



USTUR-0544-20P

USTUR Today: January 2020 Edition

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Disclaimer

United States Transuranium and Uranium Registries (USTUR):

- is **not an epidemiological study**
- since **1968**, focuses on **actinide biokinetics** for radiation protection and dosimetry
- **supports** radiation epidemiology through the improvement of biokinetic models for more accurate **dose reconstruction**



USTUR Registrants

- Voluntary tissue donors (posthumous):
whole- (47) and/or partial-body (311) donations
- Former nuclear workers from DOE sites

**UNITED STATES
TRANSURANIUM REGISTRY**

WANTED

"GANG OF FOUR" NANOCURIES

Anyone who has potential for
transuranium deposition $\geq 4n\text{Ci}$

Health Physicists

To provide registry information
to potential donors

UR
UNITED STATES
URANIUM REGISTRY

The Registries

- ADMINISTERED BY HANFORD ENVIRONMENTAL HEALTH FOUNDATION
- FUNDED THROUGH U.S. DEPARTMENT OF ENERGY
- VOLUNTARY HUMAN TISSUE PROGRAM
- DOCUMENTED ACTINIDE DEPOSITIONS

Goals

- ESTABLISH NATIONAL DATA BANK
- COMPARE PREMORTEM ESTIMATES WITH TISSUE ANALYSIS
- EVALUATE BIOKINETIC MODELS
- CORRELATE WITH EXPERIMENTAL DATA
- ASSESS RADIATION PROTECTION STANDARDS

Results

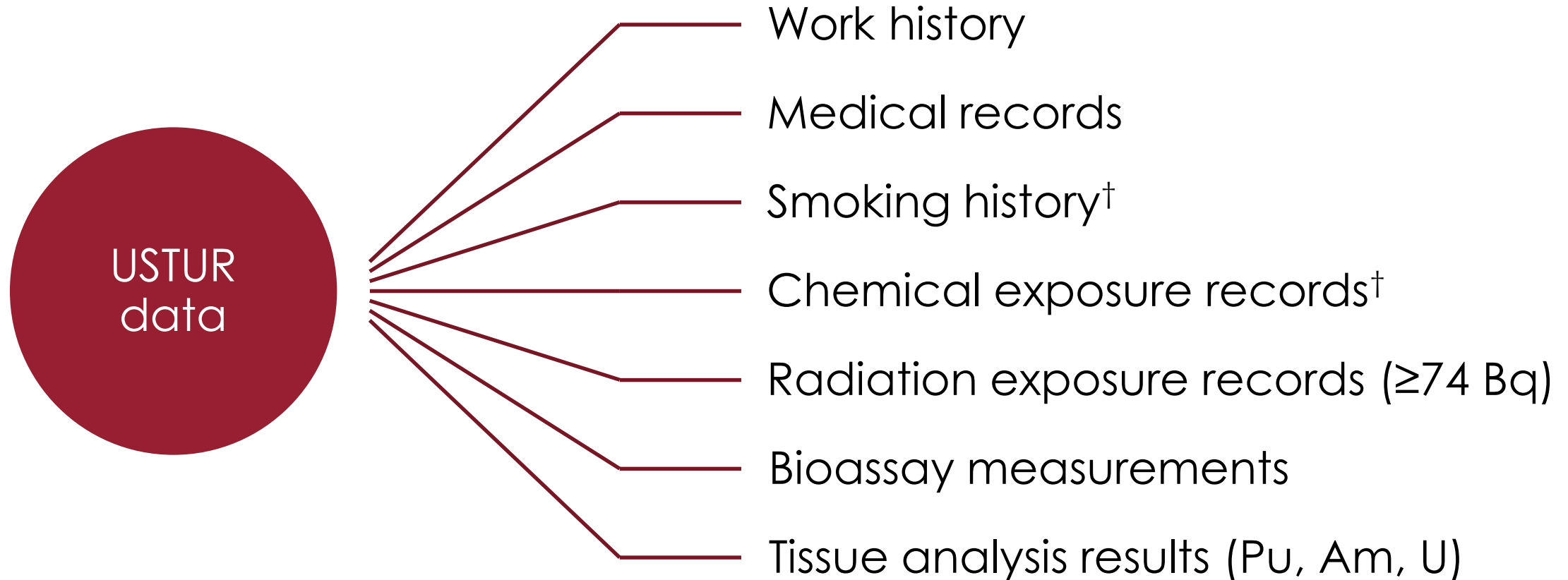
- IMPROVED UNDERSTANDING OF HUMAN ACTINIDE METABOLISM
- ENHANCED OCCUPATIONAL RADIOLOGICAL SAFETY

We're Looking for URANIUM

**Likely Sites:
LUNG-BONE-KIDNEY**



Unique Data Resource

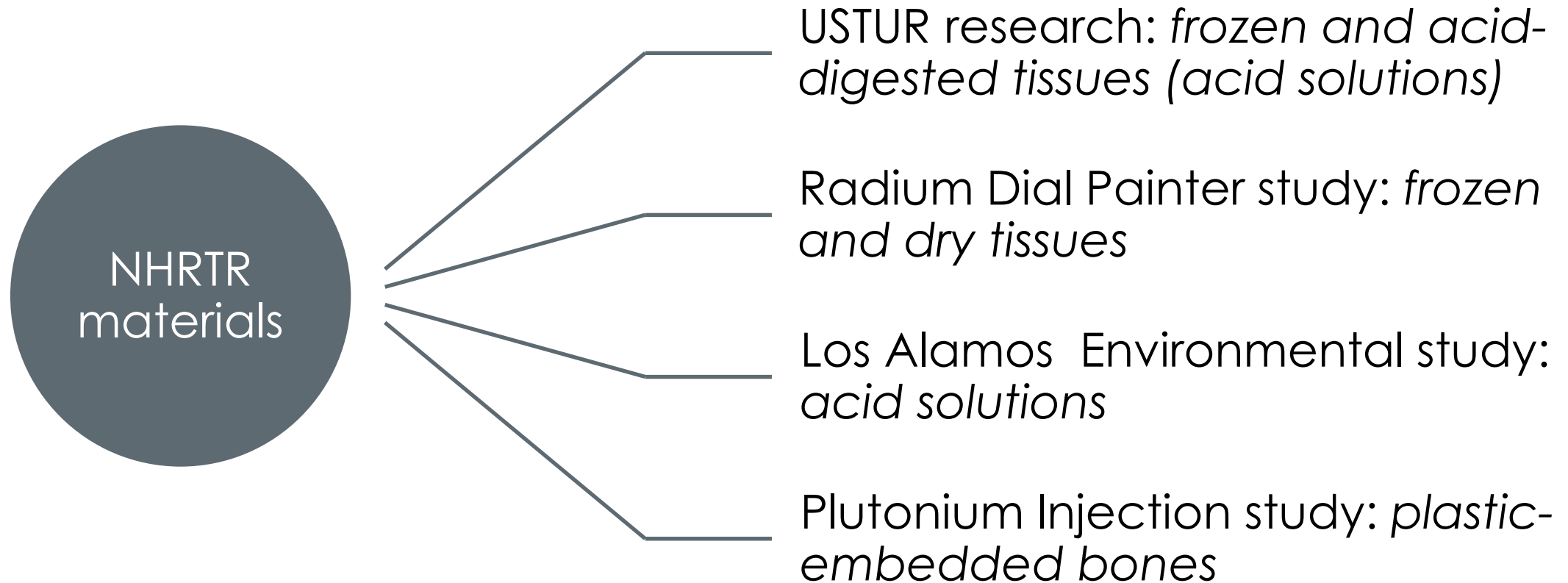


† - self-reported data





National Human Radiobiology Tissue Repository (NHRTR) at the USTUR





Faculty and Staff



EURADOS Annual Meeting 2020, Florence, Italy, 27 – 30 January, 2020





Collaborative Research Network



National Council on Radiation Protection and Measurements



Public Health England



Northwestern University



一般財団法人

九州環境管理協会



Pacific Northwest NATIONAL LABORATORY



Health Canada



UNIVERSITÉ LAVAL





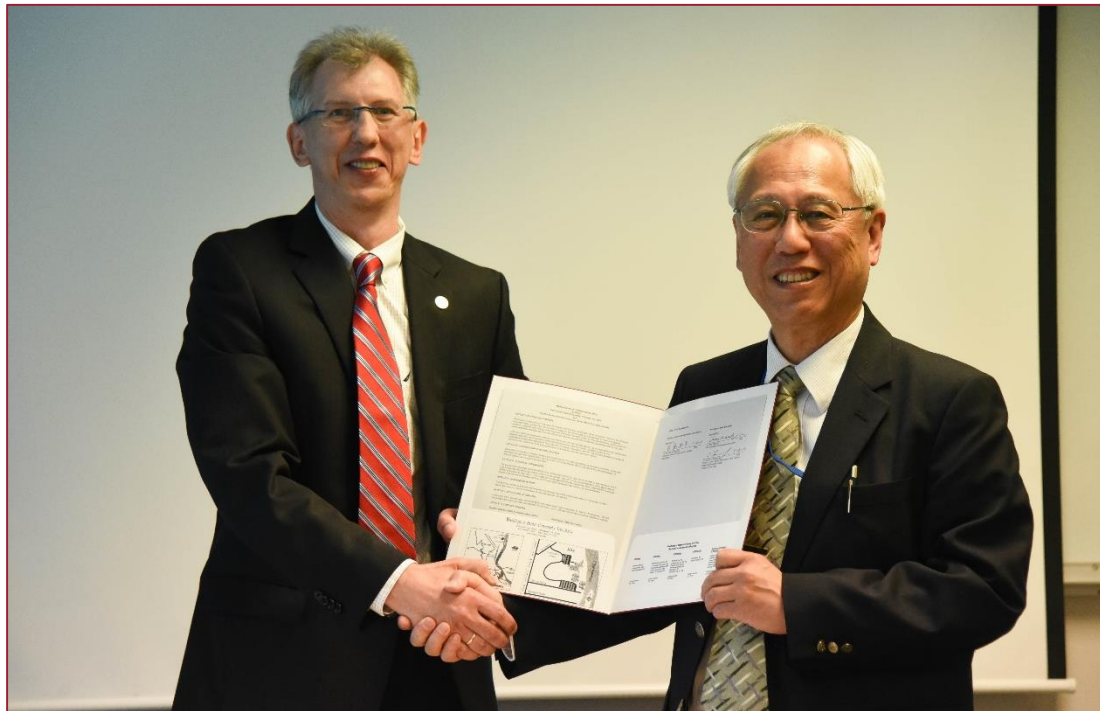
Formal Memorandum of Understanding

Kyushu Environmental Evaluation
Association 一般財団法人
九州環境管理協会

Centre for Radiation Chemical and
Environmental Hazards



Public Health
England





U.S. Million Person Study



National Council on Radiation
Protection and Measurements



OAK RIDGE INSTITUTE
FOR SCIENCE AND EDUCATION



Northwestern
University



7th MPS Workshop at ORAU

Photo Credit: Michael Bellamy

- Brain dosimetry: ^{239}Pu , ^{226}Ra
- Development and validation of site-specific biokinetic models for plutonium



Plutonium Binding in the Respiratory Tract



Public Health
England



Pacific Northwest
NATIONAL LABORATORY



Internal Dosimetry team at LANL

- Case 0269: ICRP Publication 141 (2019)
- Analysis of three additional cases from USTUR



Actinide Decorporation Therapy

Bastian Breustedt: Sabbatical (2011)

Sara Dumit: PhD Research (2015 – 2018)



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- Breustedt *et al.* (2019) *Health Physics* 117: 168-178
- Dumit *et al.* (2019) *Radiation Research* 191: 201-210
- Dumit *et al.* (2019) *Radiation and Environmental Biophysics* 58: 227-235
- Dumit *et al.* (2019) *Response to Gremy and Miccoli*. *Radiation Research* 192: 682-683





Uncertainties in Radiation Dose Assessment for Internally Deposited Plutonium



- Post-doctoral research project, August 2019 – March 2022
- Martin Šefl, PhD in Radiological Physics
Czech Technical University in Prague

Tasks

- Evaluating uncertainty in radiation dose assessment and its impact on risk projection in radiation epidemiology studies
- Calculating probability distributions on biokinetic model parameters

Data

- Exposure records, urine bioassay, and post-mortem tissue analysis results



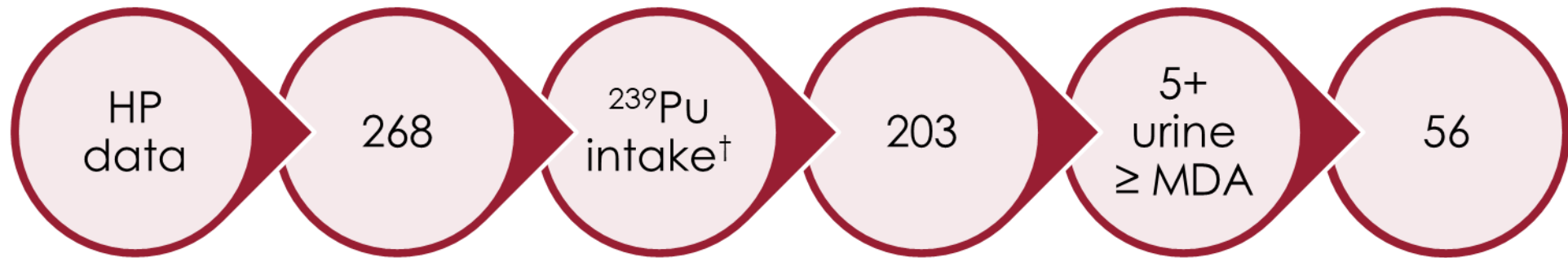
Public Health
England





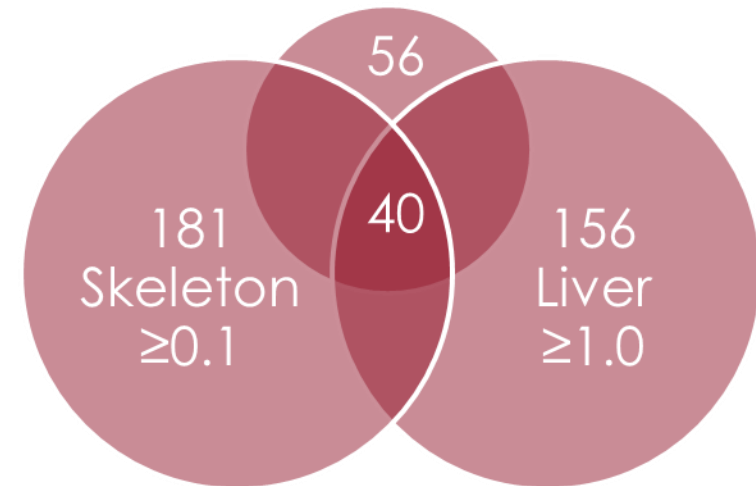
Case Selection Criteria

- Urine data points



† - no extensive chelation

- Tissue concentration, Bq kg⁻¹





Beryllium Biokinetics

ICRP Publication 30

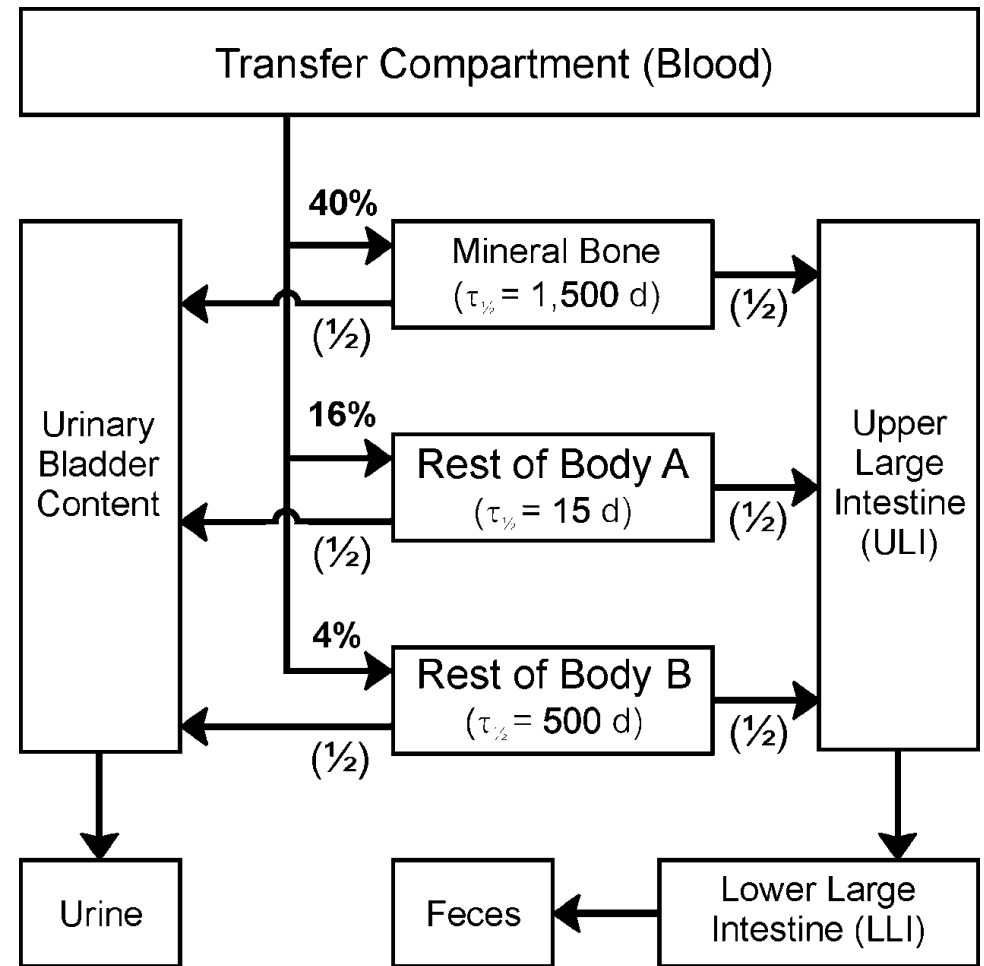
- no *Liver* compartment

USTUR beryllium tissue analyses

- Concentration:
liver > kidney > skeleton
- Systemic distribution: skeleton (56%)
– liver (23%) – soft tissue others (21%)
- *Liver* compartment needed

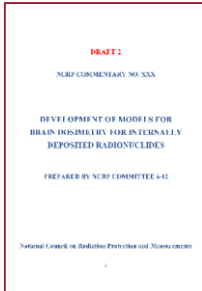


ICRP Systemic Metabolic Model





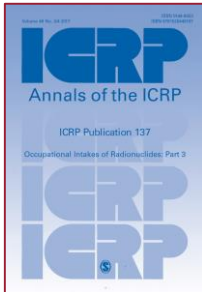
Recent Contributions to NCRP and ICRP



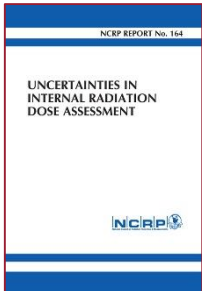
- NCRP Commentary: Development of Models for Brain Dosimetry for Internally Deposited Radionuclides (upcoming 2020)



- ICRP Publication 141: Occupational Intakes of Radionuclides - Part 4 (2019)



- ICRP Publication 137: Occupational Intakes of Radionuclides - Part 3 (2017)



- NCRP Report 164: Uncertainties in Internal Radiation Dose Assessment (2009)



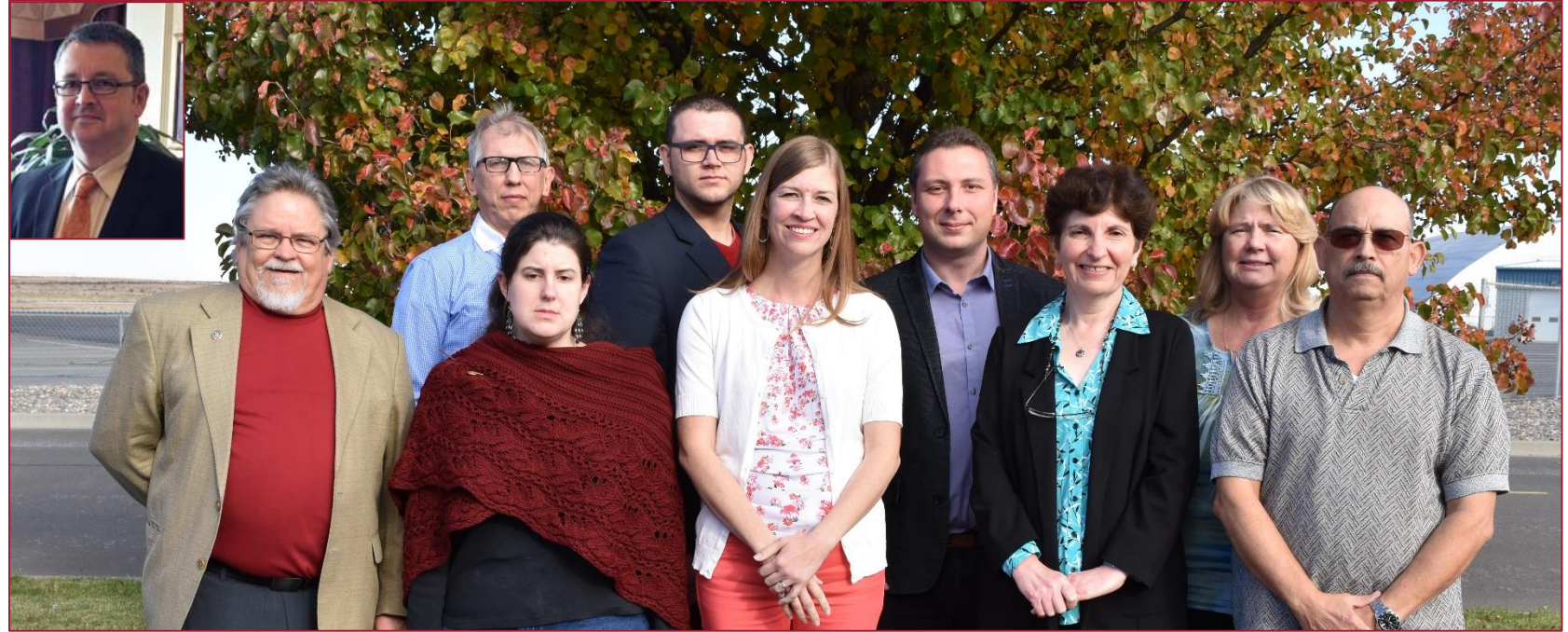
50th Anniversary: Health Physics Journal Special Issue

- 2019, 117 (2): The United States Transuranium and Uranium Registries (USTUR): Five Decade Follow-up of Plutonium and Uranium Workers
- 1995, 69 (3): 1976 Hanford Americium Exposure Incident: Update
- 1992, 63 (1): Total-body Evaluation of a Thorotrast Patient
- 1985, 49 (4): The U.S. Transuranium Registry Report on the ²⁴¹Am Content of a Whole Body





Acknowledgment





USTUR Special Session at 61st Annual Meeting of the Health Physics Society, July 19, 2016, Spokane, WA

Questions?

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