

## Efforts to deliver accurate information on radon in Korea

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### 1. Introduction

An accident at the Fukushima nuclear power plant occurred due to tsunamis in northeastern Japan in 2011. Since then, the fear of radiation has increased to the public in Korea, Japan's neighbor. There has been an increasing number of radiation-related issues, such as the increased thyroid cancer and human effects by the tritium around nuclear power plants.

There are radon gas and its progeny radionuclides seeping out of the underground in our living environment. Inhalation of these radionuclides causes radiation exposure to human. As radon concentrations are relatively high in underground spaces such as subway tunnels, cases of radon exposure have been reported.

In May 2018, it was reported that a company's bed mattresses emit a large amount of radon. A detection of radon gas from the bed mattresses indicates that any products that generate the "anion effect" are likely to emit a significant amount of thoron gas (a type of radon).

Consequently, the government took action to collect and dispose of the mattresses that released radon gas. This incident led an increasing number of people to use radon detectors to measure radon levels in their homes, and it was found that many other anion products released radon as well.

Moreover, mass media reports often describe radon as being a "silent killer" or a "cause of lung cancer," or both. Such reports have caused fear and anxiety among the general public who lack knowledge about radon. As a matter of fact, radon exposure is inevitable because radon exists everywhere. Thus, we do not need to live in fear because radon is only radioactive.

To alleviate public concern regarding radon exposure, it is important to raise public awareness of radon and the effects of exposure to radon. To this end, the Korean Nuclear Society (KNS) and the Korean Association for Radiation Protection(KARP) have established a committee of radon experts, with the intention of assigning the experts the task of publishing a technical report about radon. The committee is to ensure that outlines of the technical report what radon is, where radon comes from, what the risks of prolonged exposure to high levels of radon are, and how to cope with a situation in which one's house has high levels of radon.

### 2. Methods

#### Activities of KARP for Public Understanding of Radiation Issues in Korea

KARP has been working to promote public understanding of nuclear and radiation for more than a decade.



Training for Safety Management of Radiation in Daily Life (2014 Nov)



Radiation Safety Issue in the Medical Sector (2014 Nov)



Effects of Low Dose Radiation on Human Body (2015 Feb)



International Symposium on Radiation Safety Management in Food (2015 Oct)



Strengthen Communication with Industrial Site through Radiation Safety Regulation(2016 Aug)



Practical Strategies for Radiation Safety Communication with Public (2018 Feb)



Social Issues of Radiation and Scientific Thinking(2018 Apr)



Press Conference for Radon from Monazite in Bed Mattress (2018 Jun)



Effect of Internal Exposure due to Radon and Truth (2018 Aug)



Human Body Effects from Radiation in Daily Life & Social Issues (2018 Nov)



(L) Protests by civic activists during the press conference (R)Press Conference for Misunderstandings and Truths about Ultra Low Dose Radiation (2019 May 21)



#### Radon Release from Bed Mattress (2019 July 08)



Reports from Major Newspaper in Korea  
"a company's bed mattresses emit a large amount of radon."(2018 May)



Bed mattresses collected from nationwide are piled up in the front yard of bed production factory.

#### Radon Release from Latex Mattress imported(2019 July 08)



Radon emitted from imported mattress exceeds 4 times radiation limit of Radon



"The Government that licensed Monazite is responsible!!"  
"Inspect the whole number of radioactive suspect products!!"

#### Publishing Radon related Report

##### [Background]

Science paved pseudoscience is widespread in daily life, and a representative example is the health effect of anion.

These pseudoscience combined with human basic needs are being used as commercial marketing strategies.

The scientific community, including the medical science community, has consistently argued that "negative ions are good for health" is pseudoscience.

Radon mattress issue originated from detection of radioactive material. Radon released from monazite powder in the mattress to generate negative ions.

Radon, radiation in daily life, is a natural radioactive radiation that exists everywhere in the earth , but WHO has been pointing to the cause of lung cancer.

##### [Purpose]

Authors tried to make it easy for readers to read and understand in order to provide a variety of information based on scientific facts.

This report includes the following.

- Characteristics of Radon and Source in Living
- Concepts and indicators for quantifying the health risks of radon exposure
- Radon concentration in domestic daily environment
- Health risks of radon exposure
- Management measures to minimize radon exposure
- Social awareness of radiation

This report is expected to contribute to minimizing the social controversy about the public concern by helping the objective judgment of the reader about the health risk of radon, the living radiation.

##### [Radon exposure and lung cancer]

Lung cancer is a highly morbid disease that accounts for one-third of all cancer deaths, with a mortality rate of only 17% at 5-year survival rates.

In Korea, 28% of 5-year cancer survival rates are higher, but they account for 22.8% of all cancer deaths.

Smoking is known to be a causative agent for a variety of cancers, but lung cancer is the most relevant.

The possibility of radon-induced lung cancer is known to be due to the inhalation of radon gas in a study of miners working in uranium mines.

##### [Epidemiology Study for relation between Radon and Lung Cancer]

###### 1) Epidemiology Study for Miners

Although the increase in respiratory disease deaths in miners was observed in Europe in the 16th century, it was confirmed in the 1950s that this cause of death was lung cancer due to exposure to radon.

###### 2) Prediction of lung cancer incidence by indoor radon

It is believed that there is no threshold concentration for radon to cause lung cancer, and a very low concentration of radon is known to increase the risk of developing lung cancer.

###### 3)Epidemiology Study for Miners

Although the increase in respiratory disease deaths in miners was observed in Europe in the 16th century, it was confirmed in the 1950s that this cause of death was lung cancer due to exposure to radon.

###### 4) Epidemiology Study on residential environment

The baseline risk of lung cancer was high in smokers, and as a result absolute risk of lung cancer due to radon exposure accounted for the majority of smokers and about 25 times greater risk than non-smokers.

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#### Korean Original

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in English

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### 3. Conclusions and Recommendation

#### Conclusions

The results of the survey showed that the annual average radon concentration in Korean housing is 46.4 Bq/m<sup>3</sup> with a weighted geometric mean and 1.8 for geometric deviation. Over 300 Bq/m<sup>3</sup> houses are estimated at more than 100,000 houses.

Most of Korea's regions are granite-based, with radon levels above the world average. Some Provinces have higher potential for radon in residential spaces than in other regions. Even in the same area, indoor radon concentrations vary greatly depending on the house conditions.

The average annual radiation dose received by radon from radon is about 2.7mSv, but few houses can be exposed to several tens of mSv per year. Therefore a clear national radon policy is needed, such as establishing a radon area of interest.

#### Recommendation for Public

An easy way to lower indoor radon concentrations is through ventilation. Using a fan or opening a few windows can be quite effective. Ventilate once before bedtime is a good idea. Radon is an inert gas and radon progeny has a short half-life and does not contaminate goods or foods. There is no problem with eating food produced in the radon region of interest. There is no reason to refrain from visiting such areas.

#### Recommendation for Government

As national radon levels are substantial, public relations programs should be strengthened to help people understand radon issues and promote self-protection. Radon survey plans should be established and implemented for workplaces and new homes with insufficient radon status.

In order to set radon autonomous measurement environment for the people, a measurement infrastructure centered on private services should be established, and supervision must be conducted to ensure measurement quality along with providing measurement standards and fostering the service industry.

In order to effectively manage the radon exposure of the ground origin, it is necessary to designate the radon area of interest and institutionalize the radon protection design of the building, while providing publicity and support measures to prevent stigma damage.

In order to control the radon exposure of building materials, the radium and thorium radioactivity standards of building materials should be established, but they should be accompanied by measures to support compliance such as production site / import management and the establishment of radiation measurement infrastructure.