Comparing disease expression across species: an examination of radiation and species specific disease expression in *Mus musculus* and *Peromyscus leucopus*

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From 1969 to 1992, the Janus program at Argonne National Laboratory performed a large series of radiobiology experiments, examining the effects of varying doses of neutron and gamma radiation on two disparate species of mice, *Mus musculus* and *Peromyscus leucopus*. Much of this data has since been digitized and made freely accessible online. This study aims to revisit two of these experiments, examining differences in disease expression and lifespan between *Mus musculus* and *Peromyscus leucopus*, with the ultimate goal of determining species and radiation specific effects on disease expression.

Through decision tree and logistic regression analysis, a number of inferences could be made. First, there were significant differences in the expression of pathologies between species. For example, while *Mus musculus* were at a higher odds of developing lethal respiratory tumors, vascular tumors, and lymphoreticular tumors, *Peromyscus leucopus* were at a higher odds of developing liver tumors, skin and epithelial tumors, pulmonary diseases, renal diseases, and cardiovascular diseases. Second, there was a radiation specific effect on pathology expression, across species. Treatment of both species of mice with gamma radiation resulted in a 96% increase in the odds of developing lethal connective tissue tumors, and a 182% increase in the odds of developing a renal disease. A neutron radiation specific effect was also observed, with a large number of tumor and non-tumor pathologies found to be significantly associated with varying doses of neutron radiation, including connective tissue tumors, gastrointestinal tumors, vascular tumors, liver tumors, renal diseases, liver diseases, anemia, and edema. Finally, expression of multiple tumors was also significantly associated with varying levels of neutron and gamma radiation.

This study found that while there were intrinsic differences in pathology expression between species, there were also a number of diseases which were significantly affected by radiation, regardless of species. Knowledge of these pathologies may help in extrapolating the effects of radiation on these mouse species to other mammals, including humans.