EPR Spectroscopy for the Process of Triaging Mass Casualties after a Catastrophic Nuclear Event: A Simulated Exercise

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There is growing awareness of the need for methodologies that can be used retrospectively to provide the dosimetry needed to carry out triage immediately after an event in which large numbers of people have potentially received clinically significant doses of ionizing radiation. Although some very promising approaches are being developed using biologically based parameters there also is recognition that such measurements have the potential to be confounded by other physiological and pathophysiological factors that are likely to be present in such event.

It is increasingly recognized that EPR dosimetry has the potential for providing the needed additional dosimetric methods.[1, 2-4] The EPR measurements are based on physical changes in tissues whose magnitudes are not affected by the factors that can confound biologically based assessments. The EPR methods are based on the generation of stable free radicals, whose magnitude is proportional to the total dose of radiation received by the tissue, thereby allowing these tissues to be used as endogenous physical dosimeters.[3]

In this study, we conducted a simulation exercise that involved: ten non-irradiated participants who played the role of people who believe they have been exposed to significant levels of radiation after a terrorist attack, together with representatives from the fire department; Department of Homeland Security (DHS) certified exercise evaluators; and a Human Factors engineer. Feedback from participants was collected regarding the measurement process, video recordings were also capture with aims to perform cycle time analysis of the measuring process. There were two objectives for this exercise. The first objective was to study key factors, such as reliability, patient comfort, usability, cycle time, logistic factors, and operator's trainability of the EPR system when used for measuring multiple people waiting on a queue. The second objective was to generate stakeholders' feedback early on the development of the EPR system, looking at factors that would likely be encountered in the field after a catastrophic nuclear event, and incorporate them in future developments of the EPR technique.

In this study the feasibility of EPR spectroscopy for the screening of a large number of people waiting in a queue has been demonstrated. The cycle time for the measurement process ranged between 11 to 15 minutes.

While the results of this exercise were aimed specifically at providing feedback for he development of EPR dosimetry, the methods and the lessons learned are likely to be applicable to other dosimetric methods.

References:

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