The National Human Radiobiology Tissue Repository: Human Tissue Collection at the US Transuranium and Uranium Registries

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"Learning from Plutonium and Uranium Workers"

A Human Tissue Research Program

The US Transuranium and Uranium Registries (USTUR):

- Is a federally-funded human tissue research program
- Studies actinides (Pu, Am, U) internally deposited in the human body – in former nuclear workers who had measurable (> 74 Bq) documented exposures to those elements
- Performs complete autopsies on volunteer donors.
- Radiochemically analyzes post-mortem tissue samples for actinide elements.
- Provides long-term follow-up of actinide biokinetics, and potential health effects due to internal depositions of actinides.

The USTUR has detailed work history, radiation exposure, medical and industrial hygiene records from each Registrant's worksite.

Combined with autopsy and radiochemistry results, these form a powerful dataset broadly used to:

- Evaluate and improve biokinetic models
- Compare pre-mortem estimates with tissue analysis
- Assess radiation protection standards.

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

The NHRTR: A Resource for Researchers

The National Human Radiobiological Tissue Repository (NHRTR) houses several tissue sample collections. Materials from these collections are available for collaborative research.

- **USTUR Registrants:** thousands of frozen, formalin-fixed, ashed, and acid-dissolved bone and soft tissue samples are available. Most registrants were former nuclear workers; however, three were medically exposed to thorium via the contrast agent, Thorotrast.

Hygienically packaged frozen tissues.

- **Radium Dial Painters:** women who ingested radium in the early 1900s while painting watch dials and military instruments with radio-luminescent paint that contained radium. The radium dial painter collection consists of dried, ashed, and plastic embedded bones; frozen tissues; and data from the women who worked in the radium industry.

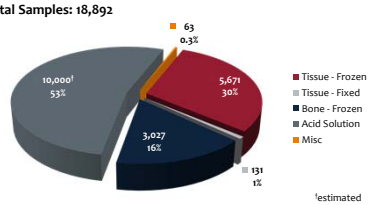
Cans of ashed radium dial painter bones, watch dial, arium radium tablets.

Available Tissues

Tissues are stored in a frozen state or acid dissolved in preparation for radiochemical analysis. From 5 to 250 tissue samples from each donation have been radiochemically analyzed to determine the actinide concentration in each organ. Frozen tissue specimens and acid solutions are available from a variety of tissues/organs, including:

- Brain
- Hair
- Kidneys
- Liver
- Lung
- Lymph Nodes
- Bone
- Skin & Muscle
- Thyroid

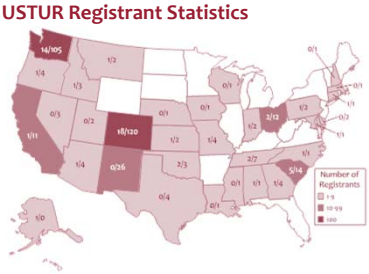
Total Samples: 18,892



†estimated

Materials available at the NHRTR

USTUR Registrant Statistics



The distribution of Registrants by US state. (living/deceased)

Since the USTUR's establishment in 1968:

- 42 whole-body donations
- 300 partial-body donations
- 8 whole- and 44 partial-body potential donors are still living.

USTUR Registrants worked with a variety of radioactive elements. When only primary intakes are considered, Registrants were exposed to:

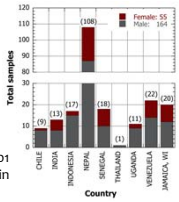
- Plutonium: 348
- Americium: 3
- Uranium: 29
- Miscellaneous: 14

The NHRTR: A Resource for Researchers

- **Plutonium Injection Studies:** Eighteen (18) hospital patients were given a single injection of plutonium during the 1940s. Urine, fecal, blood and biopsy/autopsy samples were collected to determine the relationship between body burden and excretion rate. Dried and plastic-embedded bones from four males and one female were transferred to the NHRTR from Argonne National Laboratory in 1992.

Plastic-embedded femur: mid-shaft (top) and proximal end (bottom).

- **UNSCEAR/WHO Bone Program Archive:** bone ash from 219 individuals who passed away during 1969 – 1981 were received from Environmental Measurements Laboratory in 2009. Samples were previously analyzed for ^{90}Sr, ^{226}Ra and stable Ca.
- **Los Alamos Autopsy Study:** acid-digested tissues from 901 civilians who passed away in the 1960s and 1970s.



How to Request Materials

- Provide a brief summary of the proposed sample usage
- Sign a confidentiality statement
- Provide a copy of your Institutional Review Board approval for protection of human subject.

How to Publish Results

- Include the Registries as a co-author:
  - Unpublished data - bioassay, in-vivo counting, radio-analytical results
  - Use of tissue samples or other materials
  - Collaborative effort by Registries' staff.
- Acknowledgment to the Registries:
  - Only previously published Registries' data or evaluation
  - Loan or provision of tissues or other materials
  - Manuscript exclusively prepared by other investigators without consulting the Registries.

Acknowledgement

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The Ed Hendler Bridge (Cable Bridge, 763 m) , Columbia River at Pasco-Kennewick , WA