Environmental Health

S Darby et al. Scand J Work Env Health (2006) Vol.32 supp1 p 1-16.
Residential Radon and lung cancer – detailed results of a collaborative analysis of individual data on 7148 persons with lung cancer and 14,208 persons without lung cancer from 13 epidemiological studies in Europe.

The study confirms that there is no risk-free exposure to Radon. It also finds no interaction between radon and smoking; the risks are simply additive. In our view, this means that compensation issues should remain separate; material contribution should not be an issue.

Direct data from 13 studies were pooled and reanalysed. All studies were of a case control design with extensive data on smoking history and long term domestic radon levels. Radon is known to cause lung cancer in miners, who are heavily exposed, but the risk from lower exposures is unclear.

Residential radon concentrations for lung cancer cases were on average 104 Bq/m^3, for controls the average was 97 Bq/m^3. The difference was statistically significant.

A linear dose response relationship was found. **There was no threshold exposure below which there was no risk of lung cancer.** The relative risk increased by 0.11 (95% CI = 0.00 to 0.28) per 100 Bq/m^3 for lifelong non-smokers. For the whole population (including smokers) the relative risk increased by 0.08 (95%CI = 0.03 to 0.16) per 100 Bq/m^3; clearly, smoking history needs to be corrected for.

For lifelong non-smokers, the risks of lung cancer at 100 Bq/m^3 and 400 Bq/m^3 were estimated to be 1.2 and 1.6 respectively, relative to no radon exposure. For those smoking 15 – 20 cigarettes per day the relative risk of lung cancer would be 25.8 at 0 radon exposure, 29.9 at 100 Bq/m^3 and 42.3 at 400 Bq/m^3.

A person at age 75 with no radon or smoking exposure would have a risk of lung cancer of 0.41%. For a lifelong smoker with no radon exposure the probability would be 10.11%. At 100 Bq/m^3 these probabilities increase to 0.47% and 11.63%. At 400 Bq/m^3 they would be 0.67% and 16.03%.

The linearity of the relationship was extensively tested and did not rely solely on those with high exposure.

There was no evidence of a preferred lag time between exposure and diagnosis, the effect seems to be one of **cumulative** dose.

Comment
The half life of Radon is 3.8 days producing metallic radioactive elements as it decays. These metallic elements are reactive and deposit in the lung where they irradiate surrounding tissue with alpha particles.

Radon is a dense gas which can be readily dispersed by ventilation. Miners can be exposed to 15 times the cumulative doses experienced at home.

The increased risk per Bq/m^3 is consistent with predictions made from studies of miners and with studies of residential exposure in North America.

There was no evidence of a super-additive risk associated with smoking. That is, risks from smoking and from radon exposure do not interact, they are independent.

The research was first reported in BMJ in 2005. The emphasis on interaction with smoking has since gained prominence.

Radon usually enters the home via the foundations or building materials but can be found in natural gas.

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