EFFECTS OF RADON EXPOSURE AND SMOKING ON LUNG CANCER RISK: RESULTS OF A EUROPEAN COMBINED ANALYSIS AMONG URANIUM MINERS

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Background and aims: Three case-control studies nested in the French, German and Czech cohorts of uranium miners were conducted in the frame of the Alpha-Risk European research project. These studies aimed at investigating the combined effects of radon and smoking on lung cancer risk. A pooled analysis of individual data of the three studies is presented.
Methods: The pooled data set includes 1476 cases and 3389 matched controls. Cumulated radon exposure during employment was obtained from measurements or a job exposure matrix. Smoking habits were determined from medical archives and questionnaires. Analysis was performed by conditional logistic regression using a linear excess relative risk model.
Results: Smoking status was established for 1046 cases and 2492 controls. Ninety four percent of cases and 76% of controls were ex- or current smokers. Mean five-year lagged cumulated radon exposure was 335 Working Level Months (WLM) for cases and 211 WLM for controls. The excess relative risk per 100 WLM adjusted for smoking was 0.79 (95% confidence-interval: 0.44-1.41). Lung cancer excess relative risk was higher among non-smokers than among smokers and the results suggest a sub-multiplicative interaction between smoking and radon exposure on lung cancer mortality risk.
Conclusions: This collaborative study is the largest uranium miner case-control study on lung cancer with smoking information in Europe. It confirms the persistence of radon effect on lung cancer risk when smoking is taken into account. The results are consistent with a sub-multiplicative interaction between radon and smoking and even among never smokers, the lung cancer risk is significantly associated with radon.