

# Radon and Radium Measurement in Water Supplies of Sadatshahr and Javaherdeh Regions in Iran

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**Abstract— Radon is a naturally occurring radioactive gas that is emitted from soils and rocks and is in some water sources. Radon is estimated to cause many thousands of deaths each year. That's because when humans breathe air containing radon, can get lung cancer or when drink water containing radon, this element makes series problem to digestion system. Also, drinking water containing <sup>226</sup>Ra, the parent nuclide of <sup>222</sup>Rn, is dangerous for people health. Because this element deposits it in bones and caused to bone cancer. In this study radon and radium concentrations of the 43 water samples of the Sadatshahr and Javaherdeh regions have been measured by PRASSI system. 4 samples have radon concentration higher than 11 Bq/l as normal level. Also, <sup>226</sup>Ra alone, in 2 samples have concentration higher than 0.555 Bq/l as normal level for gross alpha. For improvement of the social health level, it is essential that to reduce the radon and radium concentrations in the drinking water before using by people.**

Keywords:- Radon, Radium, Drinking water, PRASSI system, Sadatshahr and Javaherdeh Regions.

## I. INTRODUCTION

<sup>222</sup>Rn is a radioactive noble gas isotope, which is produced by the decay of <sup>226</sup>Ra within the natural decay chain of <sup>238</sup>U. The radon readily escapes from the soil or rock where it is generated and enters surrounding water or air [1-3]. Breathing air that contains radon in high concentrations can be health hazard for humans. Relationship between lung cancer and inhalation of radon and its progeny has been demonstrated [4].

Radon in water can follow two different paths to enter the human body. Firstly, some of the radon dissolved in tap water will escape to indoor air. The proportion lost in this way will depend on circumstances. However, UNSCEAR has suggested that, as a general rule, radon in tap water gives rise to radon in room air at a concentration  $10^{-4}$  lower than that in the water [5]. Secondly, ingestion drinking water containing radon. The

organ at greatest risk from the ingestion of water containing radon is considered to be the stomach [6], that can be a factor in the induction and progression of stomach cancer.

Of the four isotopes of radium, <sup>226</sup>Ra (the parent nuclide of <sup>222</sup>Rn) causes the most concern due to a combination of its long half-life (1600 years) and radiological effects [7]. Exposure to higher levels of radium over a long period of time may result in harmful effects including anemia, cataracts, fractured teeth, cancer (especially bone cancer), and death (ATDSR & USEPA, 1990).

So, presence these radioactive contaminants in drinking water is dangerous and many studies, especially about radon, have been done in this area [9]. These reasons caused we measured radon and radium concentration in water sources of Sadatshahr and Javaherdeh region.

In the present research results of radon measurement in 43 water samples, sources and tap water are actually used for drinking and other household uses in Sadatshahr and Javaherdeh. Radon of water samples that have been measured using PRASSI system includes a ZnS (Ag) scintillation detector.

## II. MATERIALS AND METHODS

Radon Measurement in the Water Samples by PRASSI System:

The PRASSI (Portable Radon Gas Surveyor SILENA) Model 5S has been used to radon concentration measurement in the water samples, which is particularly well suited for this type of measurement that must be performed in the closed loop circuit. The system set up of measurement including bubbler and drier column. PRASSI pumping circuit operates with constant flow rate at 3 liters per minute in order to degassing the water sample properly. Its detector is a scintillation cell coated with ZnS (Ag) 1830 cm<sup>3</sup> volume. The sensitivity of this system in continuous mode is 4 Bq/m<sup>3</sup> during the integration time 1 hour.