

Estimation of Alpha Activity in Various Sources of Water in Different Places of Karbi Anglong District of Assam, India

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Abstract

Alpha activity in water collected from various sources of Karbi Anglong district of Assam has been studied. The alpha track densities are found to vary considerably from sample to sample. For the studied samples the minimum and maximum values of alpha activity are found to be 0.46 ± 0.03 Bq/l and 5.00 ± 0.33 Bq/l respectively.

Introduction

Radionuclides are found in air, water and soil. The contribution to water is due largely to naturally occurring radionuclides in the uranium and thorium decay series.

Since uranium, an alpha emitter is easily soluble in the form of uranyl ion (UO_2^{2+}), uranium can be found dissolved in water as U^{6+} under oxidant conditions. This dissolved uranium, if ingested by local population, can contribute to general doses levels [1]. On the other hand, its decay products like radium-226, radon-222 and 220 etc. are also alpha emitters and their ingestion and/or inhalation by population also causes serious health hazardness [2,3].

Thorium, another alpha emitter, is usually more abundant in natural samples than uranium by a factor of about 4 [4].

Enhanced levels of uranium, thorium and their daughter products might be present in groundwater in area that is rich in natural radioactivity. As ground water moves through fractures in bedrocks that contain these deposit radioactive minerals can leach out mostly into the ground water and to smaller quantity in surface water. Wells and ponds created in such areas shows levels of natural radioactivity in water quality test. [5]

Water is one of the universal substances which are used to sustain life. Drinking water comes from surface and ground waters. Therefore, the determination of

naturally occurring radionuclides in ground water is useful as a direct input to the environmental and public health studies.

The North Cachar and Karbi-Anglong districts of Assam are the two most geographically remote hilly districts of Assam. The surface and sub-surface faults of the region are tectonically very active as evidenced by the presence of numerous hot water springs in and around the district. The drinking water sources for the population of the districts are mainly ponds, hand pumps and the deep wells. In the recent past many incidences of the consumption of contaminated water have been reported from the Public Health Engineering Department of Karbi Anglong District of Assam. [6]. Considering the possibility of high radiotoxicity of the water, we have made an attempt to estimate the total alpha activity of the water collected from various sources of Karbi Anglong district of Assam.



Figure: Map of Assam showing Karbi Anglong District of different studied locations.

Experimental Procedure

In this present investigation for measuring the alpha activity of water, we have adopted the same technique used by Ghosh et al. [7].

Water samples were collected from different places of Karbi Anglong District of Assam. Samples were collected from various sources of water where fluoride concentrations were reported to be very high by the Public Health Department of Assam. Good quality plastic containers of volume 416 cm³ were used to collect the water samples. LR - 115 (Type-II) plastic detectors obtained from Kodak-pathe film were cut in to small pieces of sizes 2.5 cm x 2.5 cm and were exposed horizontally at a distance of 4.0 cm from the bottom of the container. Detectors were kept at the center of the container and exposure was done for a period of 72 hours. The exposed sheets were then etched for a period of 90 minutes in 2.5 N NaOH solutions at a

temperature of 60 °C. The tracks were then counted in a Zeiss (Axiostar) binocular optical microscope under magnification of 400 x.

Results and Discussions

The average track density per cm² is shown in fig.1. The average track density (counts/cm²) and the corresponding α -Activity (Bq/l) for various water samples are also presented in table 1.

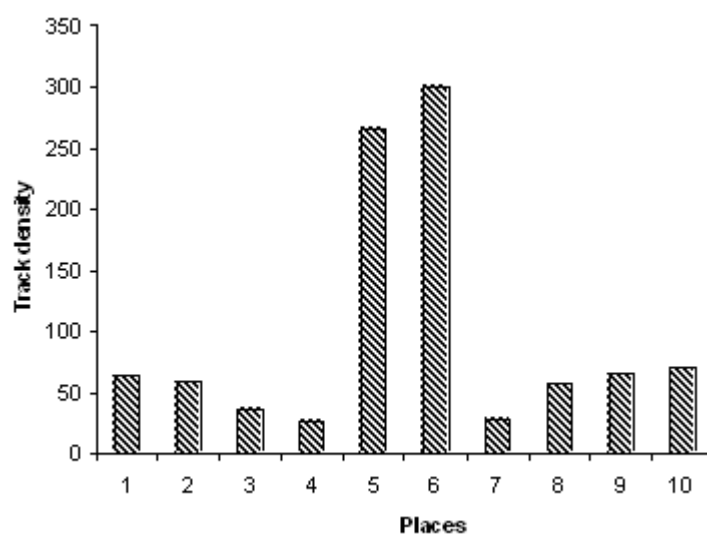


Figure 1: Variation of Alpha Track density in different places of Karbi Anglong district of Assam, India.

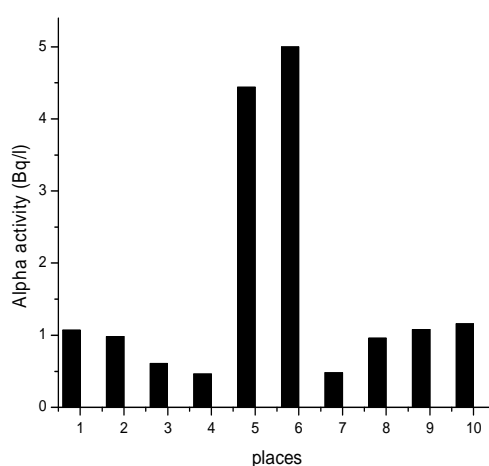


Figure 2: Variation of Alpha activity in different places of Karbi Anglong district of Assam.

It can readily be seen from figure 1 that the average α - particle track concentration varies significantly from sample to sample. It may further be seen from this figure that the average α - particle track density is much higher for the water samples of Longnit Bura Teron Gaon and Kheroni , where fluoride concentrations were also reported to be very high[8]. The reason for such high concentration of α - tracks in those samples needs further investigation for any conclusion. Figure 2 shows the variation of Alpha activity (Bq/l) in different water samples in different places of Karbi Anglong district of Assam. The alpha activity varies from 0.46 Bq/l at Diphu Town water supply to 5.00 Bq/l at Kheroni.

Table 1: Values of alpha tracks/cm² and α -Activity (Bq/l) for various water Samples of Karbi Anglong district of Assam.

Sl.No.	Location	Source	Depth (In feet)	Affect of fluoride	Average track density (Counts/cm ²)	α -Activity (Bq/l)
1	Diphu, Thana road, Karbi Anglong	Ring well water	60	Affected Area	63.78	1.07 \pm 0.07
2	Manja Tiniali, Karbi Anglong	Tube well Water	120	Affected Area	59.07	0.98 \pm 0.06
3	Longnit, Karbi Anglong	River Water	02	Highly Affected area	36.62	0.61 \pm 0.04
4	Diphu Town, Karbi Anglong	Diphu Water supply	00	Affected Area	27.57	0.46 \pm 0.03
5	Longnit Bura Teron Gaon, Karbi Anglong	Ring well water	40	Banned due to heavy fluoride	266.20	4.44 \pm 0.29
6	Kheroni, Karbi Anglong	P.H.E. water	200	Banned due to heavy fluoride	300	5.00 \pm 0.33
7	Physics Dept. Gauhati University	Distilled water prepared at G.U. Lab	00		28.69	0.48 \pm 0.03
8	Borjan,manja Karbi Anglong	Tube well	75	Affected area	58.03	0.96 \pm 0.05
9	Mentila, Karbi Anglong	Tube Well	65	Affected. Area.	65.06	1.08 \pm 0.07
10	Diphu 8 th mile Karbi Anglong	Tube well	70	Affected Area	70.12	1.16 \pm 0.08

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