

Radioactive fallout in Portugal following the Fukushima nuclear accident

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Following the nuclear accident in Fukushima Daich (Japan) Nuclear Power Plants (NPP) short (^{129m}Te , ^{131}I , ^{132}Te , ^{136}Cs) and long lived anthropogenic radionuclides (^{134}Cs , ^{137}Cs) were released to the atmosphere and dispersed along the world reaching the European countries including Portugal, around two weeks after the accident (end of March 2011). The routine radiological environmental monitoring programme carried out by ITN/UPSR in the framework of Article 35 EURATOM Treaty was enlarged increasing the frequency of sampling for more representatives samples (aerosols, rainwater, grass, leafy vegetables, milk, etc.), which give a better indication of the atmospheric radioactive deposition in the case of a nuclear accident. At the laboratory, the samples were prepared for measurements: the filters (aerosols) were pressed and put in plastic containers; the leafy vegetables and grass were cut, mixed, homogenized and set into Marinelli beakers; the milk and rainwater samples were directly placed into Marinelli beakers. The activity concentrations of the gamma emitter's radionuclides were determined using high resolution gamma spectrometry analysis. During

about one month (end of March until end of April 2011), traces of ^{131}I , ^{137}Cs and ^{134}Cs , amongst others, were detected in aerosols particles, reaching the maximum values for ^{131}I ($0.9\pm 0.1 \text{ mBq m}^{-3}$) ^{137}Cs ($0.13\pm 0.01 \text{ mBq m}^{-3}$) and ^{134}Cs ($0.126\pm 0.004 \text{ mBq m}^{-3}$) on the last week of March. The fallout of those aerosols particles contributed to the maximum levels of radioactivity ($2.48\pm 0.24 \text{ Bq m}^{-2}$ and $0.93\pm 0.15 \text{ Bq m}^{-2}$ for ^{131}I and ^{137}Cs respectively) measured in grass samples, which were observed during the first week of April. Traces of ^{131}I were also detected in milk and leafy vegetables collected during the same time period. The isotopic ratio of some nuclides ($^{134}\text{Cs}/^{137}\text{Cs}$, $^{137}\text{Cs}/^{131}\text{I}$ and $^{137}\text{Cs}/^{132}\text{Te}$), together with the backward trajectories simulated using the HYSPLIT lagrangian model, clearly indicates that the detected anthropogenic nuclides originate from Fukushima (Japan). However, the levels of radioactivity observed do not raise any concern regarding the Portuguese population exposure and therefore no radiological protection measures were recommended by the competent authorities.

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