Radon in Mineral Spring Water of Mongolia

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ABSTRACT

The results of the specific radioactivity study for Rn-222 in mineral spring water of Khalzan mountain and Janchivlan of Mongolia, using the HP-Ge gamma-spectrometer, are discussed. Some physical and chemical properties in some sample of mineral spring water are determined.

Keywords: water, mineral spring water, radoiactivity, radon, gamma-spectrometer, conductivity

1. INTRODUCTION

Natural water with unusual quality and composition which affects to some illness of human body and its organs is called as mineral spring water. In some kind of natural water especially mineral spring water, the radon and radium are accumulated in quite high amount. Water with radon sometimes-water with radon – radium is used in mineral spring sanatoria. Because radium can be accumulated in organs of human body it is prohibitived to use water with radium in drinking treatments. We have developed the method to determine the specific radioactivity of Rn-222 in water using the HP-Ge gamma-spectrometer, solid state nuclear track detector and liquid scintillator [1,2]. Using these methods the specific radioactivity of the Rn- 222 in Khalzan mountain's and Janchivlan's mineral spring water which are well known in Mongolian people for long time and it has being used as a medicine and healthy drink, was obtained. Khalzan mountain's mineral spring water is located 1066 meters above the sea level, at coordinates-north latitude $45^0\,49'$, east longitude $108^0\,34'\,30''$ in Dornogobi province, Mongolia. Janchivlan's mineral spring water is located 1600 meters above the sea level, at coordinates-north latitude $47^0\,36'$, east longitude $107^0\,37'$ in Tuv province, Mongolia.

2. EXPERIMENTAL

Using the HP-Ge gamma-spectrometer the specific radioactivity of Rn-222 in mineral spring water was determined by 295.21 keV and 351.92 keV gamma- rays from ^{214}Pb and 609.31 keV gamma-ray from ^{214}Bi [1]. Both of ^{214}Pb and ^{214}Bi are the radon's short –lived daughter nuclides. As a sample, 1000 ml mineral spring water was directly poured in Marinel vial and a screw cap was tightly closed. The gamma– ray measurement of the mineral spring water sample started about 4 h later for establishment of radioactive equilibrium between the radon and the short – lived daughter nuclides.Measurement time was about 1 h. Using the water checker U-10 "Horiba", Japan, the electrical conductivity and chemical properties in some sample of mineral spring water was measured.

3.RESULTS AND DISCUSSION

Measured specific activities of Rn-222 in mineral spring water sampled at different bore hole in Khalzan mountain's mineral spring water, in June, 2000 and august, 2001 and Janchivlan's mineral spring water in June, 2002, are presented in table 1. Measured some physical and chemical properties in some sample of mineral spring water sampled at Khalzan mountain's mineral spring water, in august, 2001, comparing drinking water of Ulaanbaatar City, are presented in table 2. Thus, the specific radioactivity for the Rn-222 in Khalzan mountain's mineral spring water ranged 160-260 Bk/l and Janchivlan's mineral spring water ranged 400- 430 Bk/l. These results is higher than usual drinking water (110 Bk/l) of Ulaanbaatar city and International radiation safety standards (60- 100 Bk/l). It has be seen that the results of measurements of the specific activities for the Rn-222 in three different bore hole of Khalzan mountain's mineral Thus, the averege of pH in Khalzan mountain's mineral spring water is 5.68 pH and average of solid particle in mineral spring water is 5.4 mg/l spring water are different in with each other. It mentioned the studying of Vabrov.VA, 1955 [3].

Table 1. The results of determination of specific activities of Rn-222 in mineral spring water (Bk/l)

Sample	Bore hole number	The specific activities of Rn-222, Bk/l	Averege, Bk/l
The sample of Khalzan mountain's mineral spring water	1	128.0±3.0	159±7
		152.3±9.8	
		158.9±10.1	
		180.9±10.4	
		169.3±5.7	
		170.2±6.2	
	2	133.8±13.8	261±8
		224.0±11.2	
		149.6±3.3	
		136.0±10.6	
		240.6±12.8	
		370.5±10.6	
		322.8±3.5	
		400.9±4.7	
		372.1±6.9	
The sample of Janchivlan's mineral spring water		400±5	415±4
		430±2	

Table 2. Physical and chemical properties inKhalzan mountain's mineral spring water

The number of sample	Solid particle, mg/l	pH	Conductivity, mOm^{-1} cm^{-1}	Solid particle in mineral spring water
1.	5.52	5.55	1.01	21
3.	5.33	5.35	1.68	43
4.	5.48	6.25	13.7	25
5.	5.43	5.56	13.9	58
12	5.47	5.71	13.9	51
The averege of mineral spring water	5.44	5.68	8.83	39.6
The averege of drinking water of Ulaanbaatar City	6.74	6.56	0.153	29

4.CONCLUSION

1. The averege of the specific radioactivies for the Rn-222 in bore hole N1 159 Bk/l, bore hole and N2 261 Bk/l were respectively for Khalzan mountain's mineral spring water and Janchivlan's mineral spring water ranged 400- 430 Bk/l. These results are in agreement with the decreasing fact from studying in 1955 (3478 Bk/l), in 1957 (444 - 555 Bk/l).
2. The specific radioactivity for the Rn-222 in Janchivlan's mineral spring water ranged 400- 430 Bk/l, which can be used in inhalation.
3. The averege of pH in Khalzan mountain's mineral spring water is 5.68 pH and averege of solid particle is 5.4 mg/l, which are almost the same as drinking water of Ulaanbaatar city.
4.

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