

Dosimetry for a Radium Dial Painter Cohort - Past Approaches and Improvements

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As part of the Million Person Study, work has begun on revisiting and expanding a Radium Dial Painter cohort of 3,276 workers. In the first half of the 20th century, workers manually painted radio-fluorescent paint onto watch and gauge dials. The paint contained Ra-226 and Ra-228 with varying isotopic ratios depending on company, workplace, and year. Workplace practices also varied by individual worker, location, and year. The practice of pointing or ‘tipping’ the paintbrushes with one’s lips was widespread in the United States until the mid-1920s and resulted in significant ingestions of radium paint. Past comprehensive studies were conducted by Massachusetts Institute of Technology, Argonne National Laboratory and other organizations. The current approach builds upon past measurements and calculations of individual radium body burdens which are coupled to the latest biokinetic models to arrive at new estimates of radium intake in the workers. Most dial painters were teenagers or in their early twenties when they began painting. Our current work treats the intakes as chronic over the work period and in and models radium uptake and skeletal development in an age-dependent manner. The current work also explicitly models radioactive progeny in the body. The latest energy absorption models for alpha emitters in the skeleton represent another improvement to past dosimetry calculations. Further, the cohort eligible for dose-response analyses is being expanded by including individuals for whom there was no dosimetry information on record. We discuss methods for estimating doses to such individuals, including uncertainties, based on imputing exposure parameters from contemporary peers performing similar work at the same facilities. This presentation focuses on doses to the bone and bone marrow. Future work will address doses to other tissues of interest such as the paranasal sinuses, lung, breast, brain and heart.

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