

Studies of Natural and Artificial Radioactivity in Brazilian Marine Samples

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In the last years there has been an increasing interest in various elements present in the environment and their possible effects on human health.

The pollutants can be transported across long distances from their emission source, removed from the atmosphere and deposited in the biosphere and hydrosphere by a number of mechanisms.

Artificial radionuclides are produced regularly in nuclear power plants and can reach the environment by means of effluent discharges, nuclear weapons tests and from accidental releases as the Chernobyl accident. The radionuclides can enter to the human population by several pathways and one of them is the marine environment.

Considering these problems and the lack of information concerning our country, the study of the natural and artificial radioactivity in Brazilian environmental samples is being performed in order to provide technology for reliable assessment of radionuclide contamination, to ensure the capacity of our laboratory to perform these analyses in environmental samples and to maintain a data base of radionuclide levels. This knowledge is necessary as a baseline for the detection of any future contamination.

Methodologies for analysis of cesium-137, strontium-90, plutonium-239, lead-210 and polonium-210 in seawater, fish, sediment, seaweed were developed⁽¹⁻²⁾ and applied in environmental samples.

Marine samples were sampled at fixed stations from the Brazilian coast by the Oceanographic Institute of the University of São Paulo.

Fish were purchased from fishermen's cooperative associations, who know the point of collection. Edible parts were used for the measurements. The main fish species analysed were sardine, ballistes, weak fish, brazilian croaker, red and white grunt.

Cesium-137 levels in seawater ranged from 0.8 ± 0.2 to 1.7 ± 0.2 Bq.m⁻³ and in fish from 14 to 220 mBq.kg⁻¹, with an analysis error of 40%.

Strontium-90 levels in seawater are of (1.6 ± 0.3) Bq.m⁻³ and fish varied from 19 to 75 mBq.kg⁻¹ for fish muscle.

These concentrations are typical due to fallout for the southern hemisphere and are lower as compared to the other regions of the world such as Sellafield and Baltic Sea.

In Brazil, available data on polonium-210 in fish are very sparse, and this radionuclide is concentrated by most marine organisms and in several cases provides the major natural radiation dose for marine organisms. The method here developed for polonium analysis was applied in fish from the Mediterranean (Monaco) and Brazilian coast. Polonium-210 levels in fish from Monaco varied from 0.7 to 11.5 Bq.kg⁻¹ of edible part, and at Brazilian coast from 0.5 to 5.3 Bq.kg⁻¹.

Cesium-137 levels obtained for seawater and fish were used to calculate the dose received by the population from consumption of fish. The dose values varied from 0.8 to

31.7 nSv.y⁻¹, and were low compared to the value recommended by the ICRP for the limit of annual dose to members of the public (1 mSv.a⁻¹).

Artificial radioactivity levels in marine samples are in agreement to the values from regions not directly affected by nuclear accidents or nuclear reprocessing plant discharges and they can be considered as reference levels in Brazilian coastal marine samples. Any increase in these levels could be attributed to some possible future contamination.

References

1. Figueira, R.C.L.; Cunha, I.I.L. **Strontium-90 determination in fish from the Brazilian coast.** J.Radioanal.Nucl.Chem., Letters, 200(6):497-507, 1995.
2. Cunha, I.I.L.; Fabra, E.L. **Cesium-137 radioactivity data in Brazil.** Fres.Envir.Bull., 4, 19-24, 1995.