

Instrumental Developments in Fingernail EPR Dosimetry

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After-the-fact dosimetry based on EPR spectral analysis of human fingernail clippings has the potential to be an effective method for the measurement of individual doses in the case of radiation exposure. The main benefit of fingernail dosimetry method is the rapid and painless access to samples from an individual who has potentially been exposed to radiation. Fingernail EPR dosimetry method is based on the generation of relatively stable free radicals, whose magnitude is proportional to the total dose of radiation. The measurements can be made for some period after the event and at the site of the event with a transportable EPR spectrometer. Current work involves the comparison of results from commercially available X-band EPR spectrometers with different cavities and compact bench top (i.e., field deployable) EPR spectrometers. Key factors required for accurate measurements are precise sample loading, the use of a built-in spin standard (e.g., Mn⁺² doped in MgO), thin wall Suprasil EPR tubes with minimal background signals, and algorithms for acquiring the necessary set of EPR spectral data and calculating the dose.