

The Relationship Between Dose, Exposure and “HIT” Number for Alpha-Particle-Induced Micronuclei

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To relate radon exposure to risk it is important to understand basic mechanisms involved in responses of cells to very low doses of alpha particles. The ultimate low dose exposure is a single cells exposed to a single alpha particle. This presentation illustrates the use of micronuclei as a biological dosimeter to related average energy absorbed in a tissue (dose) to WLM for radon inhalation (exposure) and to well defined numbers of alpha particles delivered by a single-particle/single cell irradiator to individual cells (“hit” number). Rat deep lung fibroblasts were exposed to radon *in vitro* and the frequency of micronuclei related to average radiation dose (Gy) to cells. Wistar rats were exposed by inhalation to graded levels of radon and its progeny (WLM) and the frequency of micronuclei evaluated in nose, trachea and deep lung epithelial cells and in deep lung fibroblasts. Finally, CHO cells were grown on mylar dishes and the frequency of micronuclei determined as a function of “hit” number for 3.2 MeV alpha particles. Using the *in vitro* system as a standard, the frequency of micronuclei/1000 binucleated cells/Gy was related to the frequency of micronuclei produced as a function of exposure in WLM or “hit” number. Exposure of deep lung fibroblasts *in vitro* induced 593 micronuclei/1000 binucleated cell/Gy. Radon inhalation exposure required to produce the same frequency of micronuclei in deep lung fibroblasts as on Gy of alpha dose *in vitro* was calculated to be 2118 WLM. It required a calculated 7.4 alpha traversals of CHO cells to result in the same frequency of micronuclei observed following 1 Gy of alpha dose to deep lung fibroblasts. The frequency of micronuclei in respiratory tract cells was shown to be location and cell type dependent. These data form the basis for further research on the influence of cell type on induction of micronuclei by high LET radiation. Research supported by DOE/OHER under contract DEACO6-76RLO1830.

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