SYNOPSIS

Study of Natural Radioactivity in the Island Environs of Kochi

All life forms on this earth are continuously exposed to natural radiations ever since their existence on earth. Both radioactivity and the ionising radiations associated with it have existed on earth long before life emerged. There is radio activity in the air we breathe, the food we eat and the house we live in. Background radiation consists of radiation from naturally occurring radioactive elements from geological sources, cosmic radiation and anthropogenic radio nuclides that have spread globally as a consequence of nuclear weapons testing and subsequent fall out. The all pervading natural radiation is enhanced by the technical activities of man. Human activity results in the redistribution and release of naturally occurring radioactive materials. The mechanisms by which human beings are exposed to radioactive materials that enter the general environment are often complex and a quantitative understanding of them for the purpose of risk assessment involves information that comes from many scientific disciplines including biology, physical chemistry, hydrology, meteorology and oceanography.

The Exposures from natural sources are due to

a Source of extra terrestrial origin (cosmic rays)

b Sources of terrestrial origin (due to naturally occurring atomic species like U^{238} and Th^{232} present on earth's crust in atmosphere and building materials)

c Internal exposure from radio nuclides taken into the body through ingestion of food materials, etc.

(d) Indoor inhalation exposures due to radon (Rn^{222}) and thoron (Rn^{220}) and their daughters.

Radiological studies have been made in beach sand locations, mainly in India, because along its coastlines there are quite a few monazite sand bearing placer deposits causing natural high background radiation areas; in Kerala and Tamilnadu.

The industrial effluents produced in Udyogamandal-Kalamasserry industrial belt are directly discharged in the Periyar River from which it enters the Cochin backwaters. Along with a number of chemical pollutants, radionuclides are also present in these waters. A unique feature of this backwater system is the large number of islands of various extends spread throughout the area. Also, literature indicates that a systematic study of this type has not taken place earlier and hence the present study is proposed. Establishing the baseline levels of radioactivity in the system will enable the detection of any enhancement due to technological activities like radioactive mineral processing, phosphate mineral industry, etc. Speciation studies will help in identifying the sources of technological enhancement of natural radioactivity levels in the coastal environs. Also the natural exposure data shall be used as a reference for future studies of similar nature, which may be carried out elsewhere.

The study aims at achieving the following objectives after the successful completion of the work.

1. An assessment of the background radiation levels in the coastal environment of five islands including Kochi.

2. To assess indoor gamma dose rate in the dwellings of the study area.

3. To conduct gross alpha and gross beta measurements in the soils of the study area

4. To determine activity concentrations of the naturally occurring Thorium, Uranium and Potassium levels in soils of the study area

5. To measure indoor Radon/thoron progeny levels in the dwellings of the study area.

6. To study about the concentration of radio nuclides(^{226}Ra,^{228}Ra,^{210}Pb and ^{210}Po) in the drinking waters of the study area.

7. To analyse statistically the environmental data which are strongly characterized by inherent variability.

Publications

1.“Distribution of Indoor Radon and Thoron progeny levels in the Kumbalanghi Island of Kerala**”** **M.Rajagopalan**., Jose.P.Abraham., C.M.Paul., Samuel Mathew., P.M.B.Pillai., P.P.Haridasan. Indian Journal of Multidisciplinary Research, Volume 3, Number 3, pp 467-472 December 2007

2.“Natural radioactivity content in the soils of Kumbalanghi island” Asian Journal of chemical and environmental research ,Vol. 4 (3-4), 26- 30, July- October (2011). **M. Rajagopalan,** Jose.P.Abraham, Dhanya Balakrishnan, Umadevi. A.G, Sujatha Radhakrishnan and Samuel Mathew

3.“A study on inhalation dose measurements due to indoor radon/thoron progenies in the island environs of cochin backwater” Asian Journal of chemical and environmental research, Vol 5 (1-2), 10- 14, January- April (2012) **M. Rajagopalan**, Jose.P.Abraham, Dhanya Balakrishnan, Umadevi. A.G, Sujatha Radhakrishnan and Samuel Mathew.

4.“Natural radioactivity content in soil and indoor air of Chellanam”. Radiation Protection Dosimetry September 5 (2012), pp, 1-4 *S.* Mathew, **M. Rajagopalan**, J. P. Abraham, D. Balakrishnan, Umadevi A.G.

5.“Distribution of Indoor Radon and Thoron Progeny levels in West Kochi Area, Kerala” Jose.P.Abraham, **M.Rajagopalan**., S.Sukesh Kamath., S.Chithra., P.P.Haridasan., P.M.B.Pillai. Environmental Geochemistry, Journal of the Association of Environmental Geochemists, Vol.8, No. 1&2 pp 286-289, 2005.

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10.“A study on activity concentration of natural radionuclides of building materials in Kochi” Proceedings of National seminar on ‘New Horizons of

Physics'.2011. pp 22-29. Dhanya Balakrishnan, Umadevi A.G, Jose P Abraham, **M. Rajagopalan**, P.J. Jojo..

11."A study on the distribution of iron content in the potable water of Eloor, an industrial region in the Ernakulam district of Kerala". IJEP.32 (9): 757- 761 (2012) *Indian journal of environmental protection " 757-761, 2011,32 (9).* Umadevi A.G , Dhanya Balakrishnan, Jose P.Abraham, **M.Rajagopalan**, M.George, P.Dharmalingam, Sujata Radhakrishnan, M.Harikumar.

Conference Presentations

1. **"**Distribution of indoor Radon (^{222}Rn) and Thoron (^{220}Rn) progeny levels in the island environs of Cochin Backwaters" *Paper presented in 'THORON 2010*' workshop held in Chiba, Japan, 19-22 May 2010 **M.Rajagopalan**, J.P. Abraham, D. Balakrishnan, A.G. Umadevi, S. Balakrishnan, S. Mathew.

2."Indoor Gama Dose Measuerments in Islands Environs of Kochi". Samuel Mathew, **M.Rajagopalan**, J . P.Abraham, D. Balakrishnan and A. G.Umadevi 26th Kerala Science Congress , Pookode, Wayanad, Kerala, 28-31 January 2014

3." Indoor radon and thoron measurements in Kochi" Samuel Mathew, **M.Rajagopalan**, Jose P.Abraham, and D. Balakrishnan " **4th Asian and Oceanic Congress on Radiation Protection (AOCRP-4)"** to be held in Kuala Lumpur, Malaysia, during 12th -16th May 2014. (accepted)

4."Measurements of ^{210}Po in an aquatic estuarine ecosystem in relation to anthropogenic inputs". Jose.P.Abraham, **M.Rajagopalan**, P.P.Haridasan, P.M.B.Pillai. Presented in the International Symposium on 'In Situ Nuclear Meterology as a Tool for RadioEcology' held from 13-16 October- 2008, at Rabat, Morocco

5."Survey of Indoor Radon and Thoron Progeny levels on a coastal Island in Kerala". Jose.P.Abraham., **M.Rajagopalan**., Rakesh, K., P.P.Haridasan., P.M.B.Pillai. National Seminar on Atomic Energy, Environment and Human

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