FINGERNAIL DOSIMETRY: CURRENT STATUS AND PERSPECTIVES

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The use of fingernails as EPR radiation dosimeters offers the advantages of having measurements with a relatively low dose limit (estimated 1-2 Gy) and simple sampling processing, which makes it possible to complete dose assessments in a short period of time. Moreover, dose measurements in fingernails can potentially be done at the site of a radiological accident/incident and if a small portable EPR spectrometer is used. This makes EPR fingernail dosimetry an attractive methodology for dose evaluations during mass casualty events involving radioactive sources. It is well established that the radiation-induced EPR signal (RIS) in fingernails is persistent and proportional to the radiation dose. If necessary, this signal can be preserved for long time (months) by storage at low temperatures (on ice or in freezer). However, RIS dependence on radiation dose can vary significantly depending on the level of mechanical stress in fingernails at sampling and the water content during EPR measurements. Recently, the proposed sponge model [1] is able to explain most of fingernails' dosimetric properties. According to this model, a fingernail can be described as spongy tissue, which is deformed at the time of fingernails cutting. There is also a noticeable variation of the dose dependence at different levels of mechanical stress in fingernail samples. Therefore, one of two current options can be used for performing EPR fingernail dosimetry:

- imposing rigorous controls for the number and size of clippings in samples being measured with EPR, with the possibility of using an "universal" dose dependence; or
- pin-pointing the right dose dependence for a particular sample, based on the recently found correlation between dose saturation in fingernails and their degree of mechanical stress.

These and some other recent results related to fingernail dosimetry and its perspectives are presented and discussed in details.

References

1. Reyes R.A., Romanyukha A., Trompier F., Mitchell C.A., Clairand I., De T., Benevides L.A., Swartz H.M.; Electron paramagnetic resonance in human fingernails: the sponge model implication; Radiation and Environmental Biophysics; 2008; **47**(4).