A Review of Major Exposure Factors for Assessment of Radiation Dose Due to Indoor Radon

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Introduction

Increasing social interests for radon exposure in indoor air

- Radon, one of natural radionuclides is a colorless and odorless radioactive gas.
- Social interest in radon has been raised because of its widespread everywhere and its high contribution to radiation dose.
- However, the radiation dose assessment methodology for indoor radon in Korea is not clearly established in comparison with the emerging social interests.

Necessity of reviewing radon radiation dose assessment methodology proposed by international organizations

- International organizations such as ICRP, UNSCEAR and NCRP have proposed a methodology for estimating radiation dose for radon.
- Therefore, the radiation dose assessment method for radon in indoor air proposed by each international organization was analyzed.
- Major exposure factors that used in evaluating radon radiation dose presented by international organizations were reviewed.

Objective

A review of major exposure factors for assessment of radiation dose due to indoor radon

- To investigate radiation dose assessment methods in literature.
- To analyze the major exposure factors influencing radiation dose due to indoor radon.

Investigation of Dose Assessment Methods

Radiation dose assessment methods of UNSCEAR

- ICRP and UNSCEAR have proposed the radiation dose assessment methodology for radon and each country has established the radiation dose assessment methodology accordingly.
- UNSCEAR proposed a method for evaluating effective dose by applying the major exposure factors and dose coefficients to the radioactive concentration of radon in the air.
- This is similar to the method proposed by the ICRP, but there are some differences in approaches to dose coefficients.

Table.1. Representative value of major exposure factor suggested by UNSCEAR

Exposure factor	Radionuclide	
	Rn-222	Rn-220
Equilibrium factor	0.4	0.02
Occupancy factor	indoor : 0.8	
Breathing rates	0.8 m^3/h	
Dose coefficients	9 $nSv/(Bq \cdot h \cdot m^{-3})$	40 $nSv/(Bq \cdot h \cdot m^{-3})$

Radiation dose assessment methods of ICRP

- The ICRP also applied the major exposure factors and dose coefficients to the radioactive concentration of radon.
- The ICRP stated the Statement on Radon in 2009 that the dose coefficients of radon should be re-derived on the basis of a dosimetric approach.
- Therefore, the dose coefficient was newly derived through the dosimetric approach

Table.2. Representative value of major exposure factor suggested by ICRP

Exposure factor		Radionuclide	
		Rn-222	Rn-220
Equilibrium factor		0.4	-
Occupancy factor		0.8	
Breathing rate		Public : 0.78 m^3/h, Worker : 1.2 m^3/h	
Dose coefficients	Public	6-20 mSv/WLM	1.5-5.7 mSv/WLM
	Worker	10 mSv/WLM	5 mSv/WLM

Analysis of Major Exposure Factor

Selection of representative value for major exposure factor

- Equilibrium factor was selected as 0.4 for Rn-222 and 0.02 for Rn-220. → It is necessary to set the equilibrium factor on the long-term measurement basis
- Occupancy factor was selected as 0.8. → This needs to be newly derived by appropriately reflecting the domestic lifestyle in Korea.
- Breathing rates were 0.78 m^3/h for the public and 1.2 m^3/h for the workers. → It is required to set the factors by applying Korea people data.
- Dose coefficients of Rn-222 were selected as 13 mSv/WLM for the public and 10 mSv/WLM for the workers.
- In the case of Rn-220, 5.7 mSv/WLM for the public and 5 mSv /WLM for the worker were selected.

Conclusion

- **Radiation dose assessment methodology for radon was analyzed to derive representative values of major exposure factors**
- **It is necessary to be derived appropriately by applying Korean life style and human physiology.**
- **The study results are expected to contribute to the establishment of a methodology for radiation dose assessment for radon in Korea.**

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