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TOPICAL SESSIONS
Reports of Co-Chairmen for Highlight Sessions

T-9: Radon Exposure and Mitigation

Tuesday, 16 May 2000

Chair and Keynote: J. Porstendörfer Co-Chair: P. Hubert

The papers were dealing with the two extreme ends of the assessment and mitigation process, behaviour of radon and radon decay products in the air, together with possible dosimetry on the one hand, and effectiveness of remedial actions and programme.

Dr. Porstendörfer, in his paper entitled “Radon characteristics related to dose for different living places” described the basic physical phenomena that must be taken into account in order to characterize the fate of decay products in various atmospheres. He proposed solutions for a simple assessment of the fraction that is not attached to aerosols and that gives rise to clusters as a function of the concentrations of the aerosol. Their activity size distribution is small (AMDu = 0.8 nm), leading to an important lung deposition, so that it cannot be neglected in dose assessments, especially when conditions are favourable for cluster formation, as may occur in houses and workplaces without aerosol sources. Aerosol sizes have been characterized according to three modes: nucleation particles, accumulation mode, and coarse particles.

Altogether, the dose for a given radon and radon daughters concentration can vary widely, depending on the conditions of the atmosphere, with contributions of aerosol, attached decay products, ranging from 5-11 mSv/WLM, and contributions from unattached clusters ranging from 0-13 mSv/WLM. The above doses are “dosimetric doses” and not “epidemiological doses”, a point on which the audience reaction reflected the difficulty to live with two lines of rationale for effective dose derivation. Nevertheless, the pragmatic solutions for the estimation of all the above mentioned parameters were recognized as an important contribution to radon dose assessment.

Developments on radon dosimetry were devoted to the improvement of representativeness with respect to two different aspects: measurements that would integrate exposures to individuals during the activities of their daily live and measurements that would indicate the deposition of radon progeny in lung regions.

Dr. Fleischer’s paper “Eye glass lenses for personal radiation dosimetry” illustrated the possibility to use the fact that plastic lenses are track detectors for alpha particles, providing a simple and easy-to-wear detector. Research was conducted to choose calibration methods and to discuss to which extent the air in contact with lenses is a good sample of ambient - or inhaled - air. Using the internal phase of glasses of a sample of people who wore them in an area where concentrations range from 25-81 Bq m^{-3}, an average exposure of 33 Bq m^{-3} was estimated. Discussion illustrated the great potential of such an approach, but some questions were raised about the multiple phenomena that must be mastered before an operational process can be developed.

Mr. Cheung's paper on "Bronchial dosimetry for radon progeny" demonstrated the advances that took place towards a portable dosimeter that would allow to simulate actual exposures to alpha particles of the radon progeny in the tracheobronchial region. Thanks to 400 mesh wire screens and a filter, alpha counts can give the bronchial dose for a large range of particle size (1-1000 nm). The audience acknowledged the improvement associated with such a device. However, questions pointed out some items to be clarified before industrial use.

Remedial action and programmes were described from two viewpoints; a priori estimates for efficiency in France and lessons from implementation in Northamptonshire. ***Dr. Hubert*** showed that compliance with a 1000 Bq m^{-3} action level for homes would. on the basis of the efficiency of available counter measures, avoid about 10 radon-induced lung cancer deaths annually, at a cost of 100 kEuro per avoided death (grossly equivalent to 5 kEuro per man Sv). Compliance with a 200 Bq m^{-3} action level would avoid a bout 500 deaths yearly at a cost of 400 kEuro per life saved (about 20 kEuro). However, in such a case 850,000 houses should be remediated at a total cost of 150 million Euro yearly. Such a compliance can be questioned, as underlined by the author and by comments from the audience.

Surveys performed in Northamptonshire were described by ***Dr. Denman*** in his paper on "The effectiveness of radon remediation programmes in hospitals, schools, existing and new homes in Northamptonshire". As regards houses above the action level of 200 Bq m^{-3}, only 10% of house owners took action. In areas where risk is lower it was shown that 85% of householders did not test for radon. Data on remediation actions in schools, hospitals and houses allow to support the figures of 300 kEuro, 30 kEuro, and 160-200 kEuro per man Sv saved annually. Those costs take into account the costs of detectors, which correspond to a waste of money when subsequent action is not implemented. Although those figures show that radon programmes rank among the efficient radiation protection action, householders' commitment is critical.