

# Cancer risk following alpha emitter exposure: a risk assessment of Task Group 64 of ICRP

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**Abstract**—Radiation protection, based on quantitative estimates of cancer risk, relies mainly on results from Japanese A-bomb survivors exposed, during a few seconds, to external gamma radiation. ICRP decided to consider scientific publications of populations exposed to radon decay products, or to uranium or plutonium encountered during the nuclear cycle. Several experts are contributing to this synthesis: in dosimetric modelling focusing on major target organs/tissues, in epidemiology, statistics, in detriment calculation. Inhalation of radon gas and its decay products, observed in underground mining, but also in homes, is a long-term chronic exposure to alpha emitters. All studies of uranium miners presented an excess of lung cancer linked to the cumulative dose of radon decay products. Results from large case-control studies confirmed that at low domestic exposures (around 200 Bq per m<sup>3</sup>), if lasted for at least 25 years, a clear excess of lung cancer was observed. ICRP *Publication 115* summarizes this information and suggests that exposure in homes should not exceed 300 Bq per m<sup>3</sup>. Review of recently published results of workers exposed to plutonium, like Mayak workers (Russia) and Sellafield workers (UK), is close to completion; the results of a combined analysis related to lung cancer risk will be the basis of our final discussion. Scenarios of exposure to plutonium, to radon decay products or to external gamma exposure are proposed, in order to compare life-long lung cancer risk from two different alpha emitters and from external gamma exposure. For nuclear workers exposed to uranium, only a few studies are able to consider past individual exposure to uranium in its soluble or insoluble forms. More studies are needed before being able to quantify a specific cancer risk related to uranium.