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Soil-plant transfer ratios of tellurium and the estimation of committed effective dose from ingestion of radio-tellurium released by the Fukushima Daiichi Nuclear Power Plant accident

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Radio-tellurium isotopes such as Te-127m and Te-129m were released into the environment as a result of the Fukushima Daiichi Nuclear Power Plant (FDNPP) accident. A large amount of Te-127m and Te-129m was released, and these isotopes have relatively long half-lives (109 and 33.6 days, respectively). As such, ingesting food harvested from the contaminated area shortly after the accident could have contributed to residents' internal radiation levels. However, our understanding of the environmental behavior and human radiation dose of radio-tellurium is limited. We previously reported soil-plant transfer factors (TF) and calculated the effective dose in the public.(1,2) The data obtained showed very large variations in the TF, and thus in the committed effective doses calculated with these TFs. In this study, we reanalyze the previous data, explain the mechanisms relating to the variations, and discuss the factors that may affect the estimated radiation dose values.

Experimentally-obtained soil-plant TFs were 1.2×10^{-2} to 3.0×10^{-2} for radish roots (*Raphanus sativus* var. *sativus*) and 1.4×10^{-2} to 5.1×10^{-2} for Komatsuna leaves (*Brassica rapa* var. *perviridis*). These values are much lower than those provided in the International Atomic Energy Agency technical report. The committed effective doses of radio-tellurium (Te-127 and Te-129m) were estimated using these TFs. Assuming that leafy vegetables such as Komatsuna were ingested one year post-harvest (30 April 2011), the committed effective doses were calculated to be 3.2% that of radio-caesium (Cs-134 and Cs-137) for an adult living in the southern area of Fukushima Prefecture. Dose coefficient, TF, and market dilution (the ratio of contaminated vegetables in the market) are likely the factors that significantly affect the estimation of committed effective dose.

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References:

- 1) K. Fujiwara, et al., Transfer Factors of Tellurium and Cesium from Soil to Radish (*Raphanus sativus* var. *sativus*) and Komatsuna (*Brassica rapa* var. *perviridis*) Jpn. J. Health Phys., 52, 192-199 (2017).
- 2) T.Takahashi, et al. Using Experimental Transfer Factors to Estimate the Ratio between the Committed Effective Dose from Ingestion of Radio-tellurium to that of Radio-caesium Released by the Fukushima Daiichi Nuclear Power Plant Accident. *ibid*, in press.

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