International Commission on Radiological Protection

Task Group 64: Cancer Risk from Alpha Emitters

Alpha emitters represent an important part of the population exposure to radiation. Once incorporated they irradiate mainly specific organs and tissues depending on the way they enter the human body and how they are retained or cleared. There are important assumptions in the radiation protection system about the doses attributable to these alpha emitters and the associated cancer risks. The task group evaluates how current results from epidemiological studies contribute to the consolidation of these underlying assumptions.

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Current Work

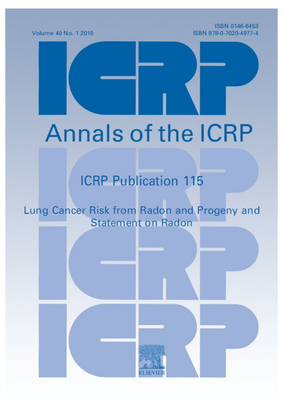
The task group is reviewing the results on cancer risks from epidemiological studies of populations exposed to plutonium or uranium; evaluating the capacity of these studies to quantify a dose-risk relationship.

An important element of this assessment is the impact of the quality of reconstructed exposures and doses. Uncertainty linked to this reconstruction is discussed.

Lifetime risk calculations are performed for lung cancer from plutonium under different scenarios of exposure; the results are compared with radiation-induced detriment from external radiation exposure.

Potential implications for radiation protection will be assessed and routes for future research will be recommended.

Radon



A review of radon progeny exposure of underground miners, of the general population living in radon prone areas, and of the associated lung cancer risk was completed by the task group, resulting in ICRP Publication 115: Lung Cancer Risk from Radon and Progeny and Statement on Radon.

Plutonium and uranium

- A draft report on cancer risk from exposure to plutonium and uranium is in preparation.
- For uranium, the information currently available from epidemiological studies remains insufficient to provide reliable estimates of risk.
- For plutonium, the two main cohorts of workers are those from Mayak in the Russian Federation and those from Sellafield in the United Kingdom, that provide quantitative information on lung cancer risk. The Mayak cohort also indicates associations with liver and bone cancer risks.
- Models available today allow the assessment of the lifetime excess risk of lung cancer mortality attributable to plutonium. The lifetime excess risk of lung cancer mortality per unit absorbed dose to the lung is assessed between 1.4 and 1.7 per 10,000 individuals per mGy, depending on scenarios of acute or chronic exposures to plutonium nitrate or oxide. These values are similar to those derived from miner studies for exposure to radon progeny.
- Comparing the lifetime excess risks of lung cancer mortality calculated for plutonium and radon progeny exposures with those from external gamma irradiation suggests a biological effectiveness of alpha particles relative to high energy photons of about 14-16. These values are compatible with the radiation weighting factor of 20 proposed by the Commission for alpha particles.