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Chemical-Biological Interactions with Radon

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Abstract

The national academy of sciences (USA) looked at the harmful effects of radon on human health (BEIR VI). This well-written, thoroughly researched study had an impact on radon remediation regulations. This article highlights three of the problems with the report's interpretation at home. First, the majority of the radiation dosage required to assess risk was delivered by homes with radon levels below US regulations. The environmental protection agency's action level was created to ensure that remediation would have little impact on the total estimated attributable risk as a result, after being fixed; the low level homes (*i.e.* those below the action level) would only have a minor effect. Effect on the assigned risk to the population estimate Remediation may only marginally reduce each person's risk in particular homes with particularly high radon levels. Second, it was not a fair appraisal of the findings to say to the public, elected officials and legislators that "next to cigarette smoking, radon is the second leading cause of lung cancer." The proper statement would be: Smoking paired with high radon levels is the second leading cause of lung cancer, after smoking. Few malignancies in nonsmokers could be attributed to radon. Thirdly, there is little doubt that excessive lung cancer is caused by radon exposure at high levels, along with cigarette smoke and other severe insults in the mining environment.

***Keywords:** Radon; Radiation; LNT; Lung cancer; Cigarette smoking; BEIR VI; Cancer risk method*

Introduction

The colourless, odourless monatomic nobel gas radon is one of the naturally occurring radioactive decay products that starts with Uranium-238 in the series (238U). Under normal conditions, radon has very little chemical reactivity, so inhaling it has very little biological effect. However, radon-226 enters a complex decay chain, resulting in the production of Radon-222 (222Rn), which has a 3.82 day half-life and generates a number of short lived daughters that release alpha, beta and gamma radiation when they decay to become stable lead. The degrading chain is fully described in BEIR VI, in addition to several preceding works. Despite being a noble gas, radon can nevertheless be inhaled and deposited because its daughters are charged and adhere to nearby airborne particles. Both the "attached percentage" and the "equilibrium" are significant factors that are affected by the surroundings in which radon is released. These elements affect how much radiation is locally absorbed throughout the respiratory tract. A Working Level Month, a metric that measures exposure to uranium miners and people in houses, was created (WLM). The average radon concentration and exposure time in a radioactive environment over time have led to this outcome. It is essential to translate WLM into a radiation absorbed dose in Gy to the lung, an equivalent dose in Sv to the lung, or an effective whole body dose in Sv (or related units). In BEIR VI, biological dosimetry and dosimetric modelling were used to calculate the radiation dosage that was absorbed by the lungs. There is no question that the environment and way of life of the workers, the high radon levels in uranium mines and the associated absorbed radiation doses to the respiratory system contributed to an increase in lung cancer.

Description

The radiation dose estimates and lung cancer statistics for uranium miners were combined with the dose derived from within home radon exposure in order to evaluate the risk of lung cancer from radon inhalation for a variety of exposure levels. Studies on the epidemiology of lung cancer and the relationship between radon levels in homes have both been used to demonstrate this relationship. Many risk factors as well as some covariate effects can be adjusted when using multivariate models. There is no question that the environment and way of life of the workers, the high radon levels in uranium mines, and the associated absorbed radiation doses to the respiratory system contributed to an increase in lung cancer. The radiation dose estimates and lung cancer statistics for uranium miners were combined with the dose derived from within home radon exposure in order to evaluate the risk of lung cancer from radon inhalation for a variety of exposure levels. Studies on the epidemiology of lung cancer and the relationship between radon levels in homes have both been used to demonstrate this relationship. Many risk factors as well as some covariate effects can be adjusted when using multivariate models. This information supports the basis for current risk estimates for radon in homes and is claimed to be consistent with the values of risk derived using the uranium miner data. Based on the result of the indicated studies, the International Commission on Radiation Protection (ICRP) has revised its lung cancer risk recommendations.

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They have suggested: A lifetime excess absolute risk of 5×10^{-4} per WLM (14×10^{-5} per (mJh/m^3) should now be used as the nominal cancer risk coefficient for radon and radon progeny induced lung cancer, replacing the previous value of 2.8×10^{-4} per WLM (8×10^{-5} per (mJh/m^3). In order to make radon regulations compatible with those for other internally deposited radionuclides, the ICRP also recommended that they be based on exposure to the respiratory track. What we actually know about the biology of low dose radiation has been examined in light of the strength of epidemiological research. It was shown that epidemiology studies need high sample numbers in order to accurately identify the risk in the low dose range and the form of the dose response relationship in the dose range experienced in households. Epidemiologists assert that combining data from different research might assist to reduce uncertainties, but as shown in a recent study, uncertainty seems to dramatically "rise" when using pooled datasets.

Conclusion

As demonstrated in the BEIR VI report, this article demonstrates that radon remediation in homes has little impact on the total cumulative dosage and that the majority of the dose used in the computation comes from residences where the radon level is below the EPA action limit. Therefore, it would be anticipated that the public's health would not be significantly affected by the risk assessments' repair. As a result, the legislation mandating radon testing in houses before sale ought to concentrate on those with notably higher radon levels, where there is minimal uncertainty over the probability of an increase in lung cancer among smokers. Contrary to BEIR VI, radon exposure is not the second most common cause of lung cancer.