



Contribution ID: 169

Type: poster

Compare plutonium isotopes activity in humans bones on the area where only global fallout was present and the area where Global and Chernobyl fallouts were present.

Thursday, 22 September 2011 17:30 (1h 30m)

Plutonium isotopes are present in investigated samples mainly as a result of nuclear weapons tests in last century and Chernobyl disaster. In human body plutonium is accumulated mainly in liver and bones and main exposure pathway is inhalation. Bone tissue samples were obtained during routine surgeries –the replacement of knee or hip joints by implants. Patients belong to general population, not exposed in any special way to radioactive contamination. Surgeries were conducted in a V Military Hospital in Kraków in Southern Poland and in a general Hospital in Bielsk Podlaski in Northeastern Poland. The patients originated from vicinity of hospital thus Pu from only Global Fallout was expected in case of Kraków and mixed Global and Chernobyl fallout was expected in case of Bielsk Podlaski. Studies got an approval of council for ethics in medical research.

Samples were ashed in 600°C for two days. The ashes were gently soaked of 6M HCl. Precipitation of calcium oxalates at pH=3 was completed to obtain transuranic fractions. Calcium oxalates were dissolved of 1M HNO₃. The oxidation state of Pu was adjusted to +4 using hydrazine and NaNO₂ and after conversion into 8M HNO₃, the fractions were passed through Dowex-1x8. Pu remains in the column was eluted using 50 ml. of 0.1M HF - 0.1M HCl. Alpha spectrometric Pu sources were prepared directly in the solutions using NdF₃ method.

In Southern Poland in investigation involved 23 people, 9 men, 11 women, and 3 person who did not specify their gender in a questionnaire. The youngest patient was 56, while the oldest 88 years old. The obtained values for ²³⁹⁺²⁴⁰Pu activity ranged between 5.7 ± 1.1 mBq kg⁻¹ and 25.0 ± 3.2 mBq kg⁻¹. In all the samples ²³⁸Pu activity fell below the minimum detection activity, which was on the level of a single mBq kg⁻¹, so suggesting global fallout as main source of radioactive contamination in southern Poland. In case of Northeastern Poland in study involved 25 people, 10 men and 15 women. Age range was between 32 to 85 years old. Minimum activity of ²³⁹⁺²⁴⁰Pu was equal to 5.4 ± 1 mBq kg⁻¹, whereas the maximum activity reached 34.3 ± 5.7 mBq kg⁻¹. In 6 samples ²³⁸Pu activity fell below the minimum detection activity, in rest activity was between 1.9 ± 1.4 to 10.6 ± 3.1 mBq kg⁻¹. The measurable amounts of ²³⁸Pu suggest presence of traces of Pu of Chernobyl origin in bodies of inhabitants of Northeastern Poland.

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Session Classification: Poster Section 2

Track Classification: Health Physics and Radiation Chemistry