

RADON CONCENTRATION IN AIR IN SOME SITES OF BABYLON GOVERNORATE

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ABSTRACT

Many researchers have investigated radon and levels in air and their health amplifications, this research study the concentration in the air of some sites of Babylon governorate utilizing. [RAD7] radon detector manufactured by DURRIDGE COMBANY Inc. The results show that the higher activity of radon was (25) Bq/m³ in Al- Tuhmaziai site and low activity are (0) Bq/m³ in Al-Gamey site.

Keywords: Radon, Radon concentration, ²²²Rn

INTRODUCTION

Radon is a naturally occurring radioactive gas generated by the decay of uranium and thorium bearing minerals in rocks and soils. Radon and its decay products are the major contributors to human exposure from natural radiation sources and have been identified as the second leading cause of lung cancer after tobacco smoking. Radon-222 and radon-220 are the most common isotopes of radon, with the term “radon” typically referring to radon-222 and “thoron” to radon-220. [1]

In recent years, exposure to radon and its possible health effects have gained increasing attention as indicated in a recent report of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). [2]

Radon (radon-222) has a half-life of 3.82 days and originates from the uranium (uranium-238) decay chain. [3]

The Concept of Equivalent Radon Concentration for Thoron

The annual effective dose due to indoor radon exposure, E_{Rn} , was assessed based on the formula given by the UNSCEAR report:

$$E_{Rn}(nSv/y) = C_{Rn}(\text{Bq}\cdot\text{m}^{-3}) \times 0.4 \times 7000(\text{h}/\text{y}) \times 9(\text{nSv}/(\text{Bq}\cdot\text{m}^{-3}\cdot\text{h})^{-1}) \text{-----}(1)$$

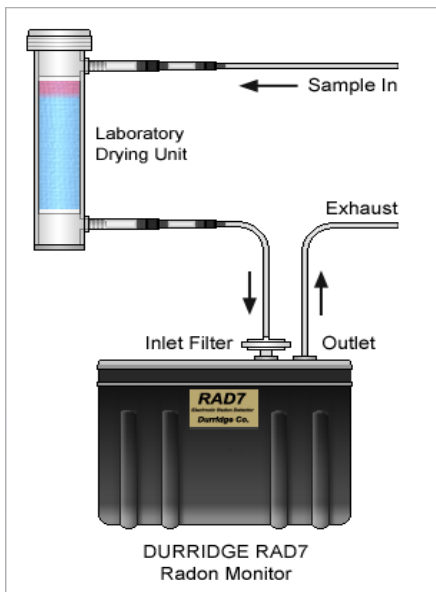
where C_{Rn} is the arithmetic mean radon concentration in the units of $\text{Bq}\cdot\text{m}^{-3}$, the typical value of 0.4 was used as the equilibrium factor for radon indoors, a recommended value of 9 nSv ($\text{Bq}\cdot\text{m}^{-3}\text{h})^{-1}$ was used to convert radon equilibrium-equivalent concentration (EEC) to the effective dose, and an 80% home occupancy time, *i.e.*, 7000 h per year, was assumed. [4, 5]

Radon enters the body system during inhalation, which results in an increase in the exposure dose that can result in the development of lung cancer Radon (²²²Rn) and its progeny in air are the most important contributors to human exposure from all natural radiation sources (UNSCEAR, 2000). ²²²Rn is regarded as a risk factor that contributes to the global burden of disease and is the second biggest cause of lung cancer after tobacco smoking. In general, residential ²²²Rn is regulated by a ²²²Rn concentration action level between 200 and 600 Bq m⁻³ based on ICRP recommendations (ICRP,1993). Recently, however, an increase in lung cancer risk has been observed even with exposure levels below 200 Bq m⁻³ In view of such

scientific data, WHO proposed a reference level of 100 Bq/m^3 to minimize health hazards due to indoor ^{222}Rn exposure. [6]

EXPERIMENTAL

The RAD7 is a Sniffer that uses the 3-minute alpha decay of a radon daughter, without interference from other radiations, and the instantaneous alpha decay of a thoron daughter. The RAD7 sniffs out entry points and radon gushers and recovers in minutes from high radon exposures. The RAD7 is also a Continuous Monitor that measures the EPA action level of 4 pCi/L , with 10% standard deviation, in one hour. At the end of each run, the detector prints out a complete report.



RESULT AND DISCUSSION

In our research six sites in Babylon governorate have been selected to achievement this study. The following tables illustrated the concentrated of radon in this sites measured by Bq/m^3 .

The results show that the higher activity of radon was $(25) \text{ Bq/m}^3$ in Al- Tuhmaziai site and low activity are $(0) \text{ Bq/m}^3$ in Al-Gamey site.

Table 1. The Concentration of radon gas in air of some Babylon's sites

Sequence	Region	First Reading	Second Reading	Third Reading	Fourth Reading	Mean Bq/m^3	$\pm S. D$ Bq/m^3
1	Al- Muhandisn	34	0	34	0	11	67
2	Al- Tuhmazia	0	34	0	68	25	35
3	Alshuhadaa	34	0	0	0	8	17
4	Residential Buildings	0	22.5	11.3	11.3	11	9
5	Al-Gameya	0	33.8	0	33.8	17	18
6	Al-Murtatha	0	11.3	0	0	9	7

The figure 1 shows that the concentration of the radon in air in some sites of Babylon governorate.

Annual Effective Dose

The magnitude of annual effective dose (which the dose resulting from exposure to the radon gas during one year) can be taking by equation (1) as shown in the table (2).

Table 2. The magnitude of annual effective dose

<i>Sequence</i>	<i>Region</i>	<i>Effective dose nSv/y</i>
1	Al- Muhandisen	27.72×10^4
2	Al- Tuhmazia	63×10^4
3	Alshuhadaa	24.84×10^4
4	Residential Buildings	27.72×10^4
5	Al-Gameya	0
6	Al-Murtatha	22.68×10^4

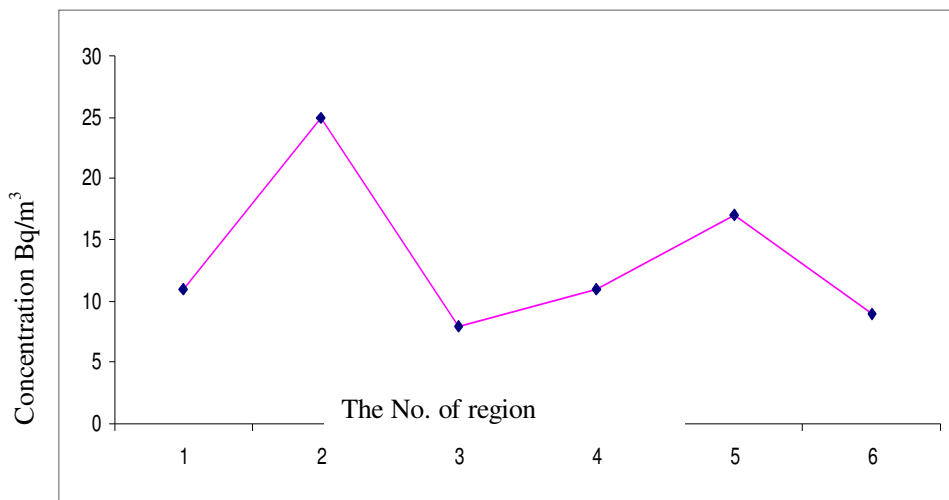


Figure 1. The concentration of the radon in air in some of Babylon governorate

CONCLUSION

The result of radon content in air is shown in Table (1). The ²²²Rn concentration in air is not regulated, but the USA Environmental Protection Agency (EPA) has proposed a maximum concentration level (375 Bq/m³) or (300 pCi L⁻¹) our results show that all samples don't excess than of the EPA's proposed limit.

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