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Environmental radioactivity research in Finland

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Nuclear weapons test fallout studies –radioecology competence developed

Environmental radioactivity in Finland is an established research field and has long traditions. Research started at the Department of Radiochemistry, University of Helsinki and at the predecessor of the Finnish Authority for Radiation and Nuclear Safety (STUK) in the last years of 1950s. Also Finnish Meteorological Institute started monitoring of atmospheric radioactivity at the same time. The most important task at the time was to clarify the effects of radioactive fallout from the atmospheric nuclear weapons tests in the environment and food chains. A major scientific achievement from that period was the study on a critical radiocesium-enriching food chain from lichen via reindeer into reindeer-herding Sami people observed in Finnish Lapland. Fallout studies remained the largest field in environmental radioactivity studies in the 1960s to 1970s and were extended to environmental behavior of transuranium elements in the early 1970s.

Importance of indoor radon becomes evident

Early 1980s the researchers at STUK revealed the importance of indoor radon to radiation doses to humans and in the coming years radon research became more and more important. Today we know that indoor radon is responsible for more than half of the average radiation dose to Finnish population and measures to decrease its intrusion into dwellings have been developed at STUK. The finding was of utmost importance in developing radiation protection strategy and practices.

Fallout of the Chernobyl accident requires good competence

The competence developed in the weapons tests fallout studies became very important in 1986 when Finland was exposed to a radioactive fallout from the Chernobyl accident. In fact Finland received the largest fallout excluding the three closest countries to Chernobyl, Ukraine, Belorussia and Russia. The environmental surveillance and research department of STUK had considerably increased to about 60 persons of which 20 were researchers. Thus they had good resources to react to the accident which they very well did. Department of Radiochemistry, University of Helsinki, focused on the behavior of transuranium elements in the environment and, for example, together with STUK and the Finnish Meteorological Institute unique spatial distribution maps of Pu, Np, Am and Cm in Finland were developed. It is no exaggeration to say that no other country has such a deep knowledge on distribution and behavior of radionuclides from the Chernobyl fallout on their own territory.

National needs to study naturally occurring radionuclides

Through intensive fallout studies we have, however, learned to know that the radioactive pollution has only a minor effect on the radiation doses to humans. Even in the most critical groups, such as reindeer herders in 1960's and most exposed groups after the Chernobyl accident, the doses from pollution radionuclides have been below that received from indoor radon on average. During the last twenty years or so, the importance of naturally occurring radionuclides has gained more attention in research in Finland. Studies like uranium series radionuclides of U, Ra, Po and Pb in the drinking water and in forest environment have tackled important national problems and considerably increased our knowledge in these areas. Latest achievements are studies on the behavior of naturally occurring radionuclides in the mining processes. Due to increasing mining activities and potential in Finland this field definitely needs further attention.

Studies on geological behavior of nuclear waste radionuclides brings new insight into environmental research

After constructing four nuclear power reactors in Finland in late 1970s and early 1980s geological behavior of radionuclides in relation to final disposal of spent nuclear fuel became a major research field in radiochemistry in Finland. This work, done to support safety analysis of final disposal, has been mainly carried out at the Laboratory of Radiochemistry, University of Helsinki, and the VTT Technical Research Centre, Finland. The

radionuclides studied are largely the same as in traditional radioecological research, isotopes of Cs, Tc, Sr, I, TRUs etc., but also new radionuclides characteristic to spent nuclear fuel only, such as isotopes of C, Cl, Se, Mo, Nb, have been covered. Even though bedrock has been the main interest, compared to surface environment in traditional radioecology, the chemical and physical processes studied are largely the same. Main difference is that nuclear waste studies have been carried almost entirely using model experiments while in traditional radioecology actual environmental samples have been used.

Radiochemistry at the University of Helsinki in key role in educating experts

From the very beginning the environmental radioactivity studies have been mainly implemented by physicists and chemists. The chemists working in the field have been mainly educated at the Radiochemistry Department/Laboratory/Unit of the University of Helsinki. The unit has almost 60 years' experience in working in this field, so it has the required traditions and knowledge to educate new experts to the field. It has relevant facilities, including laboratories and instruments, to do work in this field. Radiochemistry education at the University of Helsinki has internationally a unique, extensive radiochemistry teaching program covering handling and measurement of radionuclides and behavior of radionuclides in the environment.

emphasized text

Primary author: Prof. LEHTO, Jukka (Department of Chemistry - Radiochemistry, University of Helsinki)

Presenter: Prof. LEHTO, Jukka (Department of Chemistry - Radiochemistry, University of Helsinki)

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