

## Level of Radionuclide Contents in Surface Water from Shutt-Alrab River in Basrah Governorate, Iraq

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**Abstract:** *The study aims at providing a base-line data for the effective monitoring of radioactive contents in water of investigated area. Attempts were made to measure the radionuclide's concentrations level in the 17 samples of surface water taken from Shutt – Alarab River, in the Southern - East province in Basrah governorate. The contents of radionuclide's were obtained by using different techniques; radon gas concentrations measured by CR-39 detector and RAD7 electronic instrument. Gamma ray spectroscopy analysis system NaI was applied to measure natural radioactivity concentration of uranium, radium and thorium in the water samples. It was found that, the average radon concentrations in water varies from  $0.040 \pm 0.008$  Bq/L to  $0.112 \pm 0.018$  Bq/L and radium concentration measured by gamma spectroscopy is  $0.030 \pm 0.210$  Bq/L to  $13.829 \pm 950$  Bq/L. The average radon inhalation effective dose was estimated to be 0.005 mSv/y and average radium ingestion effective dose was 1.153 mSv/y. All the results were within the international limits recommended by ICRP, UNSCEAR and WHO.*

**Keywords:** *Natural radioactivity, Radon gas, CR39, NaI, Radium, effective dose.*

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### 1. INTRODUCTION

Water is essential to human life as air to breath. Thus, it is important to investigate the level of radionuclides in water. Naturally occurring radioactive elements such as uranium, radium, and radon are dissolved in very low concentration during normal reaction between water and rock or soil. The main concern of environmental monitoring is the measurement of the natural radiation arising from naturally radioactive materials and their progenies exist in air and water. The natural radioactive gas radon  $^{222}\text{Rn}$  and its decay products are one causes of lung cancer [1-3]. Radon is a natural inert radioactive tasteless and odorless gas, whose density is 7.5 times higher than that of air. It dissolves in water and can readily diffuse with gases and water vapor, thus building up significant concentrations. Radon is particularly well suited to study groundwater and surface water and their interaction, because of activity in groundwater is 1 to 100 kBq m<sup>-3</sup>; depending on the lithology of the area, which is much higher than the surface water 1 to 100 Bq m<sup>-3</sup> [4]. The sources of Radon in water are; either from radioactive decay of dissolved radium in water, or, from a direct release of radon from minerals containing member of uranium and thorium decay series. Groundwater can have unusually high constituents of a dissolved radioactive contribution that build up during the period of water with rock contact for a long time period, or water injected in the well in order to maintain pressure in the well during oil production process [5].

Radium and radon concentration in ground and surface water were matter of investigations carried out by many researchers recently [6-9]. The results of these investigations show changeability in the concentration with time and geological structure of the area.

This work aims, to determined radon and radium concentration from water and estimate the effective dose due to the use of this water in different purposes. The investigation also covered the gamma concentration from  $^{238}\text{U}$ ,  $^{226}\text{Ra}$  and  $^{232}\text{Th}$  in water of Shutt- Alrab River, the main source of drinking water in Basra Governorate.

### 2. EXPERIMENTAL METHODS

In Basra governorate, the household water is supplied from two sources; one from Bada'a (on Euphrates River) and the other from Shatt-Alrab river ( formed by the confluence of the