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Development of a Rapid Method to Determine Plutonium in Foodstuffs

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After the Fukushima accident the development of rapid methods for foodstuff was getting more demanding in Austria. Therefore the Federal Ministry of Health financed a project for the development of a rapid method for the determination of plutonium in foodstuffs. Currently our lab determines plutonium just in environmental samples. This method takes about one week with ashing, dissolution, ion-exchange chromatography, micro-coprecipitation and alpha spectrometry. With a few changes concerning the sample preparation and by using the ICP-MS, a short method was developed in our laboratory to measure at least 10 samples within one day (1 person working for 10 h). The new method uses microwave digestion and a quick ion-exchange chromatography. The stripping solution of plutonium (5 ml 1,2 M HCl + 0,125 ml 30% H2O2) is taken for the ICP-MS determination of Pu-239 without further pre-treatment. Pu-242 can also be measured by ICP-MS. Therefore the Pu-242 is added as tracer to the samples and the chemical recovery can be determined. If the determination of Pu-240 and Pu-238 is required the remaining solution of the ICP-MS measurement can be used to perform the micro-coprecipitation and the alpha spectrometry. With this method the requirements of the Council Regulation (Euratom) No 2218/89 of 18 July 1989 amending Regulation (Euratom) No 3954/87 laying down maximum permitted levels of radioactive contamination of foodstuffs and feedingstuffs following a nuclear accident or any other case of radiological emergency, are fulfilled. In this paper the method and the challenges during the development with high thorium und high uranium concentrations in the samples are described. Tests were conducted using sea sediment reference material, fish reference material and spiked samples.

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