

Polonium, uranium and plutonium in the ecosystem of the southern Baltic

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In the theoretical section of this thesis the author deals with the chemical properties, distribution in nature and application of the isotopes of polonium, uranium and plutonium. He subsequently describes their distribution in components of the marine environment, such as the water, suspended matter, bottom sediments, phyto- and zooplankton, phyto- and zoobenthos, fish and mammals.

In the closing sections of the introduction the reader is acquainted with the effects of ionising radiation on living organisms with respect to a number of factors. The isotopes of polonium, uranium and plutonium are regarded as the source of an internal radiation dose within the human body and other organisms.

Covering the overall biological, trophic and geochemical characteristics of the biocenotic components examined, the following chapter contains literature data on the hydrological and meteorological conditions in the southern Baltic.

The objective of this work has been stated clearly, and achieved.

The chapter entitled 'Materials and research methods' has been correctly constructed and shows that from the analytical point of view the research work is sound. Following the ion-exchange separation and electrolytic deposition of the polonium, uranium and plutonium isotopes, their radioactivity was determined by α -spectroscopy. The results were calibrated with reference to standard materials within the framework of the programme initiated by the IAEA Intercalibration Laboratory in Monaco. The calibration data confirmed the accuracy of the author's research methodology. The water, and the biological and geological samples, were then analysed, a procedure which, it should be emphasised, was extremely laborious.

In 'Results and discussion', the author attributes the observed differences in radionuclide content in the various components to *e.g.* the diverse features of the plant and animal species analysed and the environmental conditions specific to the study area. He then goes on to discuss the degree to which the isotopes ^{210}Po , ^{238}U and $^{239, 240}\text{Pu}$ accumulate and are discriminated in the components and how they move from one trophic level to another. In the final two sections of this chapter, he has calculated the magnitude of the internal radiation dose in the organisms analysed and has assessed the potential radiological effects of fish consumption. One of his findings was that among the α -radioactive isotopes, ^{210}Po was the most powerful internal radiation source in the organisms he studied. He estimated that the annual radioactive intake of a statistical inhabitant of Poland resulting from the consumption of fillets of Baltic fish amounted to 10 Bq ^{210}Po , 24 mBq $^{234+235+238}\text{U}$ and 7 mBq $^{239, 240}\text{Pu}$. This is undoubtedly a significant observation from the nutritional point of view, highlighting as it does not only the cognitive but also the practical aspects of this work. This problem is of crucial importance, judging by the continually increasing threat to marine ecosystems, including that of the Baltic, from uncontrolled radioactive 'leaks' due to nuclear weapons' testing and accidents at nuclear power stations, the latter often being located in coastal areas or their vicinity. Further serious threats include the dumping of radioactive wastes at sea, and the fact that no system of international inspection of radioactive materials in arms stockpiles has yet been set up. The volatile political situation in the world, especially in the former nuclear power, the USSR, is conducive to illegal and uncontrolled deals involving radiotoxic, fissile materials. In the light of the above, the author is to be complimented on his highly topical choice of research subject.

In my opinion, the results of this work enable the effect of these radionuclides on the Baltic environment to be assessed, especially in the coastal zone, which is particularly prone to human pressure. Moreover, the data presented here could be useful in forecasting the threat to marine ecosystems of the influx of α -radioactive isotopes such as the ones analysed in this work.

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