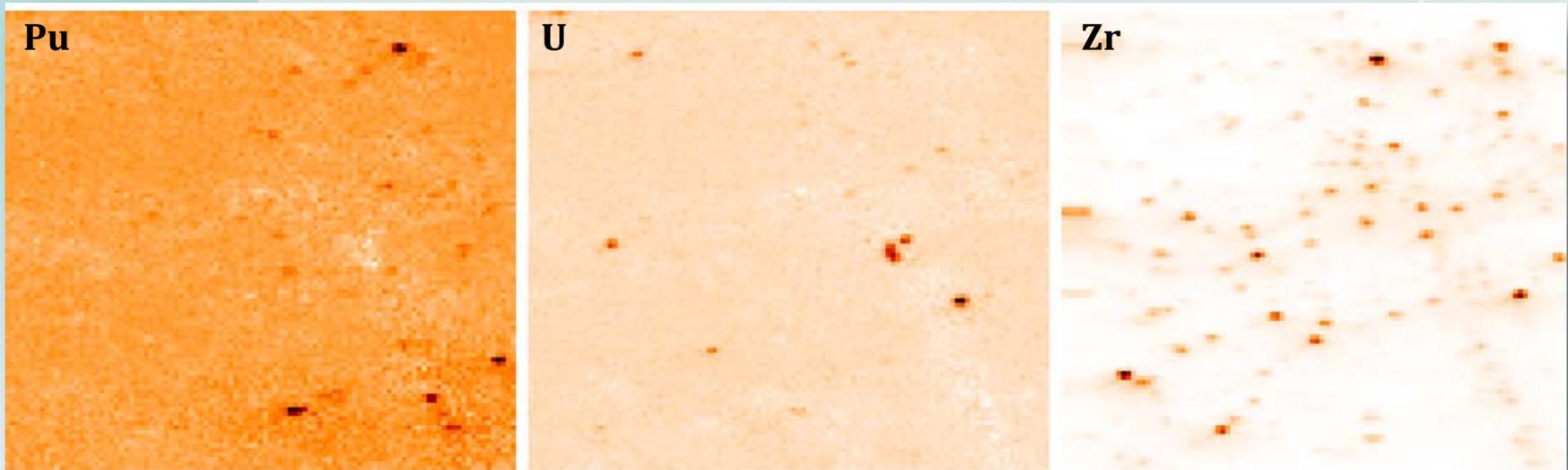


Dr. Björn De Samber

Dr. Laszlo Vincze

SR- μ XRF at DESY facility (Hamburg)

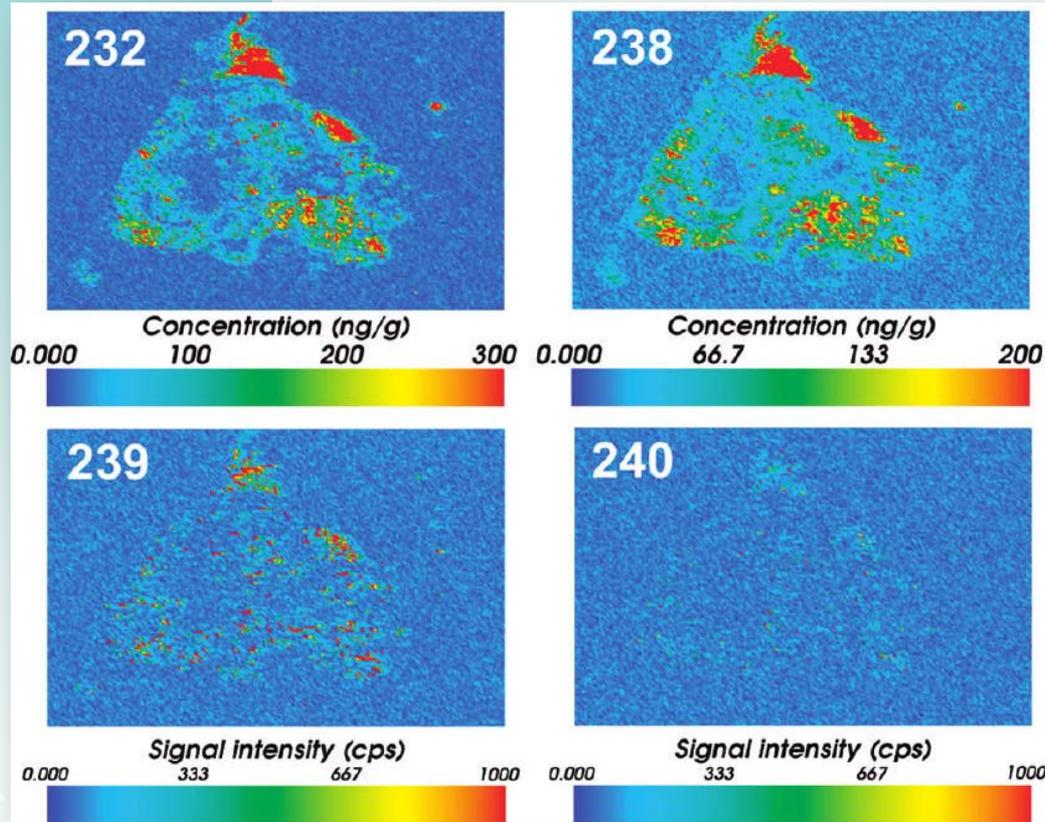
- Resolution: 18 μm



Elemental Pu, U and Zr distributions in paratracheal lymph node from USTUR Case 0407

Isotopic distribution: LA-ICP-MS

- **Elemental Bio-Imaging Facility, University of Technology, Sydney, Australia**



Featured Article:

D. Hare, S. Tolmachev, A. James, D. Bishop, C. Austin, F. Fryer, P. Doble
Elemental Bio-imaging of Thorium, Uranium, and Plutonium in Tissues from Occupationally Exposed Former Nuclear Workers
Analytical Chemistry
 2010 82 (8), 3176-3182

Distribution of m/z 232 (Th), 238 (U), 239 (Pu) 240 (Pu)
 in paratracheal lymph node from USTUR Case 0407

Beryllium analysis: ICP-MS



Dr. Dominic Lariviere

Assistant Professor

Director, Radioecology Laboratory

Department of Chemistry, Laval University

Québec City, Canada

Paper in Preparation: D. Larivière, M. Tremblay, M. Durand-Jézéquel, S. Tolmachev. *Detection of Beryllium in Human Tissues by Aerosol Dilution with Inductively Coupled Plasma Mass Spectrometry.*

^9Be in USTUR donors tissues

Tissue/Organ Description	Donation type	Time of exposure [†] , y	Weight, g		^9Be concentration	
			Tissue	Solution	Solution, pg g ⁻¹	Tissue, μg kg ⁻¹
<u>Case 0262</u>	WB	8				
Lung (L)			433.5	400.1	227 ± 7	0.210 ± 0.006
LN Peribronchial			18.1	300.0	373 ± 4	6.18 ± 0.07
Femur (R) MS			155.8	600.0	4 ± 1	0.017 ± 0.003
<u>Case 0425</u>	WB	23				
LN Hilar			6.5	177.1	300 ± 3	8.13 ± 0.08
Femur (R) MS			95.4	507.2	19 ± 1	0.101 ± 0.005
<u>Case 0706</u>	WB	6				
Lung (R)			389.7	1075.6	1326 ± 6	3.65 ± 0.02
LN Pulmonary			2.1	325.0	382 ± 2	50.8 ± 0.3
Hair			14.8	232.8	18.4 ± 0.4	0.240 ± 0.005
Femur (R) MS			133.7	653.9	825 ± 4	4.03 ± 0.02
<u>Case 0720</u>	WB	23				
Lung (R)			606.1	500.0	126 ± 2	0.104 ± 0.002
LN Hilar (R)			4.0	427.3	969 ± 16	104.6 ± 1.7
LN Paratrechial			6.9	100.0	4928 ± 54	71.1 ± 0.8
Femur (R) MS			124.3	558.5	21 ± 1	0.094 ± 0.004
<u>Case 0744</u>	WB	3				
Lung (R)			60.3	166.2	9.0 ± 0.1	0.023 ± 0.001
LN Pulmonary			1.4	250.0	1427 ± 17	247.7 ± 3.0
Femur (R) MS			155.6	813.9	19 ± 4	0.10 ± 0.02
<u>Case 0817</u>	PB	38				
Lung (R)			313.0	997.2	25.6 ± 1.5	0.082 ± 0.005
Femur (R) MS			162.6	933.1	27.7 ± 1.3	0.159 ± 0.007
<u>Case 1002</u>	WB	27				
Femur (R) MS			146.7	600.0	8 ± 1	0.033 ± 0.004

† - self-reported years of exposure; R - right side, L - left side; MS - middle shaft; WB - whole body; PB - partial body

#6: Study synergistic effects

Beryllium - Asbestos

Radiation - Asbestos

Radiation - Beryllium



#7: Radiochemistry must continue at the rate that budgets allow

FY2011 Budget - 900 k\$:

Hiring laboratory technician

- Fredrick L Miller, B.A.

Purchasing new equipment/software

- Microwave digestion system; extra set of digestion vessels
- Acid vapor cleaning devise
- Hot-block digestion system
- Electroplating apparatus
- AlphaVision[®]-32 v5.5 software upgrade for α -spectrometry



New Equipment



Mutiwave 3000 with 8SXF-100 rotor



Acid vapor cleaning device



Rotor 1DRY for Mutiwave 3000



12-position electroplater apparatus for α -counting sources preparation

#8: Donations should be encouraged

- Several phone calls from families were received in FY 2011 with the question: “Are you still in business?”
- Annual 2011 Newsletter was sent to the Registrants and the Families confirming that despite the reduction in funding, the USTUR was still accepting donations
- On April 25th, a letter from the Director was sent to all Registrants assuring them that the DOE considers Registrant donations to be a priority
- It was decided that for whole body donations a small portion of ashes would be returned to the family if requested



Family correspondence



Wishing you flurries of fun
all winter long.

Thank you for your efforts
on behalf of John Tompkins

I thought you might enjoy
reading his obituary

Take care
Nancy Tompkins Christie

ps Ashes arrived safely-

Sample storage: Current

Storage conditions:

- Sealed vacuum-packages of individual soft tissue and bone samples. Storage at $-30\text{ }^{\circ}\text{C}$
- Individual pathology containers and neutral buffered formalin for fixed tissue
- Glass bottles with acid solutions at controlled temperature warehouse



Sample storage: Future

Walk-in-freezer vs multiple chest-freezers:

- Reducing storage space
- Savings on electricity

Dry bone ashes vs acid solutions:

- Reducing amount of acids (used and stored)
- Reducing storage space

Dissection of tissue samples

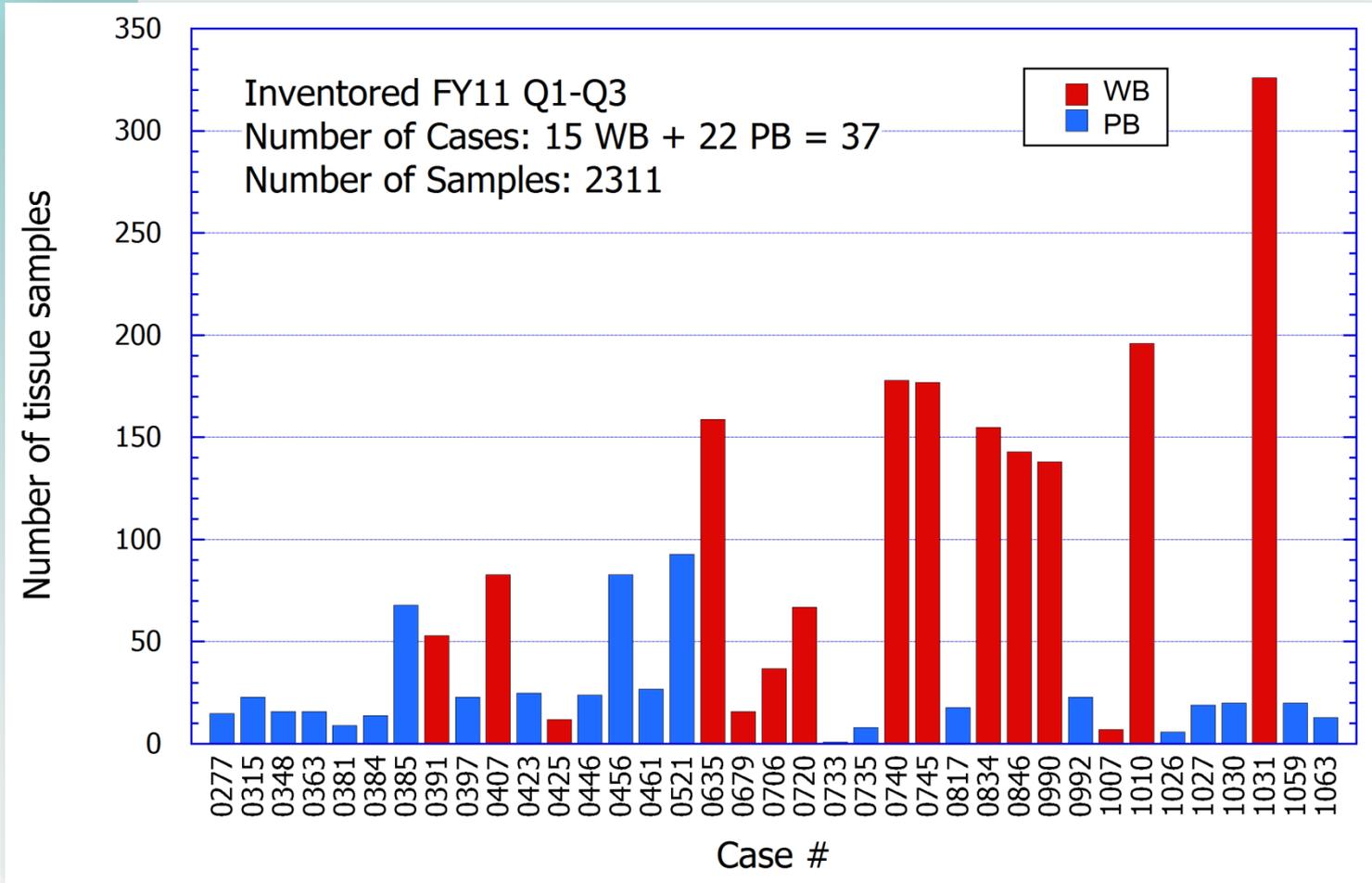
Staff:

- Florencio Martinez
- David McLain

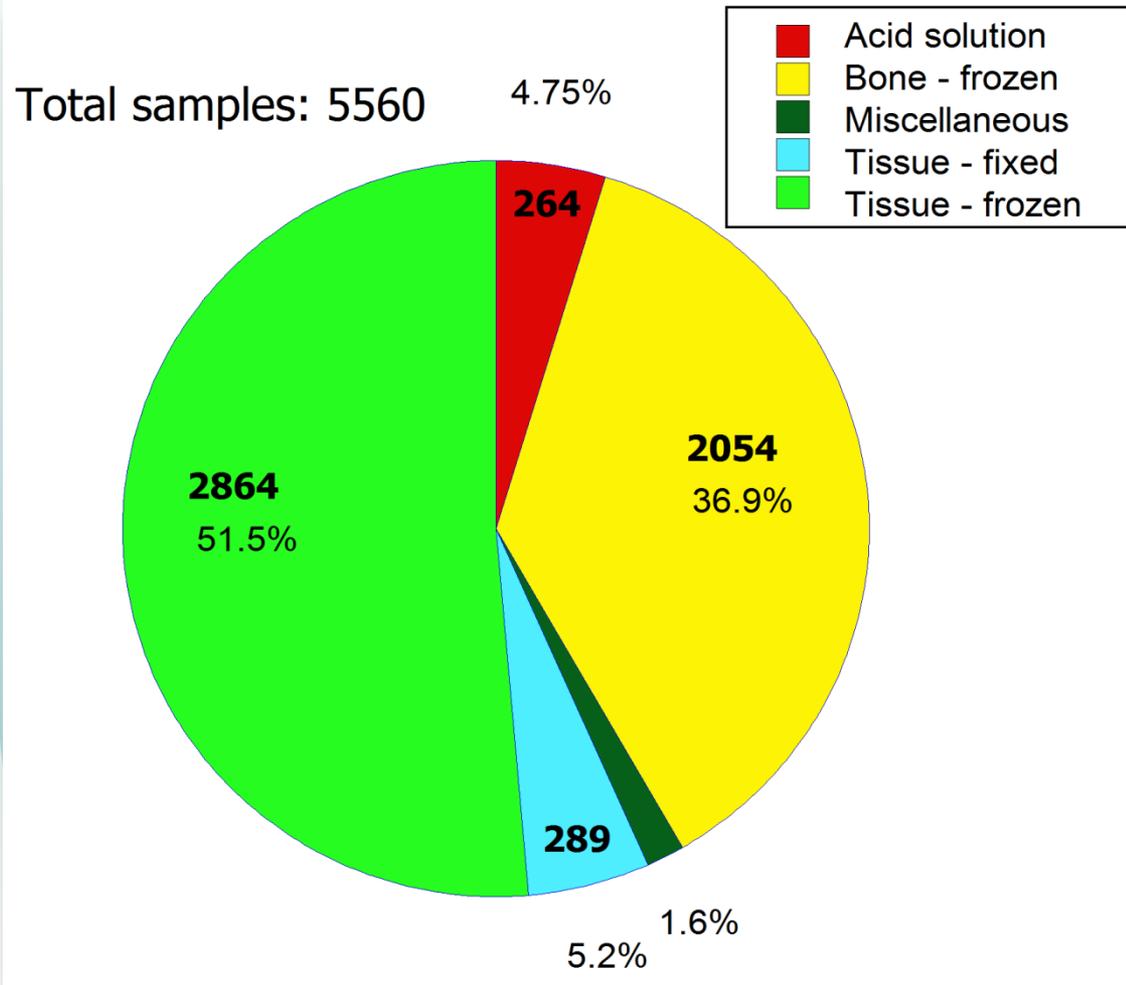
Completed – 11 WB +1 PB:

- 2010: 0385, 1031, 0740;
- 2009: 0456;
- 2008: 0407, 0846 – left side;
- 2006: 0391;
- 2005: 0990, 0745, 0720 – left side;
- 2000: 0635;
- 1997: 1026 – partial body, left side.

Tissues inventory FY2011



THEMIS inventory



Health Physics Data Entered

Case Number	0269	0385	1031
<i>Year of Death</i>	<i>1994</i>	<i>2010</i>	<i>2010</i>
Incidents	4	14	1
Contamination	50	27	0
External Dosimetry	2	358	0
<i>In-Vitro</i> Bioassay	568	17	2
Blood	4	0	0
Feces	99	0	0
Urine	453	14	2
Other	12	3	0
<i>In-Vivo</i> Bioassay	26	28	0
Liver	3	0	0
Lung	7	0	0
Skeleton	12	2	0
Whole Body	0	26	0
Other	4	0	0
Air Monitoring	1	0	0
Work Site Assessments	19	4	0
Treatments (Ca-EDTA, Ca-DTPA, ZrCi, Decholin)	167	0	0
Total	1,431	493	5





THANK YOU

