

Variability of Radiation Doses Reconstructed by EPR in Teeth of Former United States Nuclear Workers

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Purpose

Our prior results showed that in the most cases, radiation doses measured by electron paramagnetic resonance (EPR) in tooth enamel samples significantly exceeded worksite reported doses. In an effort to understand causes of this discrepancy, we carried out EPR dose measurements in additional tooth samples collected from individuals studied before.

Materials and methods

Tooth enamel samples from five tissue donors to the United States Transuranium and Uranium Registries were used in this study. EPR measurements were performed using ELEXYS 500 spectrometer and high purity germanium detectors were used to measure gamma-emitting radionuclides.

Results

Significant variation of the EPR measured doses among multiple teeth collected from the same individuals was observed. These variations are potentially due to an additional exposure of the head/neck region as compared to the other parts of the body, e.g. torso where personal dosimeters are typically worn. The latter could explain very significant discrepancy of the doses, derived from EPR measurements and reported by worksites. With gamma-spectroscopy, no ¹³⁷Cs was detected in tooth roots.

Conclusions

In several cases there was nonuniform exposure of the head of the teeth' donors which may explain the discrepancy between worksite reported and EPR reconstructed doses. Results of the gamma counting suggested that exposure from ¹³⁷Cs in the roots was not a factor in the observed discrepancy.

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