



WASHINGTON STATE UNIVERSITY
College of Pharmacy and
Pharmaceutical Sciences



2026 USTUR Scientific Advisory Committee Meeting
Hampton Inn, Richland, Washington; April 16–17, 2026

Radiochemistry Laboratory Operations

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“Learning from Plutonium and Uranium Workers”

Outline

FY2026 progress

- Tissue analyses
- Case analyses
- Status summary

FY2027 analysis strategy

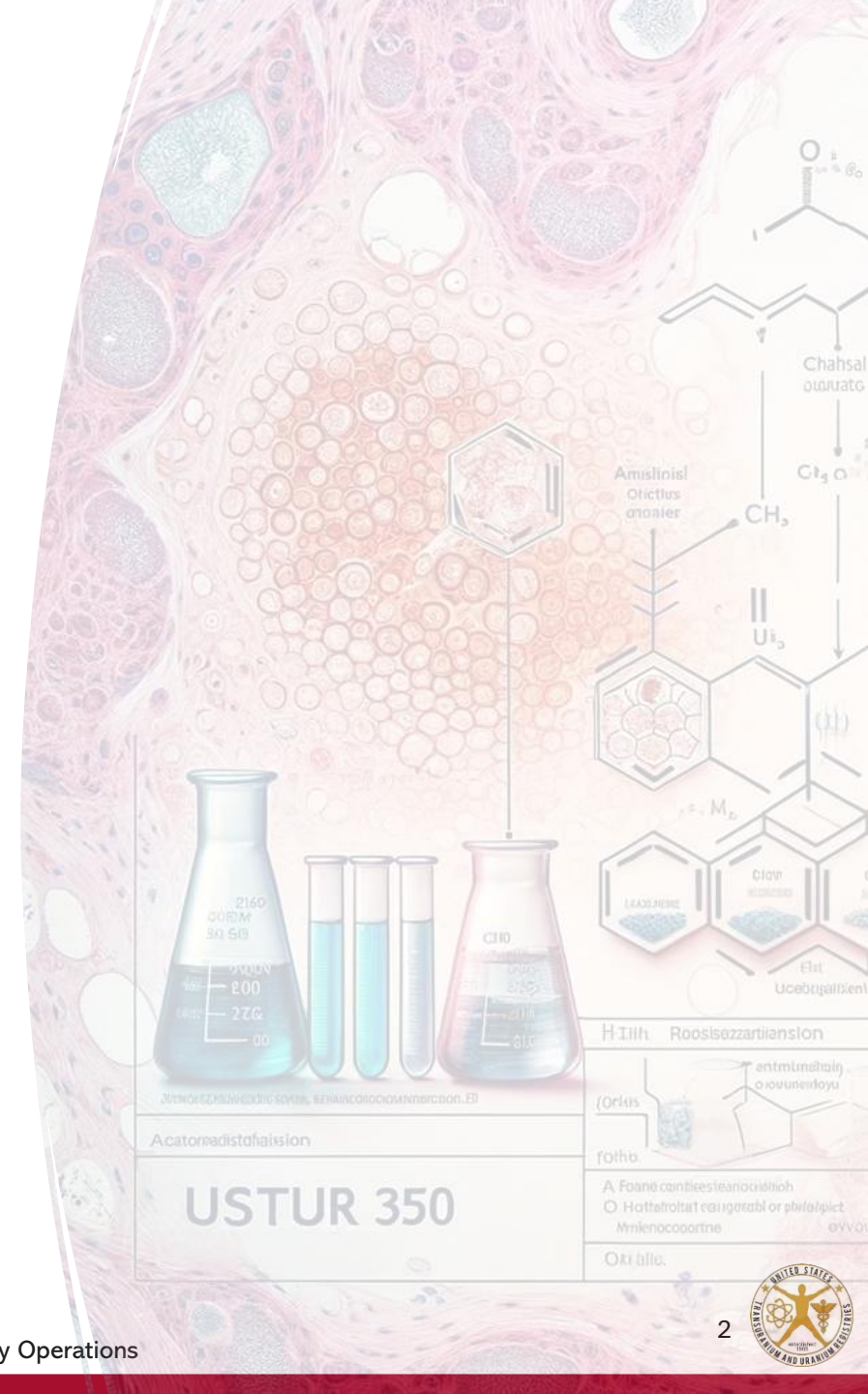
- Tissue sample backlog
- Completion of tissue sample analyses

Facility and equipment

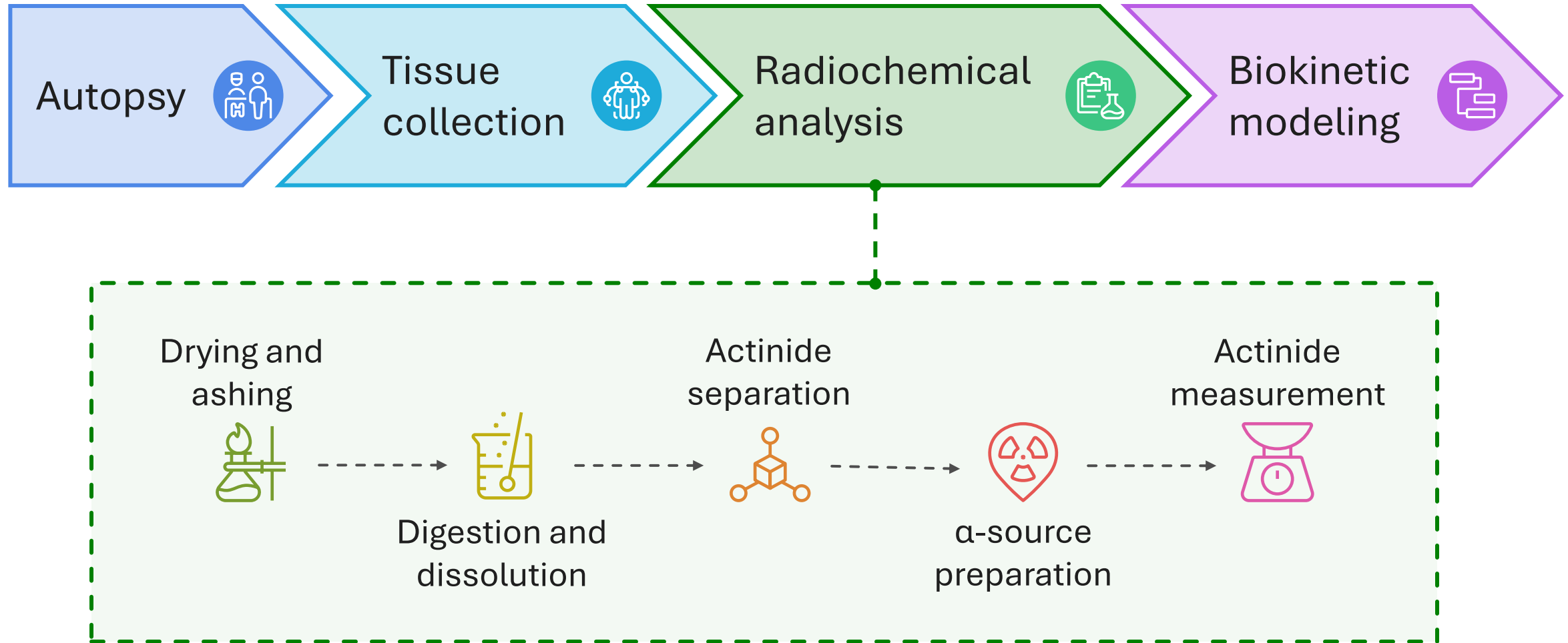
Radiochemistry database

'URpy' implementation

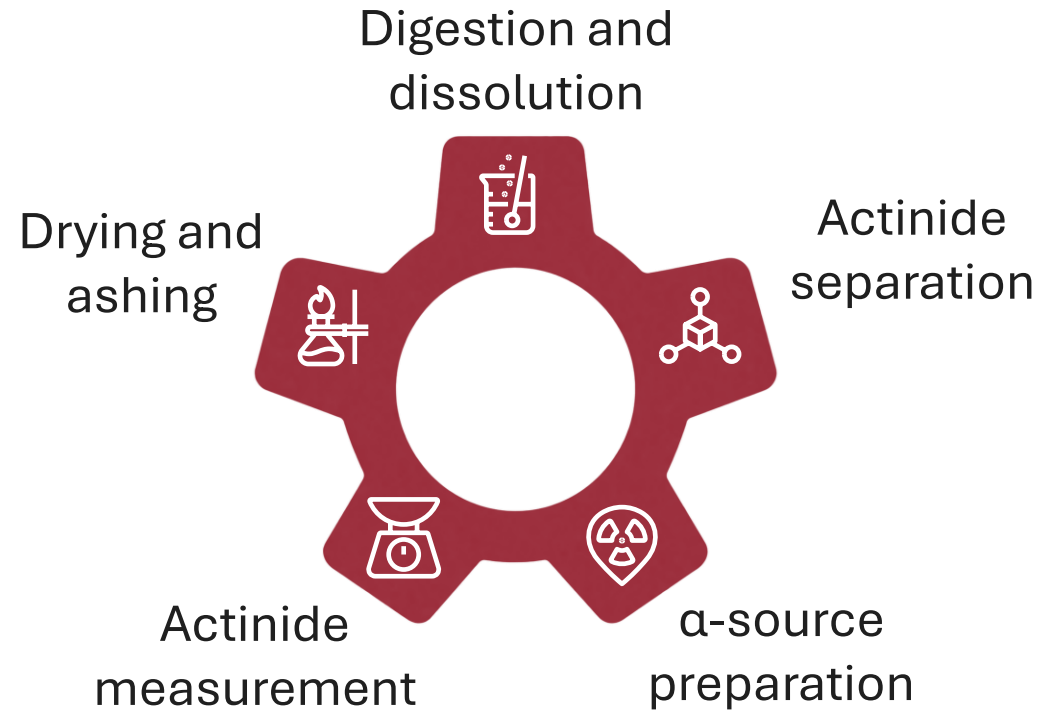
- Benchmarking: URpy vs Excel Calculations
- Reanalysis of historical cases



USTUR Operation & Research: A Big Picture



FY2026 Tissue and Case Analysis Progress



Tissue Analyses Progress

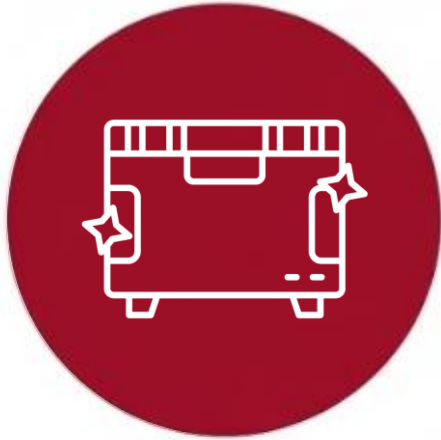
- **Tissue samples analyzed** from one whole- and one partial-body donation



- **Total sample analyses** conducted in addition to primary tissue samples



Case Analysis Status Change



Intact

No tissue samples have been analyzed.



Incomplete

A selected sub-set of tissue analyses is currently in progress.



Surveyed

Key scientific samples completed, revealing exposure levels.
Exclusive to whole-body cases.
More tissues needed to finish case.



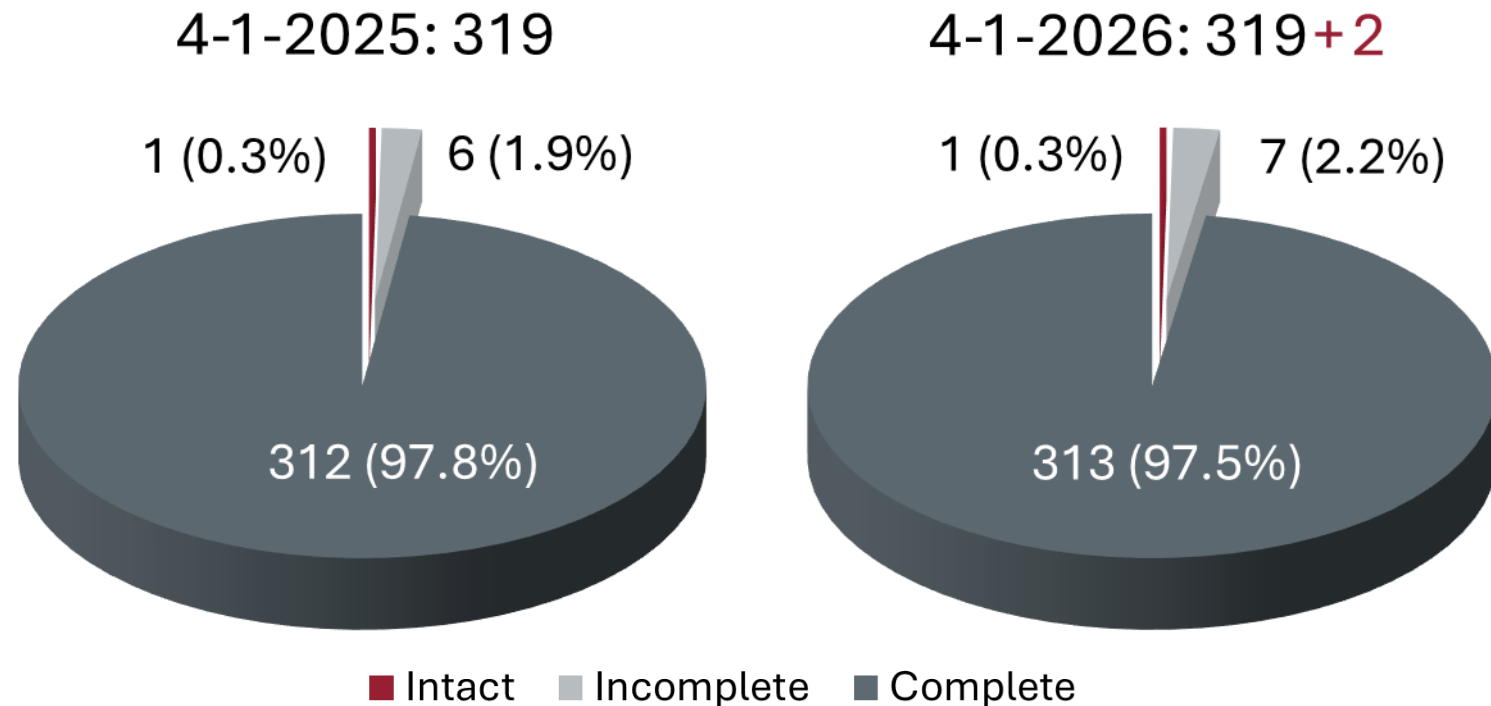
Complete

Full selection of tissue samples analyzed and results fully reported.

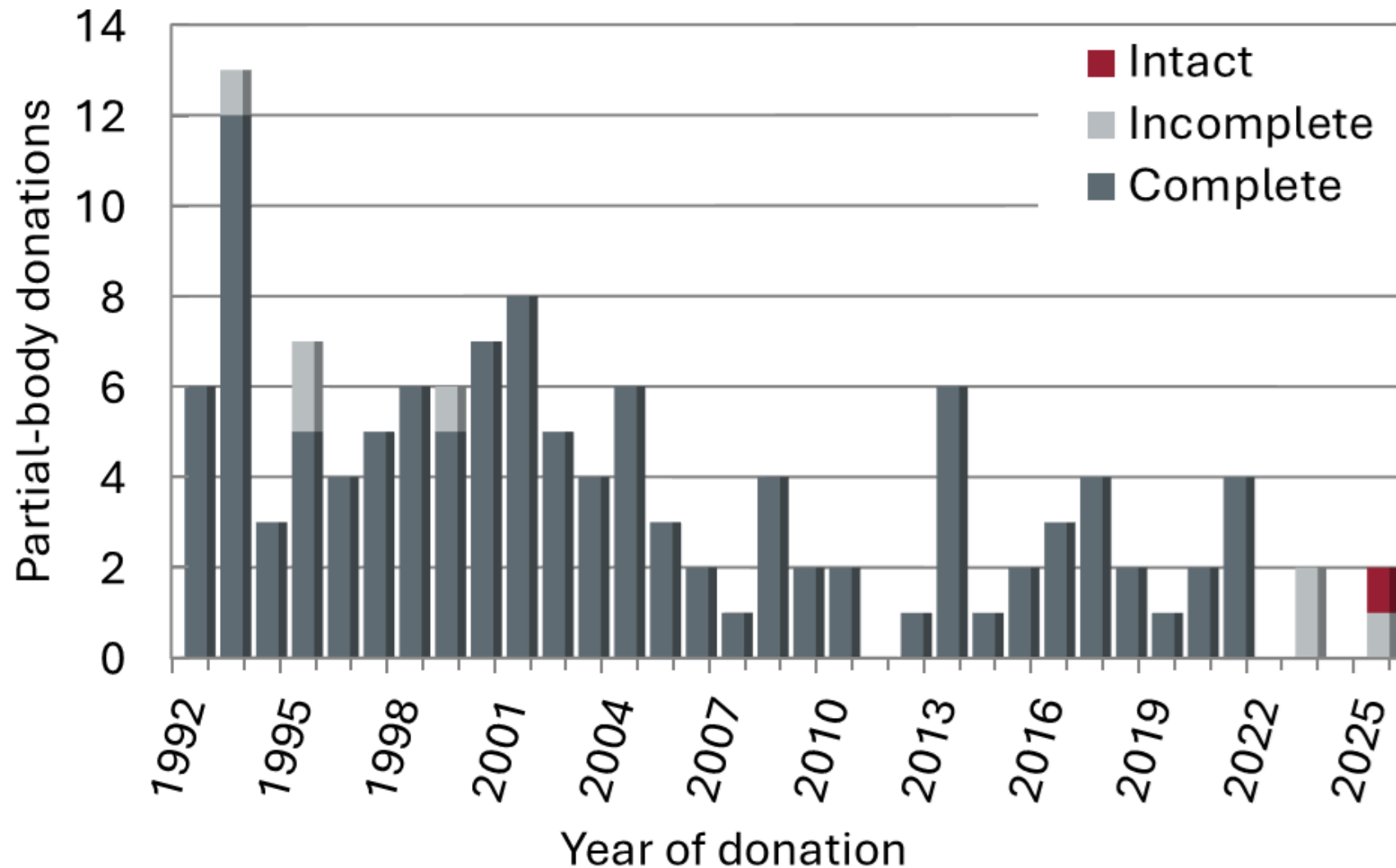


Case Analysis Progress: Partial-Body

- Two new partial-body donations received in FY2026, cases 0393 and 0482
- Incomplete → Complete: 0288 (2021)
- **Intact** → Incomplete: 0482 (2025) and 0605 (2023)

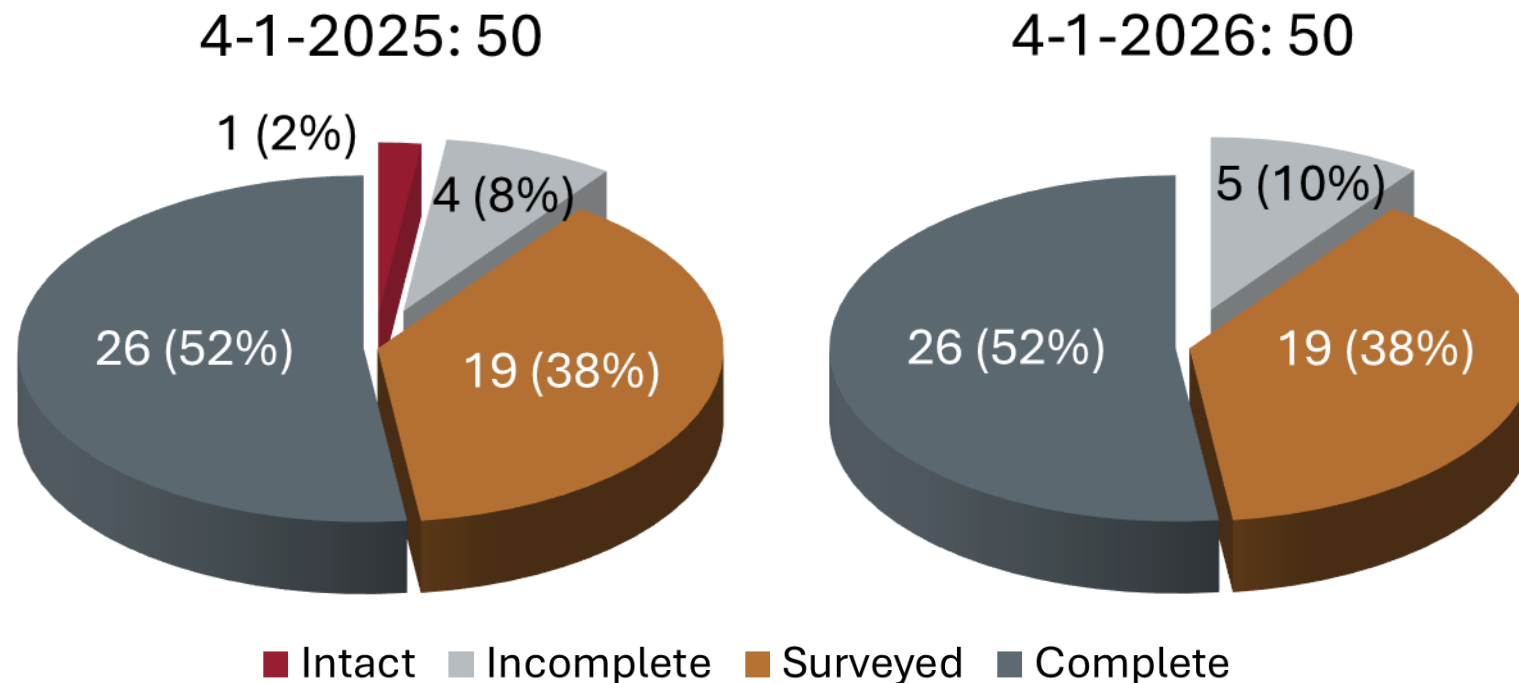


Case Status Summary: Partial-Body

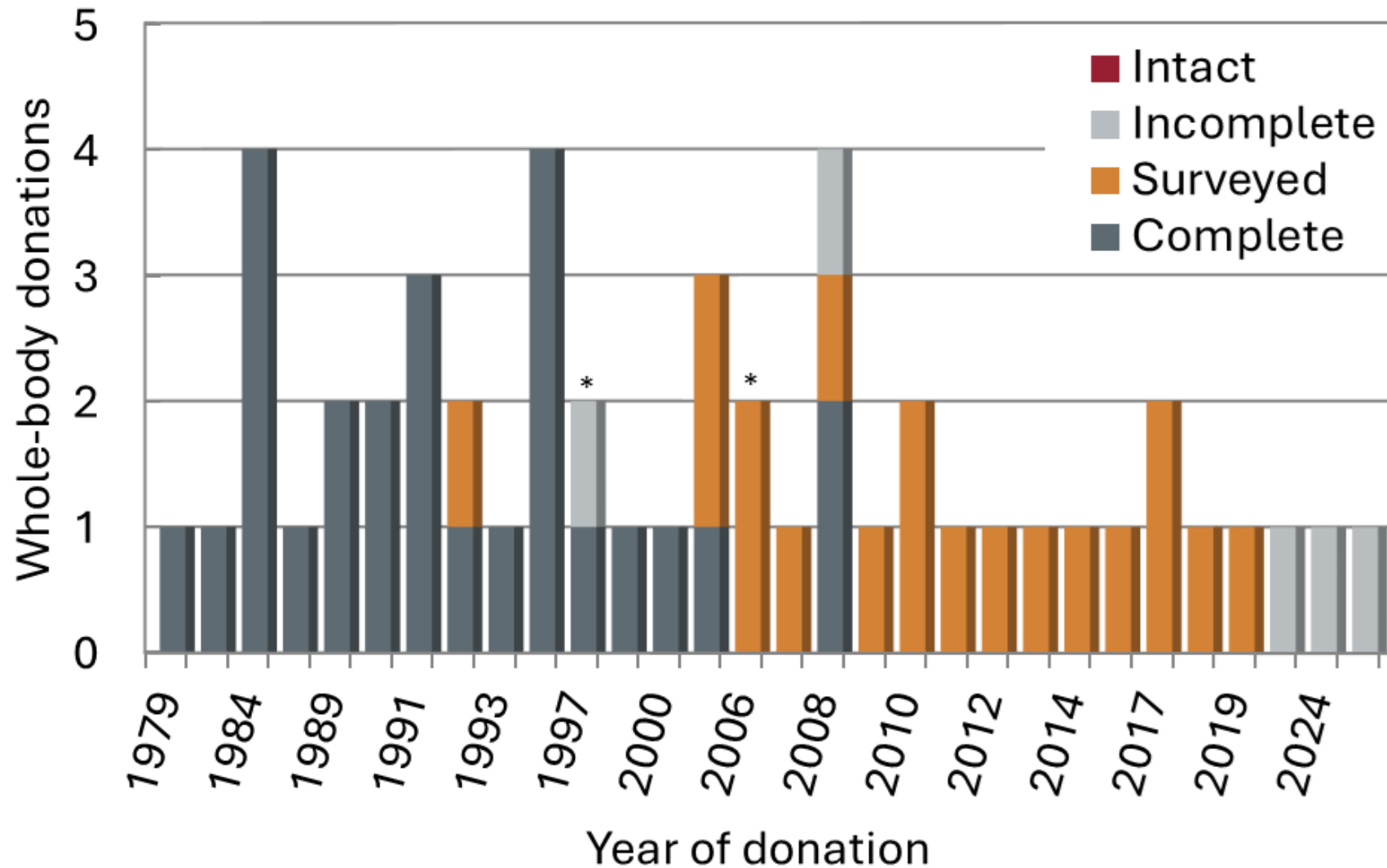


Case Analysis Progress: Whole-Body

- No new Whole-body donations received in FY2026
- **Intact** → Incomplete: 0409 (2025)



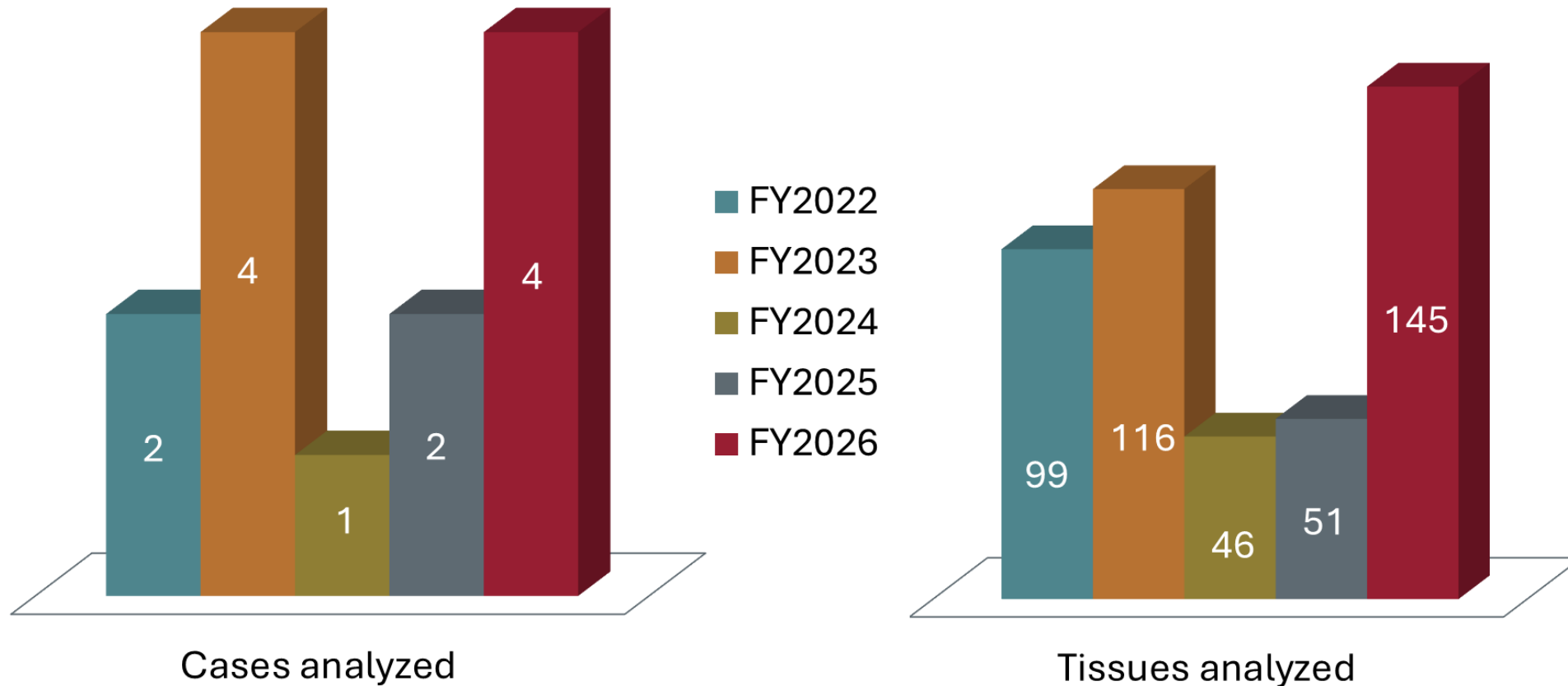
Case Status Summary: Whole-Body



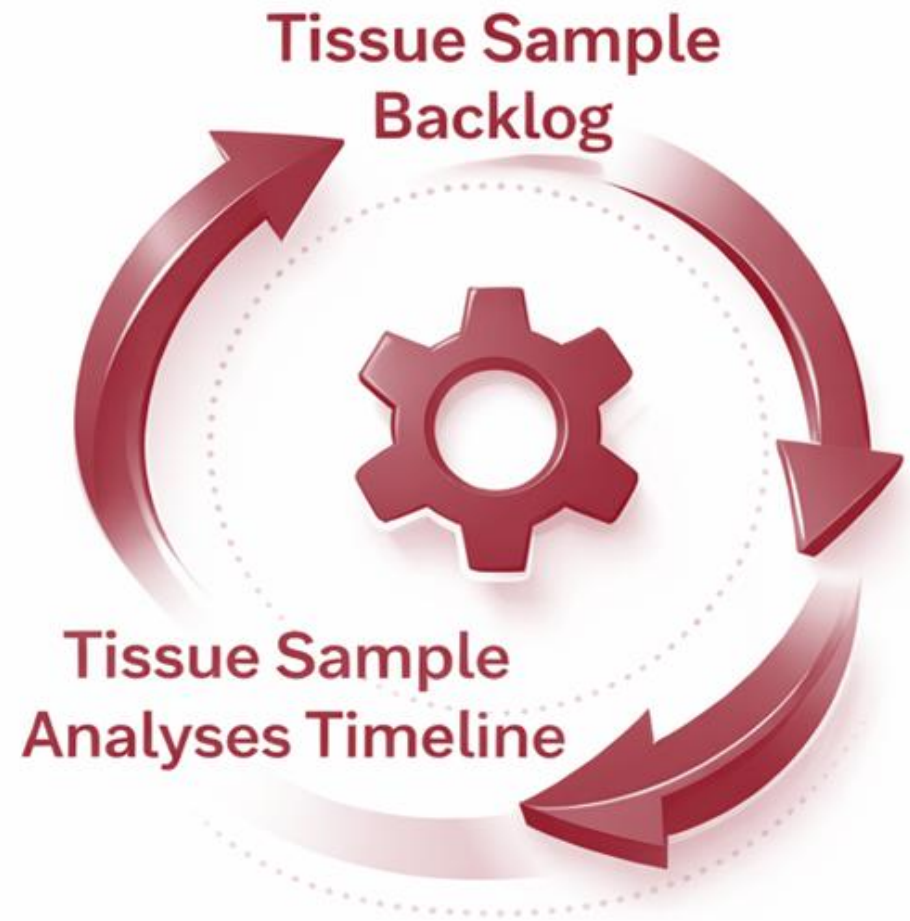
* Thorotrast cases



FY2026 Case and Tissue Analyses Summary

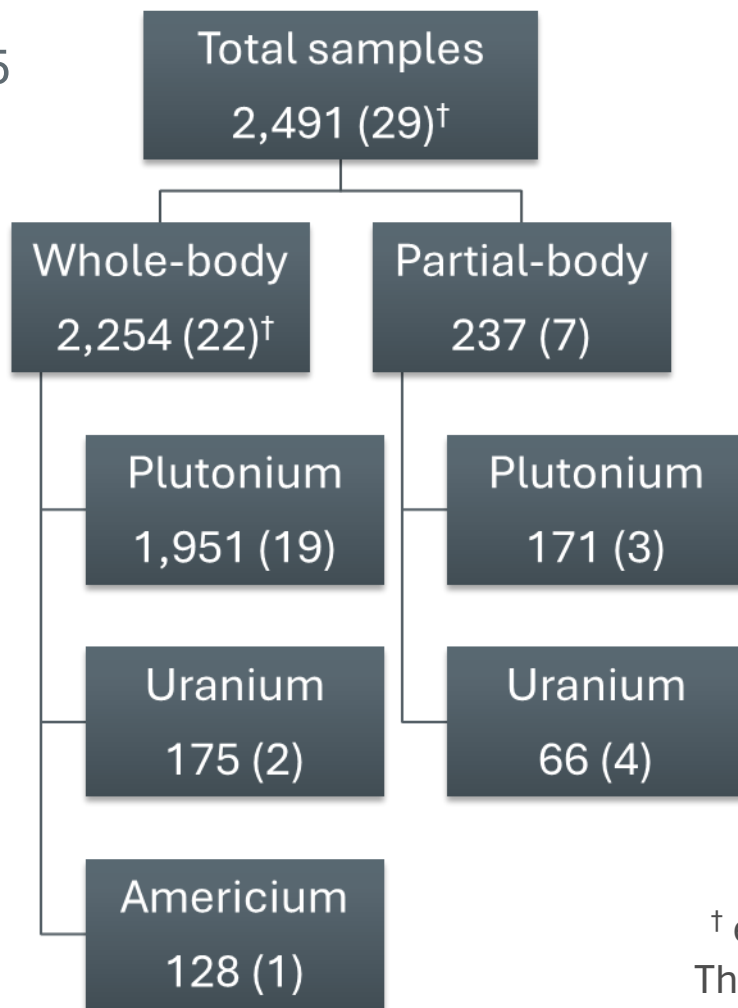


FY2027 Tissue and Case Analysis Strategy

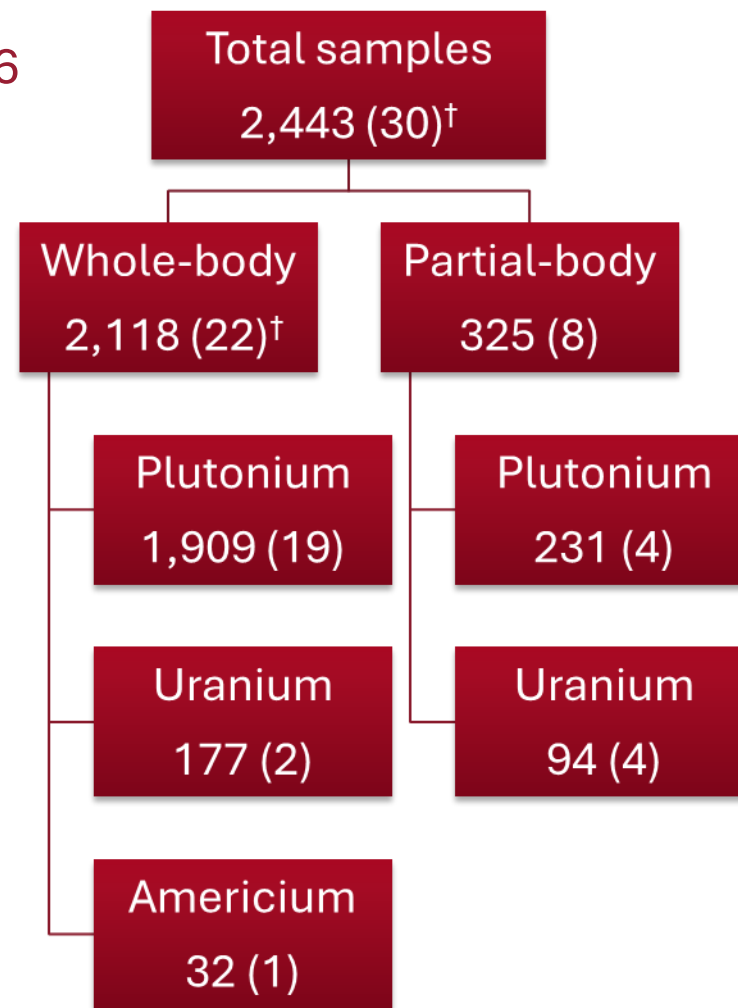


Tissue Sample Backlog

4-1-2025



4-1-2026

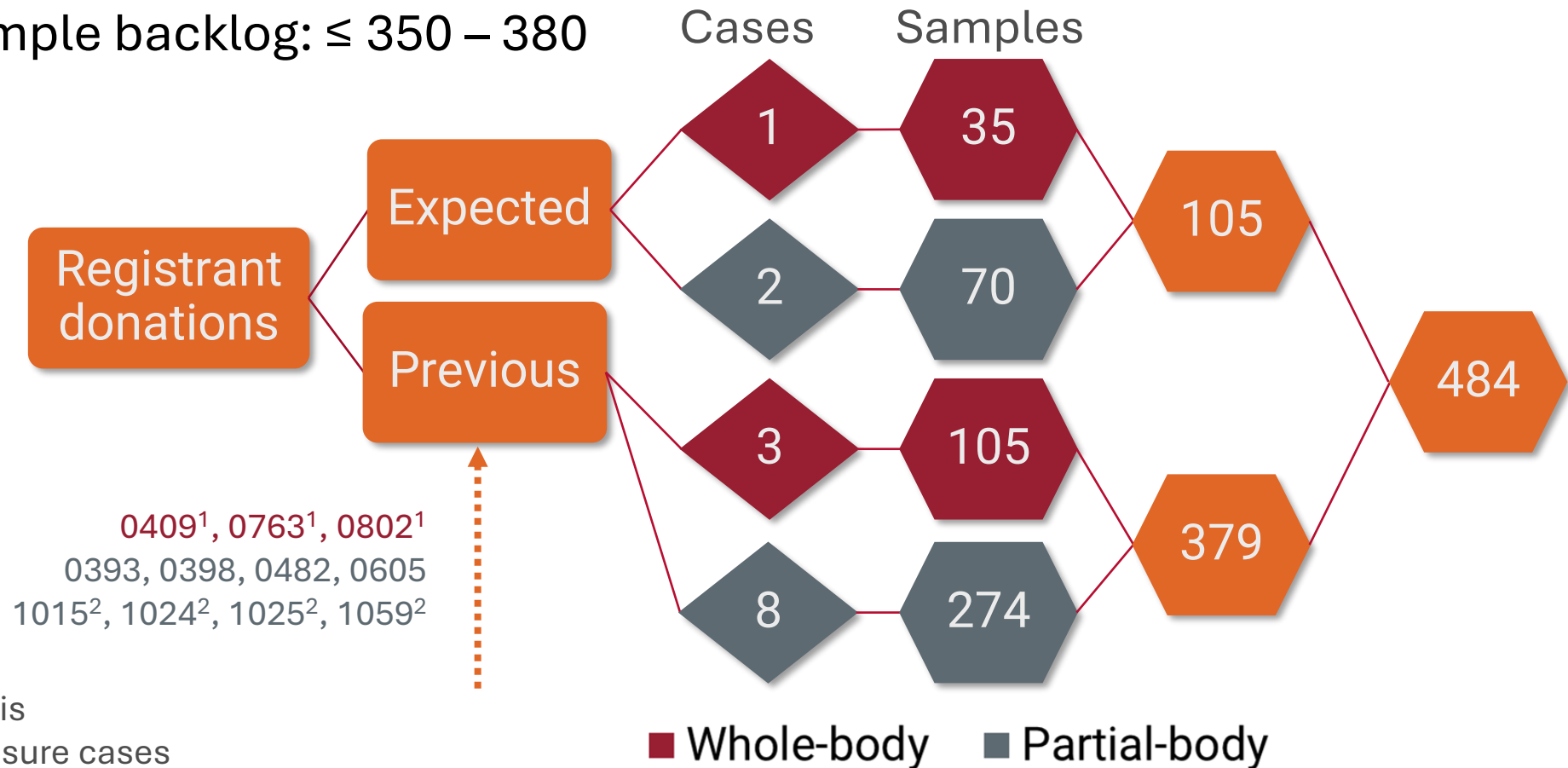


[†] excluding two
Thorotrast cases



FY2027 Analysis Strategy

- Tissue analysis throughput: 450 – 480
- From new donations: 100 – 105
- Tissue sample backlog: $\leq 350 - 380$

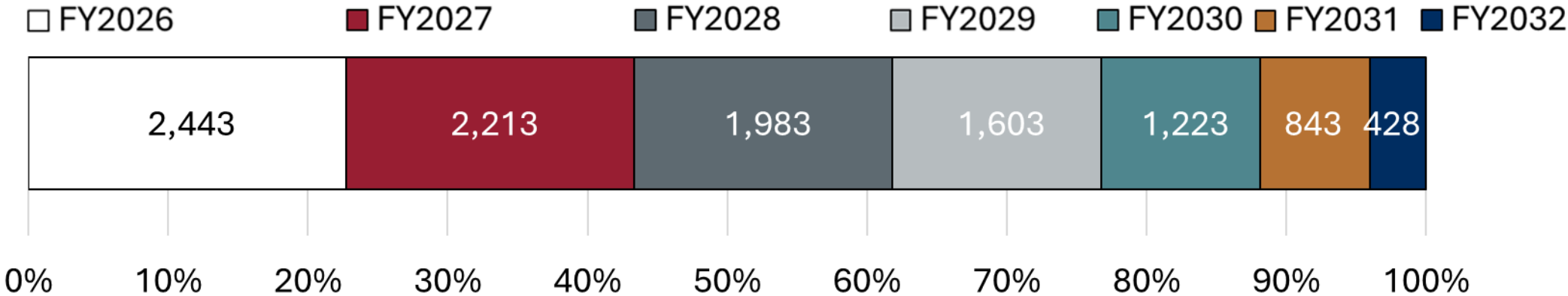
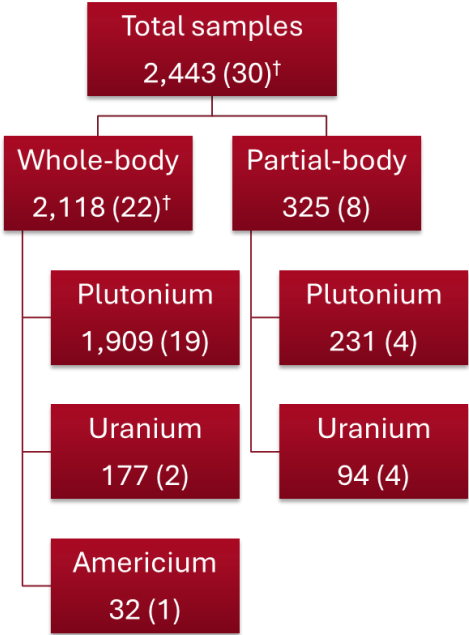


¹ survey analysis

² uranium exposure cases

Tissue Sample Analyses Timeline

- Current sample backlog 2,443
 - Sample analysis throughout 450
 - Expected samples to be analyzed
- Whole-body × samples $2 \times 150 = 300$
- Partial-body × samples $11 \times 35 = 385$
- Total tissue samples 3,128
 - Time to complete $3,128/450 = 7$ years



Laboratories Facility Maintenance



Routine Maintenance Tasks



Radiation contamination survey by USTUR personnel (quarterly)



Radioactive waste disposal by the WSU RSO (quarterly)



HVAC system general maintenance by a certified contractor (quarterly)



Hazardous (acid) waste disposal by the WSU EH&S (biannually)



Medical waste disposal by a certified contractor (biannually)



Fire safety inspections by a certified contractor (annually)



Laboratory Chemical Inspection

- Laboratory inspection conducted on March 3 by WSU Environmental Health & Safety



Jason Sampson
Director
Environmental Health & Safety



J. Levi O'Loughlin, Ph.D.
Associate Director
University Biosafety Officer
Office of Research Assurances

WASHINGTON STATE UNIVERSITY
Environmental Health and Safety

Laboratory Inspection Checklist

Inspector: Jason T Sampson Date: 3/3/24
Inspector phone: 509-335-7138 Accompanied by: JLS
Inspector email: jason.sampson@wsu.edu

Laboratory Information

Department: _____
Principal Investigator (PI)/Laboratory Instructor: _____
PI telephone number: _____
PI e-mail address: _____
Building: _____
Laboratory room number(s): _____
Lab Safety contact person: _____
Lab Safety contact telephone number: _____
Lab Safety contact e-mail address: _____

☒ Radiation ☐ Lasers (Highest Class: _____) ☐ Biosafety 2 or greater ☐ Animals ☐ Hazardous Drugs

Chemical Classes Present

☐ Particularly Hazardous Substances (select carcinogens, acute toxins, reproductive toxins)
☐ Regulated Air Contaminants
☐ Pyrophorics
☐ Water Reactive
☒ Reducing Agents
☒ Oxidizers ☒ Flammable Chemicals

EH&S Laboratory Inspection Checklist

	Compliant	Y
Safety showers	Y	
Eyewash stations	Y	
Fume hoods	Y	
Chemical storage	Y	
Fume waives	Y	
Safety mirrors	Y	
Main perimeter storage	Y	
Fume hoods	Y	
Chemical storage	Y	
Environments system	Y	

No major issues identified.

Y: Compliant N: Not Compliant S: Safety NA: Not Applicable
Revised 1/2026

Radiochemistry Database

The screenshot shows a web application window titled "LIMS_FE : Database- C:\Users\George\Desktop\LIMS_FE.accdb (Access 2007 - 2016 file format) - ...". The application has a menu bar with "File", "Home", "Create", "External Data", "Database Tools", and "Help". A "Tell me what you want to do" search bar is also present. The main content area is divided into three tabs: "Case File", "Navigation", and "General Notes". The "Case File" tab is active, displaying the "Case 0359" information. The case details include: "Donation Type" (WB), "Started" (8/31/2020), "Collection Date" (empty), "Surveyed" (3/26/2021), "Most Recent Count" (3/24/2021), "Completed" (empty), "Radiochemistry Status" (SURVEYED), and "Reported" (empty). The "Reports" section lists "Ashing and Dissolution Sheets", "Radiochemical Separation", "Electrodeposition", "Batch Entry", and "Results for Health Physics DB", each with "Preview" and "Export" buttons. The "Run(s)" dropdown is set to "242". The "External Files and Attachments" section includes a "Case File (Link)" field, an "Attached Files" list, and a "Case Notes" text area containing: "Pu - No recorded intake; some U Lung lobe aliquote size - 50%. 2 dpm tracer". The "Working Forms" section includes buttons for "Tissue Backlog", "Add Autopsy Masses", "Select Samples For Analysis", and "Analyzed Sample Information". The bottom status bar shows "Record: 1 of 1", "No Filter", and a "Search" field. The "USTUR Case Number" is displayed at the bottom left.

Case File Navigation General Notes

Case 0359

Donation Type WB Started 8/31/2020

Collection Date Surveyed 3/26/2021

Most Recent Count 3/24/2021 Completed

Radiochemistry Status SURVEYED Reported

Reports

Ashing and Dissolution Sheets Preview Export

Run(s) 242

Radiochemical Separation Preview Export

Electrodeposition Preview Export

Batch Entry Preview Export

Results for Health Physics DB Preview Export

External Files and Attachments

Case File (Link)

Attached Files

Case Notes:

Pu - No recorded intake; some U Lung lobe aliquote size - 50%. 2 dpm tracer

Working Forms

Tissue Backlog

Add Autopsy Masses

Select Samples For Analysis

Analyzed Sample Information

Record: 1 of 1 No Filter Search

USTUR Case Number



Expanded Data Capture and Documentation

- Expanded data capture from previously external records
- Improved tracking of sample positions during processing steps
 - Support for non-standard (interstitial) sample locations
- Enhanced visibility of sample-specific data for review



Notes Form, Case 0359

Sample ID	Tissue Type	Tissue Location
0359-610	Respiratory	Lung: Sup

Initial Ashed Beaker 410.98 g, 4.1 g ash, 10/14/2020 + 20 mL HNO₃, Reash. MW

Aliquot ID: 0359-610A	Run No: 243	☐ ICPM
PlanchetID: 0359-610A Am	☐ Reount	
PlanchetID: 0359-610A Pu	☐ Reount	

Sample ID	Tissue Type	Tissue Location
0359-620	Respiratory	Lung: Ma

Initial Ashed Beaker 154.39 g, 1.01 g ash, 10/15/2020 +10 mL HNO₃, Reash. MW
contents appear to shreds of plastic from digestion cup. Filter retained.

Aliquot ID: 0359-620A	Run No: 243	☐ ICPM
PlanchetID: 0359-620A Am	☐ Reount	
PlanchetID: 0359-620A Pu	☐ Reount	

Sample ID	Tissue Type	Tissue Location
0359-630	Respiratory	Lung: Inf

Initial Ashed Beaker 212.46 g, 2.62 g ash, 10/15/2020 +10 mL HNO₃, Reash. MW

Aliquot ID: 0359-630A	Run No: 243	☐ ICPM
PlanchetID: 0359-630A Am	☐ Reount	
PlanchetID: 0359-630A Pu	☐ Reount	

Sample ID	Tissue Type	Tissue Location
0359-636	Fat: Torso	Front Low

MW 4 tubes.

Aliquot ID: 0359-636A	Run No: 243	☐ ICPM
PlanchetID: 0359-636A Am	☐ Reount	
PlanchetID: 0359-636A Pu	☐ Reount	

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Ashing and Dissolution Form

Rev. 6
Date: 1/20/26

20000980

Case : 0359	Beaker Tare (g): 91.83
Sample : 004	Drying Oven Shelf: Shelf II, Row C, Column 2
Initial (g): 1.41	Total Dry (g): 92.21
Prepared (g): 1.41	Tissue Dry (g): 0.38 Dry Fraction: 26.95%
Tissue Type: Lymphatic - LNTH	Furnace Shelf: Lower Shelf, Row C, Columns 3/4
Tissue: Parabrachial (R) LN	Total Ashed (g): 91.86
Procedure No.: USTUR 105 (R 1), USTUR 111 (R 5)	Tissue Ashed (g): 0.03 Ash Fraction: 2.13%

☒ Evidence of fire in furnace during ashing

☐ Evidence sample was on fire MW Tubes: 1 No. of Rotors: 1

☐ Possible sample loss in preparation Rotor Pos'n: 3

Notes:

MW 1 tube.

Reagents Used:

HNO ₃ (mL): 21	Filtered? ☐	Solution (g): 132.88	Acid: 4 M (ACS) HCl
HCl (mL): 14	Tare (g):	004A	Aliquot (g): 27.32 ICP-MS ☐
HF (mL): 4	Total Filter (g):		
-H ₃ BO ₃ (mg): 50	Mass Filter (g):		
H ₂ O ₂ (mL):	Filtration Date:		

	Date Started	Initials	Date Completed	Initials
Received:	7/31/2020	EMT		
Drying:	7/31/2020	EMT	8/17/2020	EMT
Ashing:	8/17/2020	EMT	8/31/2020	EMT
Digestion:	11/17/2020	EMT	11/19/2020	EMT
Dissolution:	11/19/2020	EMT	12/8/2020	EMT

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Standardized Data Structure and Reporting

- Standardized reports for radiochemical separation and planchet tracking
- Consistent structure for recording analytical results and metadata
- Improved accessibility and organization of case-level data

Radiochemical Separation Form, Run 243 Rev. 5
Date: 1/16/26

Am/Pu 100 uL: 33 mBq
U/Th 200 uL: 33 mBq

Blank: L853 Spike: X853 Separation Date: 12/31/2020 EMT: UTR0038 Am-243: Am-243 Pu-242: UTR0042 U Tracer: Th Tracer:

Notes: 12/30/2020, Loading finished late, cartridges left stacked with 10 mL HNO₃ overnight

Procedure(s): USTUR 350 (R, I)

Aliquot ID	Mass (g)				Sample Analyzed	Nominal Tracer Activity (mBq)				Collection Date
	Initial	Pres/d	Ashed	Soln		Am	Pu	U	Th	
L853					4M (ACS) HCl	33.0	33.0			
X853				1001.85	QCAPP0018	33.0	33.0			
0359-046A1	262.65	145.04	1.31	133.49	Stomach	33.0	33.0			
0359-0961A	93.59	93.59	0.68	133.10	Front: lower (R) torso skin	33.0	33.0			
0359-081A	227.11	227.11	1.43	133.84	Front: lower (R) muscle	33.0	33.0			
0359-104A	33.77	33.77	19.63	432.52	Parotid 1 (R)	33.0	33.0			
0359-136A	17.24	17.24	3.94	137.27	Thoracic 5 - Arch	33.0	33.0			
0359-137A	31.19	31.19	4.71	137.49	Thoracic 5 - Body	33.0	33.0			
0359-171A	51.07	51.07	7.99	176.88	Rob 5 (R)	33.0	33.0			
0359-180A	65.52	65.52	6.23	178.62	Sternal Body	33.0	33.0			
0359-208A	105.08	105.08	45.61	1025.84	Female: Mid Shaft (R)	33.0	33.0			
0359-210A	285.29	285.29	50.23	1104.82	Female: Distal End (R)	33.0	33.0			
0359-211A	30.18	30.18	7.63	141.80	Patella (R)	33.0	33.0			
0359-314A	12.33	12.33	0.05	131.61	Axillary (L) LN	33.0	33.0			
0359-610A	369.21	369.21	4.66	248.48	Lung: Superior (R)	33.0	33.0			
0359-620A	92.23	92.23	1.12	133.24	Lung: Middle (R)	33.0	33.0			
0359-630A	756.13	756.13	3.12	168.27	Lung: Inferior (R)	33.0	33.0			
0359-636A	196.85	196.85	0.61	131.65	Front Lower Fat (R)	33.0	33.0			
0359-701A1	#####	647.00	6.72	398.07	Liver	33.0	33.0			
0359-944A	5.66	5.66	0.07	132.38	Trachea-Bronchial LN (side unspecified)	33.0	33.0			
0359-1538A	157.64	157.64	1.31	134.26	Hand (R) skin, muscle, fat	33.0	33.0			
0359-3001A	0.00	0.00	0.01	130.71	Blank 01	33.0	33.0			
0359-3010A	0.00	0.00	-0.01	131.09	Blank 10	33.0	33.0			
0359-3011A	0.00	0.00	0.01	132.46	Blank 11	33.0	33.0			

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Planchet Information Form, Run 242 Rev. 1
Date: 1/20/26

Notes:

Planchet ID	Electrodeposition				Alpha Counting				Batch	Recn	Procedures	Notes		
	ED Start	Intr's	ED End	Intr's	Pos'n	Det	Shelf	Cut Time (s)					Cut Date	Intr's
L852 Am	1/11/2021	EMT	1/14/2021	EMT	1	35	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
X852 Am	1/11/2021	EMT	1/14/2021	EMT	2	36	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-002A Am	1/11/2021	EMT	1/14/2021	EMT	3	43	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-003A Am	1/11/2021	EMT	1/14/2021	EMT	4	44	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-004A Am	1/11/2021	EMT	1/14/2021	EMT	5	45	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-005A Am	1/11/2021	EMT	1/14/2021	EMT	6	46	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-006A Am	1/11/2021	EMT	1/14/2021	EMT	7	47	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-008A Am	1/11/2021	EMT	1/14/2021	EMT	8	48	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-009A Am	1/11/2021	EMT	1/14/2021	EMT	9	17	2	150000	3/22/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-010A Am	1/11/2021	EMT	1/14/2021	EMT	10	18	2	150000	3/22/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-011A Am	1/11/2021	EMT	1/14/2021	EMT	11	19	2	150000	3/22/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-014A Am	1/11/2021	EMT	1/14/2021	EMT	12	20	2	150000	3/22/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-016A1 Am	1/11/2021	EMT	1/22/2021	EMT	1	21	2	150000	3/22/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-018A Am	1/11/2021	EMT	1/22/2021	EMT	2	22	2	150000	3/22/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-020A Am	1/11/2021	EMT	1/22/2021	EMT	3	23	2	150000	3/22/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-021A Am	1/11/2021	EMT	1/22/2021	EMT	4	24	2	150000	3/22/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-024A1 Am	1/11/2021	EMT	1/22/2021	EMT	5	49	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-026A Am	1/11/2021	EMT	1/22/2021	EMT	6	50	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-030A1 Am	1/11/2021	EMT	1/22/2021	EMT	7	51	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-031A Am	1/11/2021	EMT	1/22/2021	EMT	8	52	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-034A Am	1/11/2021	EMT	1/22/2021	EMT	9	53	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-035A Am	1/11/2021	EMT	1/22/2021	EMT	10	54	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-042A Am	1/11/2021	EMT	1/22/2021	EMT	11	55	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐
0359-045A Am	1/11/2021	EMT	1/22/2021	EMT	12	56	2	150000	3/19/2021	GT	A242	☐	USTUR 520 (R, O), USTUR 600 (R, O)	☐

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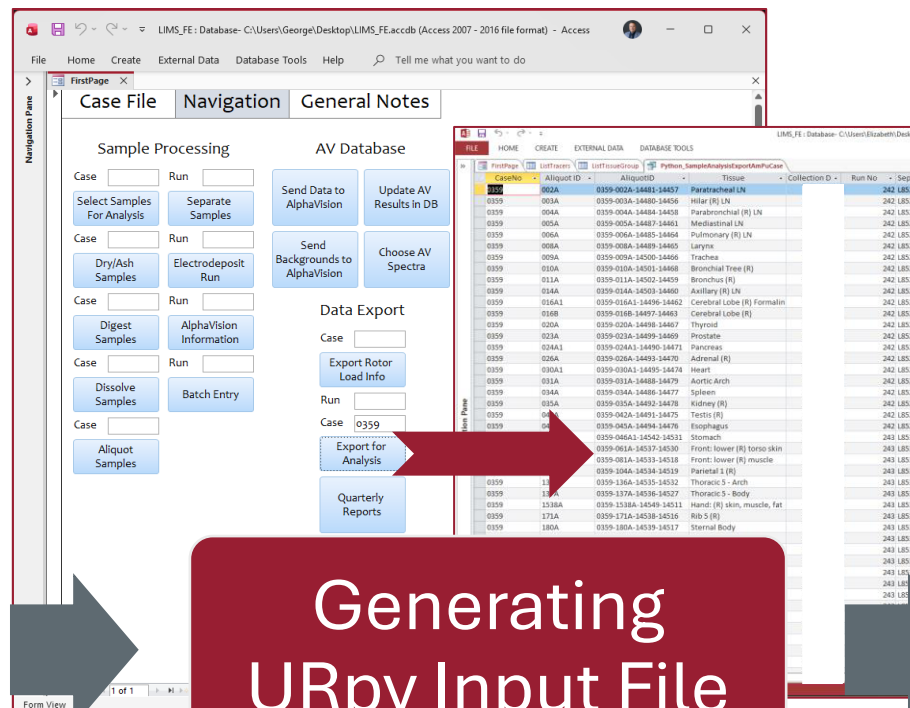


Traceability Through Analysis Results ID

- Generation of URpy Input Files with Traceable Spectrum Selection



Unique Analysis Results ID



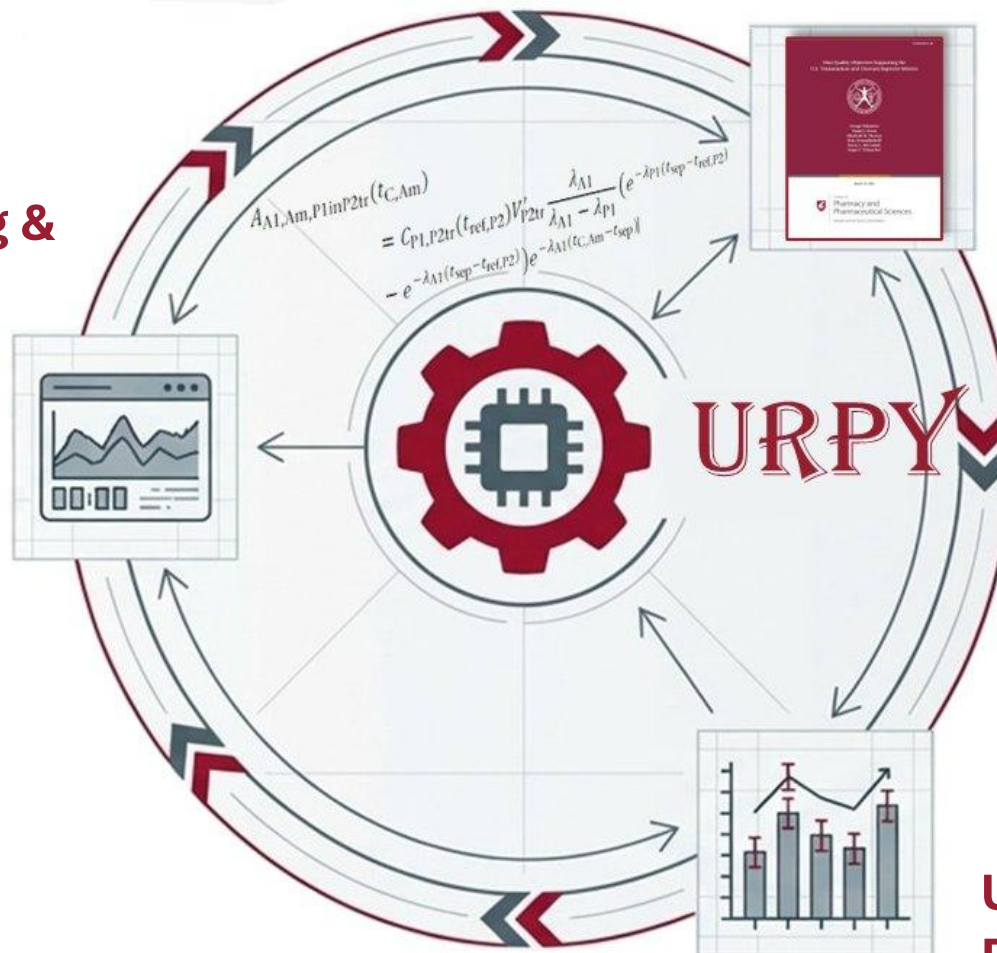
Generating URpy Input File



Data Analysis in URpy

'URpy' Implementation

Data
Processing &
Validation

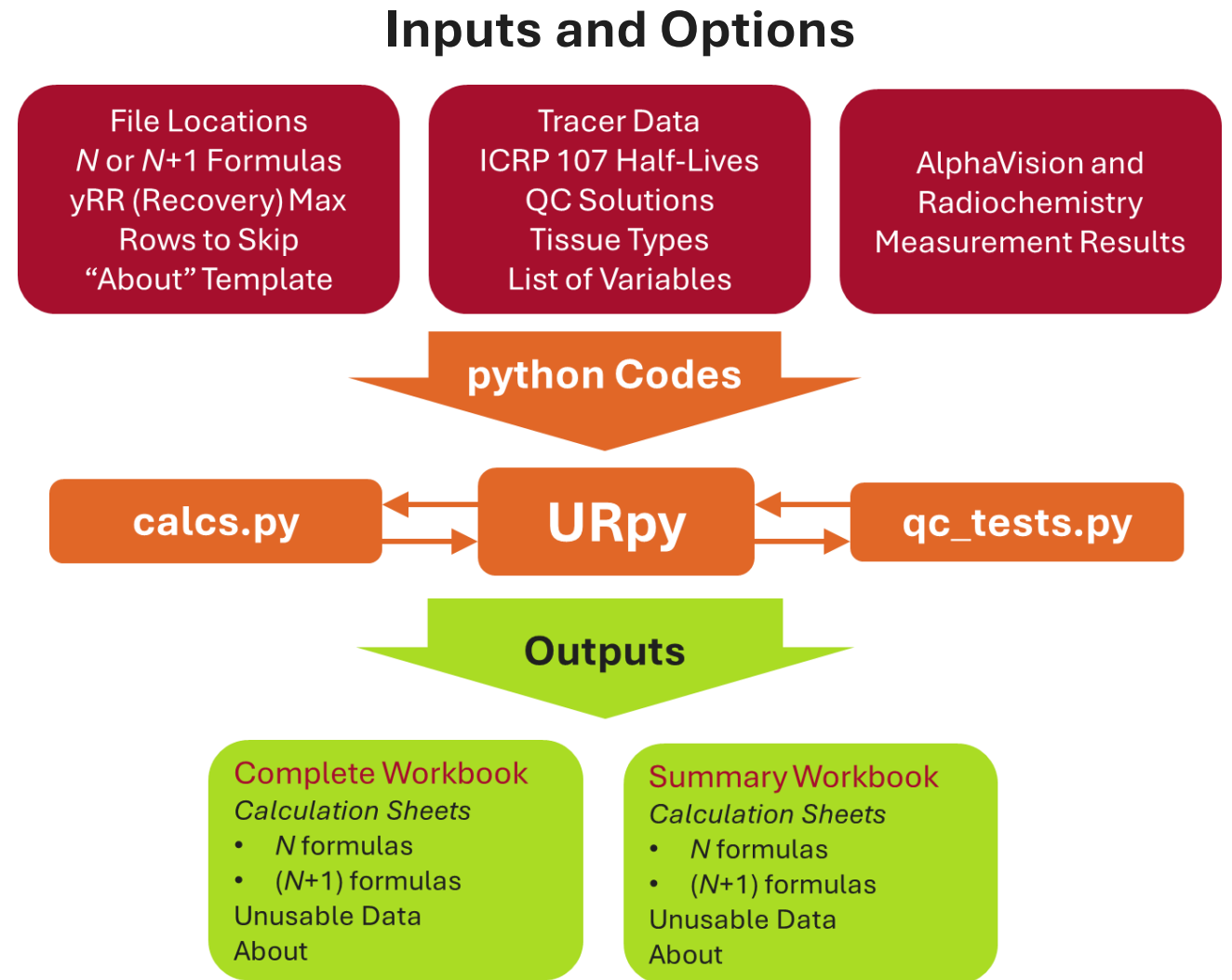


Automated
Quality Control
& Flagging

Uncertainty
Propagation &
Evaluation

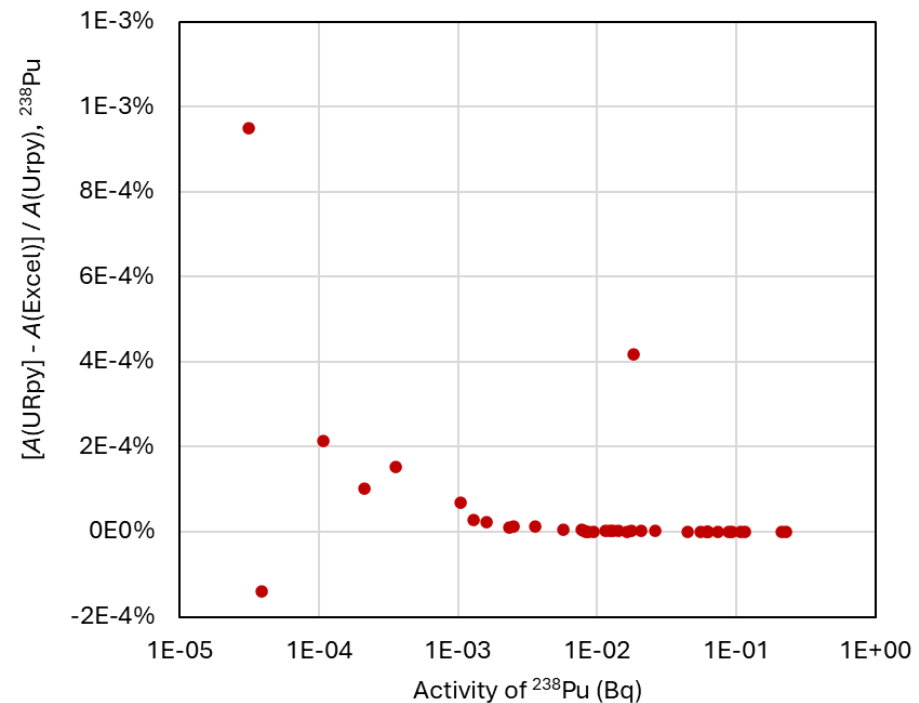
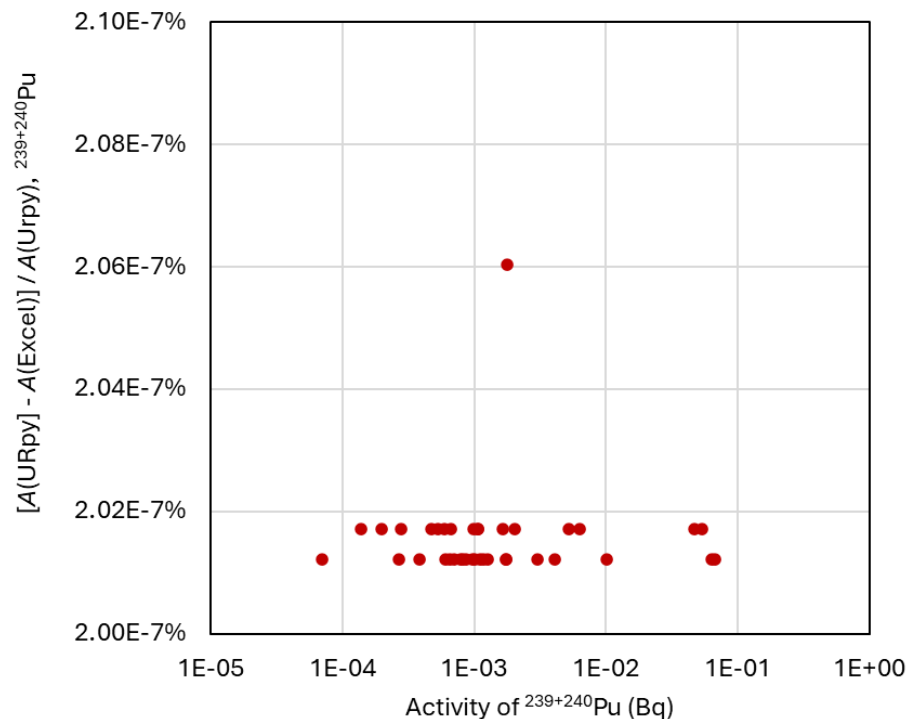
‘URpy’ Implementation

- Python-based implementation aligned with DQO-defined software specification
- Automated processing of multiple cases with direct Excel input and output
- Full transparency with all intermediate calculations reported (302 columns)
- Propagation of combined standard uncertainty at each calculation step
- Integrated QC testing, error handling, and support for Am, Pu, and Cm analyses



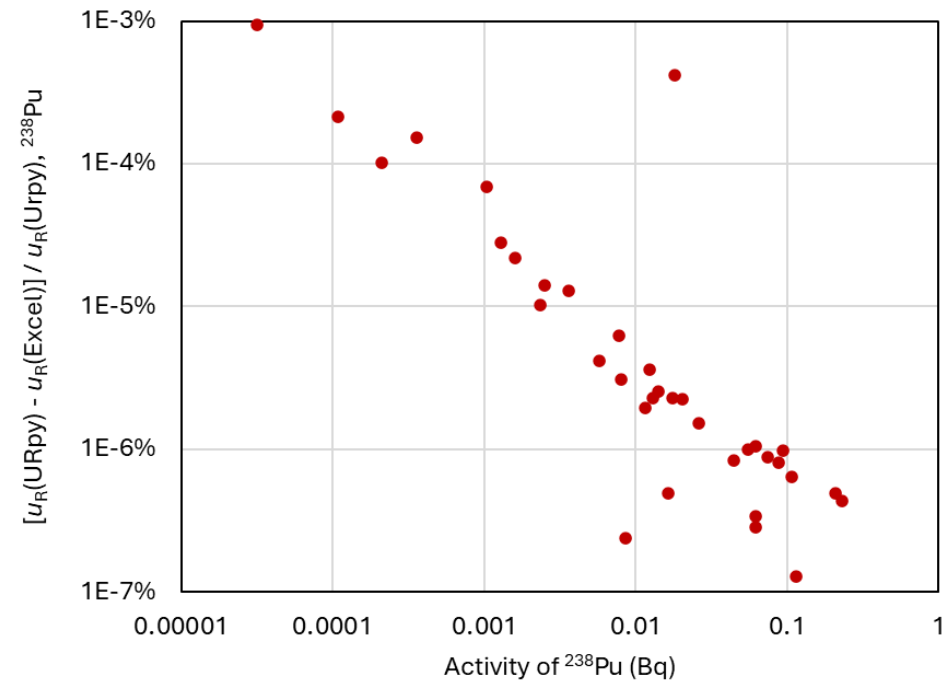
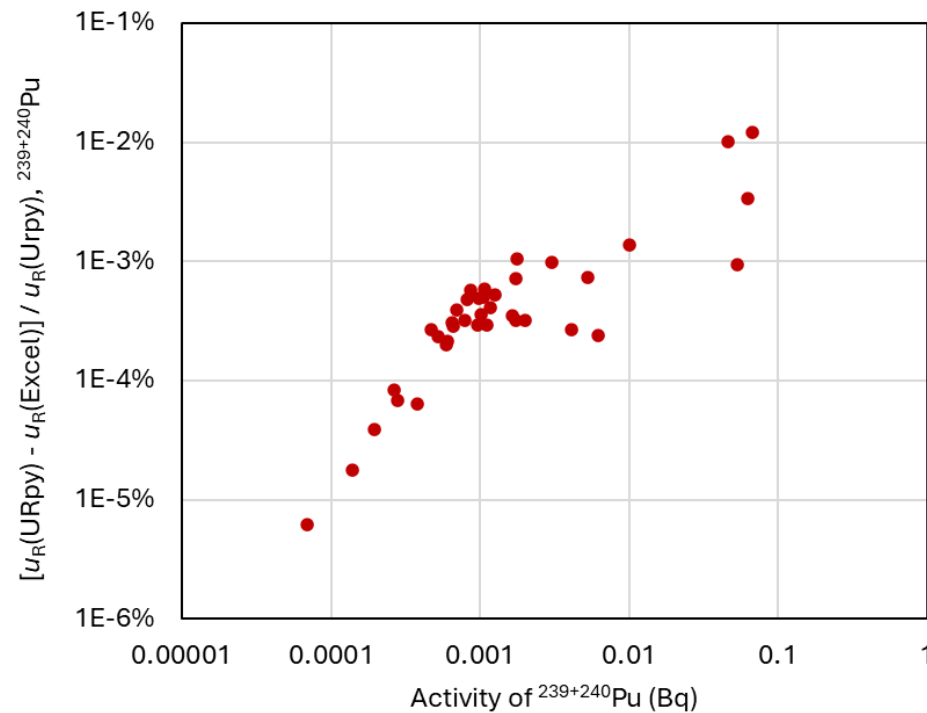
Benchmarking: *URpy* vs *Excel* Calculations (I)

- Comparison of ^{238}Pu and $^{239+240}\text{Pu}$ **activity values**: Case 0688
- URpy results benchmarked against an independent Excel implementation of DQO equations



Benchmarking: *URpy* vs *Excel* Calculations (II)

- Comparison of ^{238}Pu and $^{239+240}\text{Pu}$ **relative uncertainty values**: Case 0688
- URpy results benchmarked against an independent Excel implementation of DQO equations

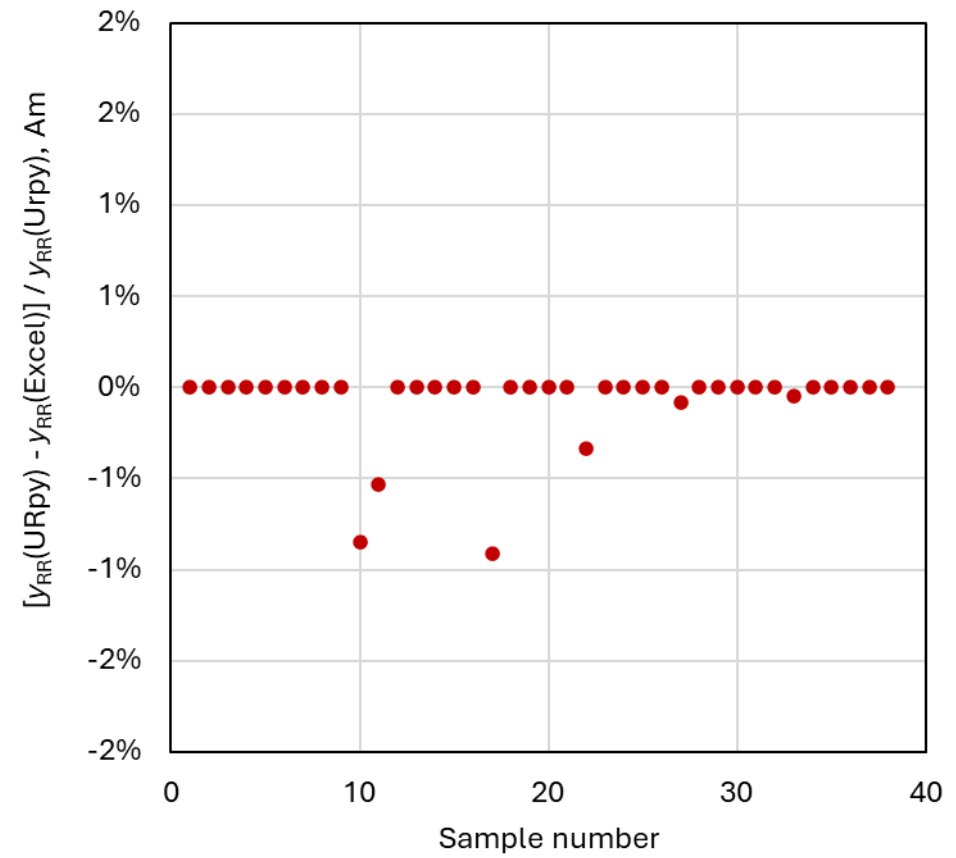
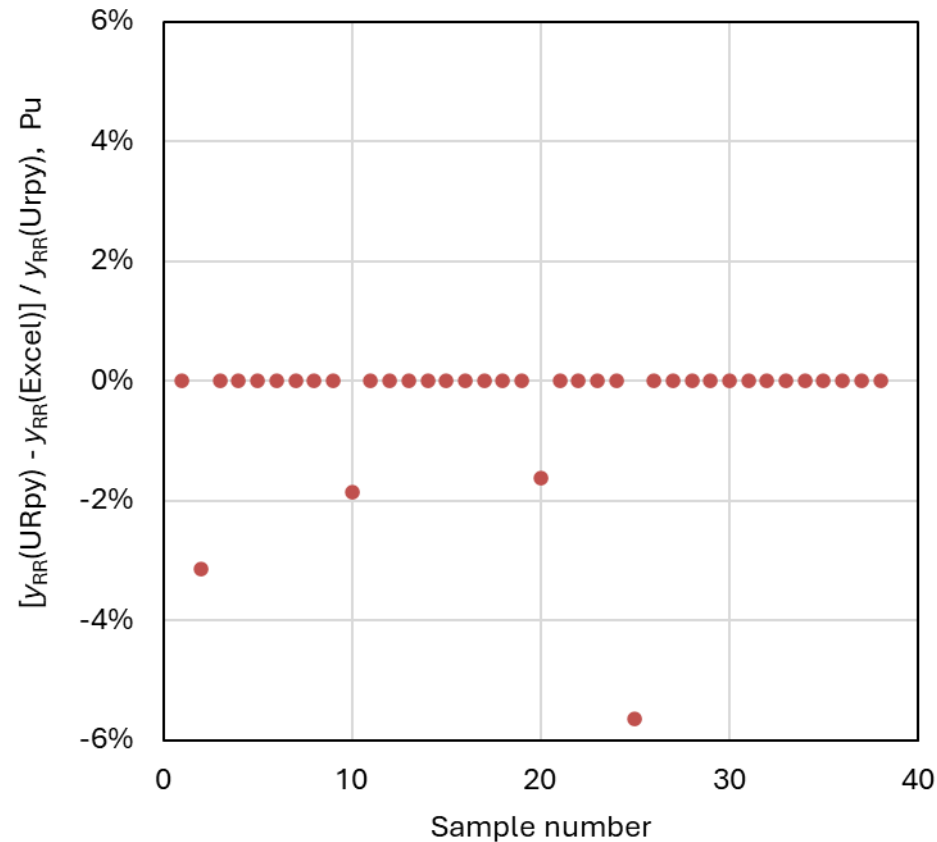


The largest percent difference is about 0.01%; the smallest is about 1 ppb.



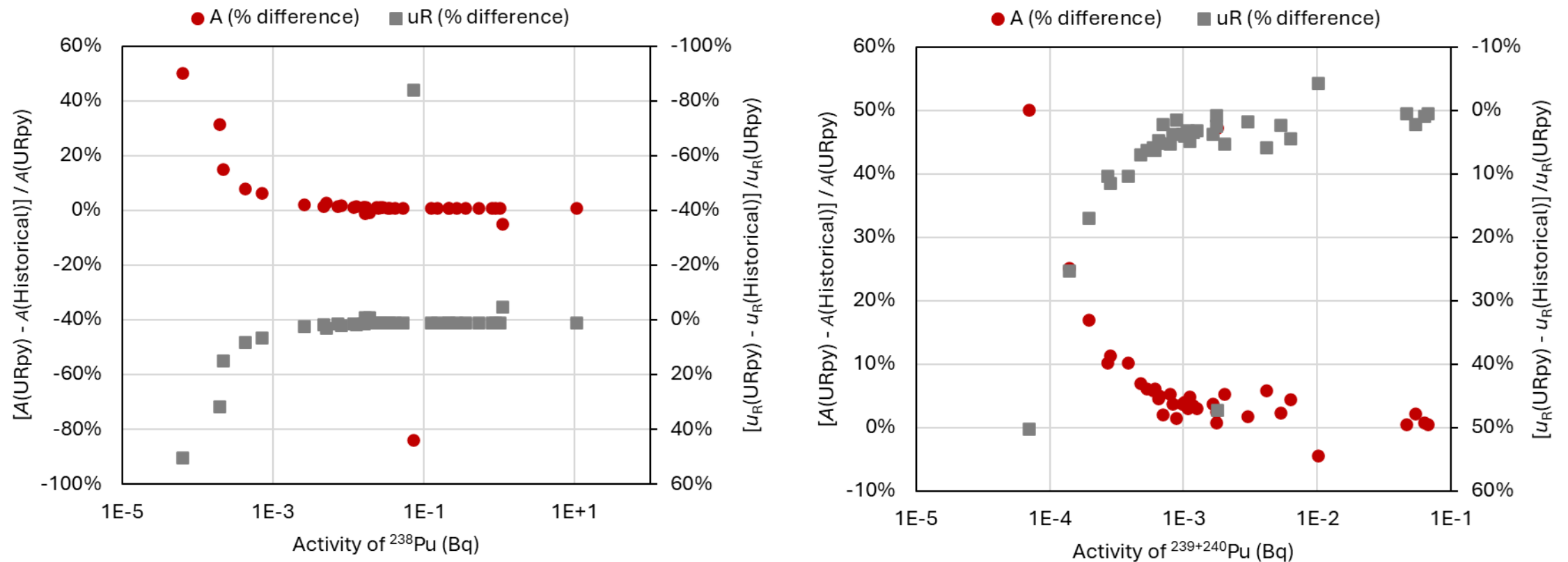
Benchmarking: *URpy* vs *Excel* Calculations (III)

- Tracer Chemical Recoveries: Case 0688



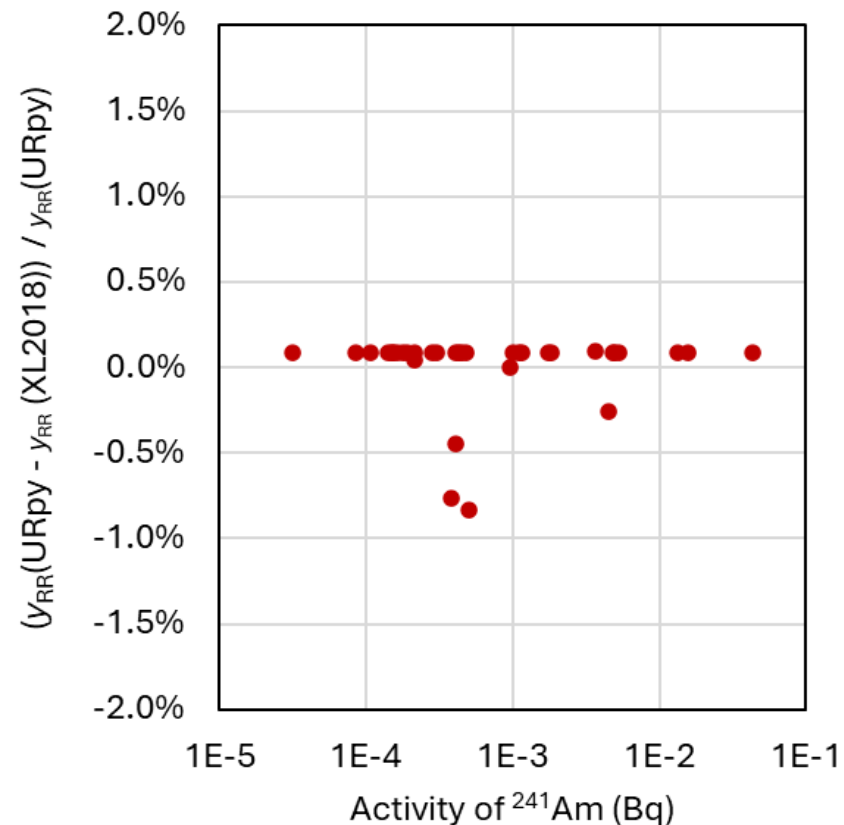
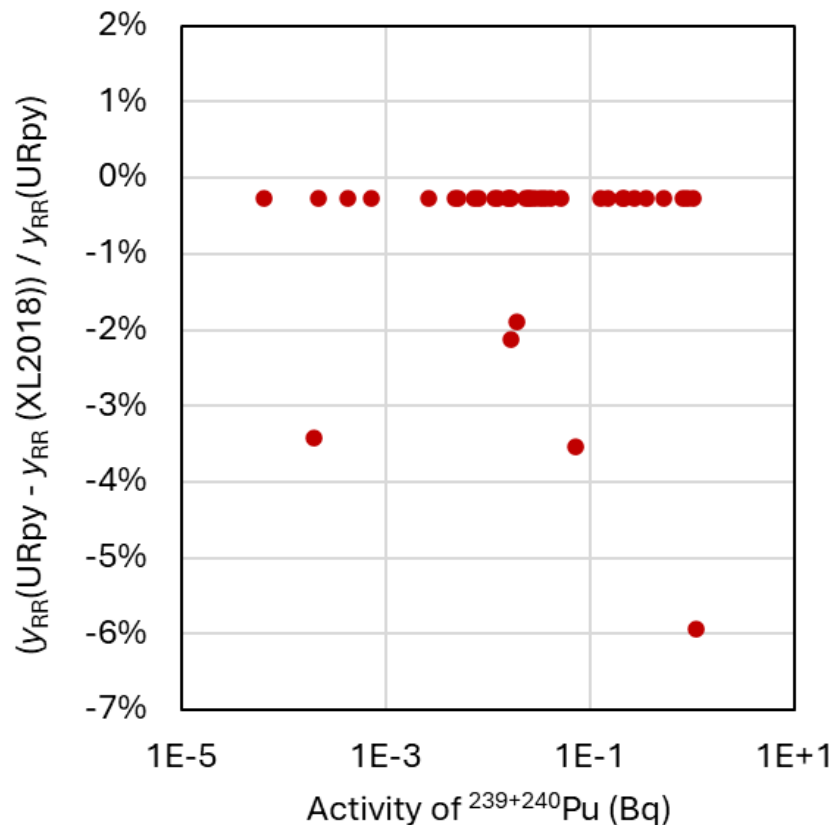
Historical Comparison: *N+1 Effect (I)*

- Comparison of ^{238}Pu and $^{239+240}\text{Pu}$ activity and relative uncertainty values: Case 0688
- URpy results compared with historical Excel calculations
 - Note: historical calculations used *N+0*, while URpy uses *N+1*



Historical Comparison: *N+1* Effect (II)

- Tracer Chemical Recoveries: Case 0688
- No *N+1* effect observed (high tracer counts)



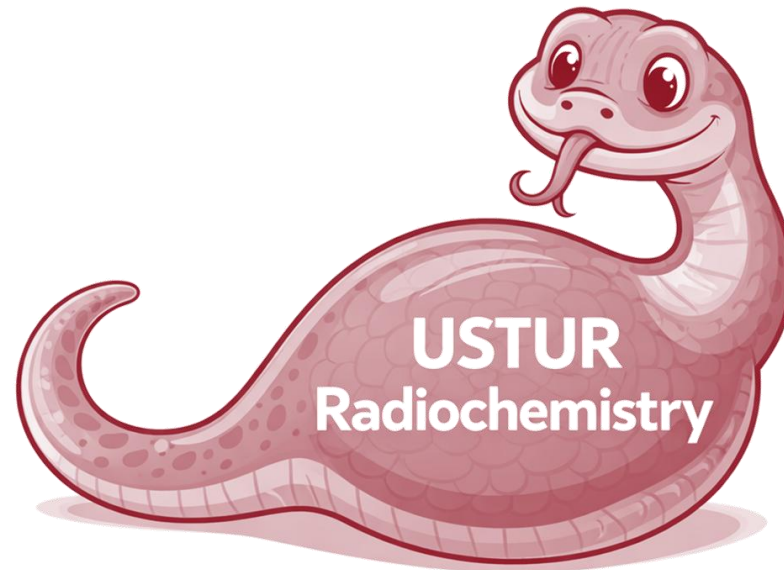
Conclusions

- A structured comparison framework was developed and applied to evaluate consistency between URpy and historical calculations (Excel 2018)
- URpy calculations were verified against independently implemented calculations, demonstrating agreement within numerical precision for the tested method
- Comparison with historical results identified discrepancies in both activity and uncertainty, reaching up to ~50% in some cases
 - Discrepancies are most pronounced at low count levels, attributable to the use of the $(N+1)$ formulation in URpy for improved low-count estimation (consistent with MARLAP guidance)
- Chemical recovery values showed good agreement between historical calculations and URpy results



Future Work

- Extend the comparison to the remaining nine cases
- Complete implementation of DQO-defined QA/QC procedures within Urpy
- Expand automated data validation, verification – i.e. data flagging capabilities
- Evaluate the impact of methodological differences on reported results across a broader dataset



Questions?



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