

# TRITIUM: RELATIVE BIOLOGICAL EFFECTIVENESS AND CANCER RISK

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**Background and Aims:** The relationship between exposure to tritium, a source of beta radiation, and risk of cancer has received little attention in the epidemiological literature. For radiation protection purposes, and for radiation risk assessments, tritium dose and gamma radiation doses are often combined. This is done under the assumption that the biological effectiveness of the absorbed dose of tritium relative to the absorbed dose of gamma radiation, or RBE, is 1. In this paper, we utilize Bayesian methods in order to evaluate the excess relative rate (ERR) of leukemia and leukemia excluding CLL per unit of absorbed dose of tritium as well as its RBE compared to absorbed dose of gamma radiation.

**Methods:** In order to conduct this analysis, we utilize an incidence density sampling procedure to select cases and controls from the Savannah River Site occupational cohort of workers employed from 1951-1999. Markov chain Monte Carlo methods are used for the analysis in order to incorporate informative priors.

**Results:** The ERR/10mGy and associated 90% highest posterior density (HPD) of leukemia and leukemia excluding CLL are 0.272 (0.024, 0.660) and 0.304 (0.044, 0.753), while the RBEs are 8.36 and 5.36, respectively.

**Conclusions:** This is the first empirical estimate of tritium's relationship to cancer risk based on epidemiological data.