In Vivo Radiation Effects

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Quantification of the risk of health effects in humans from exposure to radiation is limited by the observational nature of most studies. Life-span animal studies were designed to supplement the human data and assist in risk assessment. Beginning in the 1940s, various laboratories and universities conducted studies on incorporated radionuclides using beagle dogs. The National Radiobiology Archives, housed at the United States Transuranium and Uranium Registries (USTUR) in Richland, WA has been collecting, organizing, cataloging, and preserving these data and materials (including laboratory notebooks and archival tissue specimens), and making them available for future research or analyses. The data available includes documentation of the type and amount of exposure, dose and dose-rate, pedigree, housing conditions, detailed clinical health information from annual physicals with detailed blood chemistry, and extensive postmortem information. Radionuclides studied include plutonium, cesium, and strontium. Data on life-span studies have been used to estimate the risk of lung fibrosis and lung cancer in dogs after exposure to plutonium; currently, pedigree information is being used to evaluate a familial confounder of the risk of lung fibrosis or lung cancer. These data have also been used to explore lung, liver and bone cancer incidence with multistage modeling techniques. Materials available include tissue preserved in paraffin blocks and pathology slides. Modern methods of molecular biology and biochemistry can use these materials to investigate potential biomarkers of risk and exposure as a function of time after exposure. Immunohistochemistry can be done on samples to compare with *in vitro* studies. These archived materials are useful for identifying primary and secondary targets and providing essential information on the optimal time course of potential mitigation and decorporation strategies. This work was supported by Radiation Biology and Biophysics, U. S. Department of Energy, Pacific Northwest National Laboratory's Laboratory Directed Research and Development Program and funding from a pilot project awarded by the National Institutes of Health, National Institute for Allergy and Infectious Disease grant U19 AI 067770, Centers for Medical Countermeasures against Radiation.

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