Effective dose coefficients for inhaled radon and its progeny: ICRP's approach

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Abstract

The International Commission on Radiological Protection (ICRP) has recently published three reports on radon exposure: (i) Publication 115 on lung cancer risks from radon and radon progeny [1], (ii) Publication 126 on radiological protection against radon exposure [2] and (iii) Publication 137 on Occupational Intakes of Radionuclides (OIR), Part 3 [3]. The latter document gives doses coefficients for the inhalation of radon, thoron and their airborne progeny as well as recommendations for their use for the protection of workers. As with all other radionuclides, the effective dose coefficients are calculated with ICRP reference biokinetic and dosimetric models. Sufficient information and dosimetric data are given so that site-specific dose coefficients can be calculated based on measured aerosol parameter values.

In its review of epidemiological data on radon-induced lung cancer, ICRP concluded that the nominal risk coefficient for radon-induced lung cancer at low levels of exposure should be increased by about a factor of two in comparison to the value recommended previously (ICRP Publication 65) [1,4]. Accordingly, the upper reference level (URL) for radon in dwellings was reduced from 600 Bq m^{-3} to 300 Bq m^{-3}. As part of an integrated protection strategy, ICRP recommended the same URL of 300 Bq m^{-3} for workplaces [2].

Although protection against radon is based on measurement and control of levels of exposure, dose estimates are required in certain situations for workers. Based on both dosimetry and epidemiological data, the Commission recommends the use of a single dose coefficient of 3 mSv per mJ h m^{-3} (about 10 mSv per WLM) for the calculation of occupational doses following exposure to radon (^{222}Rn) progeny in underground mines and in building, in most circumstances. However, for indoor workplaces where workers are engaged in substantial physical activities and for workers in tourist caves, a dose coefficient of 6 mSv per mJ h m^{-3} (about 20 mSv per WLM) is consider to be more appropriate. In special cases, site-specific dose coefficients can be applied, if approved by the regulatory authority, where exposure conditions are non-typical, and sufficient, reliable aerosol data are available [3].

In this presentation, the application and use of dose coefficients for workplaces are discussed. Results of dose calculations for indoor workplaces, mines and tourist caves, are presented. The presentation also describes the general approach for the management of

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radon exposure in workplaces based both on ICRP recommendations and the European directive (2013/59/EURATOM) [5].

References

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