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STUDIES ON RADON AND ITS PROGENY IN AND AROUND BANGALORE CITY

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Introduction

Radon is a naturally occurring radioactive noble gas in the environment. As a noble gas, it decays to short lived and long-lived daughter products. They are heavy metal ions and highly chemically reactive attached to the atmosphere components to form aerosol particle. The study of health effects of exposure to low-level to α- radiation emitted from radon and its progeny in dwellings and environment have received continuing attention on these gases and their daughter products have to which all persons are exposed [1]. Many authors have investigated radon and its progeny arising to their hazardous effects on human health after inhaling them. It is know that radon daughters cause the main part of the radiation dose to the lungs with the contribution depending on the relative amounts of the radionuclides in the air. In the present work radon and its daughter products in indoors in and around Bangalore city were measured.

Methodology

Radon and its progeny concentrations in granite quarries and some dwellings around the quarries were measured using Solid State Nuclear Track Detectors (SSNTD). SSNTD based twin cup dosimeters developed and standardized at Bhabha Atomic Research Centre (BARC) were used for the measurement [2]. The equilibrium factor for radon is estimated from extracted ventilation rate. From the equilibrium factor and radon concentration, radon progeny concentration is estimated. The activity of ^{226}Ra was determined by using HPGe detector.

Results and discussion

The results of concentrations of radon and its daughter products were measured in different types of few dwellings in and around Bangalore city are summarized in table -1. Higher concentration of radon and its progeny were observed in Alanahally and Maralebekuppe villages are situated where the granite rocks very well exposed to the surface compared to other areas. This may be due to higher content of radium in bedrock and soil beneath a dwelling and mining activity [3]. The lower concentration of radon and its progenies were observed in other villages of Kanakapura Taluk. This may be due the mining activity is completely stopped and the pink granite rocks are overlapped by dolerites and altered granites at a depth of 10 – 20 feet.

The variation of radon and its progenies in different types of dwellings in Bangalore city and Bangalore rural district (Maralebekuppe) are shown in Fig-1 and 2. Mud houses have higher concentrations compare to concrete houses and huts. It is known that the major contribution to indoor radon and its progenies concentrations is due to local soil where the dwellings are exist [4]. The huts are thatched roofs and the heights of the roof are small (6.5 feet) and involve good ventilation hence these shows less concentration of radon and its progenies were observed.

In Victoria Hospital, higher concentration of indoor ^{222}Rn and its progeny is observed in ground floor room. This is because the floorings and walls are made up of granites. The A.C. room shows relatively lower concentration of radon and its progenies. This may be attributed to A.C., which enhances air exchange rate. The mortars have slightly high concentration. This may be due to the reason that the house is quiet old and poorly ventilated, as the windows are always kept closed. The average inhalation dose due to radon and its daughter products is 3.5 $mSv.y^{-1}$ with a median of 3.14 $mSv.y^{-1}$. The inhalation dose is higher than global average.

Conclusion

The maximum progeny concentrations of radon have been observed in the houses situated near the quarries where the mining activity was takes place. The concentration is mainly depends on the activity of radionuclides present in soil and rocks. The results show that the impacts of radiation hazard due to mining activity (crushing and loading) on the laborers and public near the quarries considerable. There is no correlation between radon and its progeny concentration. The activity of ^{226}Ra, concentration of radon and its progeny are higher than global average.

References

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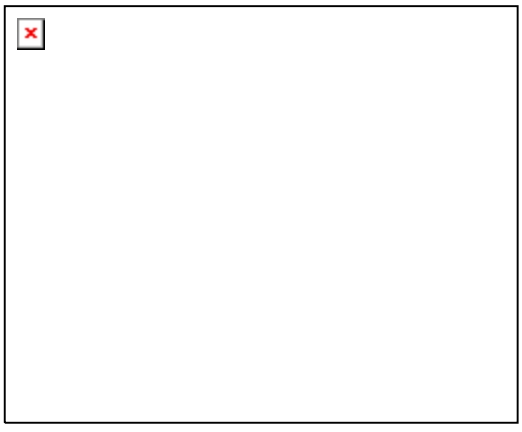

Figure – 1 Variation of radon in different types of dwellings of Bangalore city

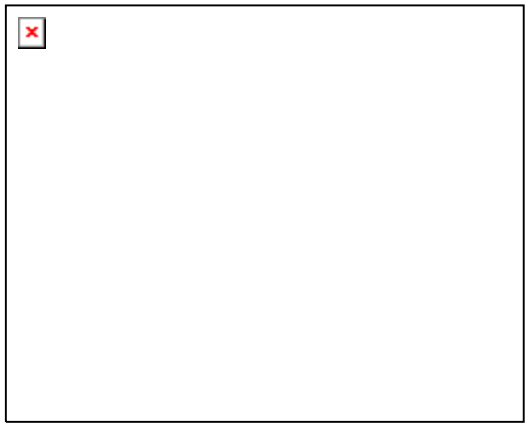

Figure – 2 Variation of radon in types of dwellings in Bangalore rural District

Table – 1 Average indoor radon and its progeny concentrations and equivalent effective dose in and around Bangalore City.

SI.No	Location	Activity of ^{226}Ra ($Bq.Kg^{-1}$)	Concentration of ^{222}Rn ($Bq.m^{-3}$)	Progeny concentration (mWL)	Effective dose ($mSv.y^{-1}$)
1	Bangalore city Victoria Hospital (V.H) Tile Flooring	34.24	63	6.75	1.66
2	Poly –Vinyl Flooring, (AC Room of V.H)	32.41	40	4.15	1.06
3	HSR Layout Granite Flooring	37.23	104	11.24	2.74
4	Koramangala Mosaic Flooring	33.44	50	5.4	1.32
5	Kanakapura Taluk Maralebekuppe a. Small tiled, F- Cement	163.65	205	13.5	5.41
	b. Mud house F- Bare		300	10.73	7.92
	c. Mangalore tiled, F-cement		180	15.6	4.75
	d. Hut, F- Bare		155	11.12	4.09
6	Alanahally Mud house, F- Bare	152.23	260	16.7	6.86
7	Hosahally Mangalore tiled F- Cement	122.62	150	17	3.96
8	Terinadoddi Mangalore tiled, F-Cement	110.56	113	3.89	2.98
9	Kodihally Small tiled F- Bare	127.38	180	8.6	4.75
10 11	Nayakaradoddi Mangalore tiled F- Cement	112.6	160	12.5	4.22
12	Ramanahally, Small tiled, F- Bare	80.60	175	8.2	4.62
13	Maharajakatte Mangalore tiled F- Cement	75.32	96	7.8	2.53
14 15	Puttadasanadoddi, Hut, F- Bare	69.85	70	0.3	1.85
	Moolegondi, Hut, F- Bare	50.32	65	0.25	1.72
	Kabballi, Hut, F- Bare	42.0	55	0.24	1.45
16	Ramanagara Taluk L B Palya	122.62	110	0.86	2.90
17	K G Hosahally Concrete F- Cement	128.8	125	3.34	3.30
Average		85.07	132.8	7.91	3.50