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Potential of Single Cell Gel Electrophoresis Assay (Comet Assay) in Heavy Ion Radiation Biology

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ABSTRACT DNA damage and repair following heavy ion radiation have been studied using various techniques like pulse field gel electrophoresis, sedimentation, and neutral/alkali elution. These techniques are cumbersome, time consuming and need a substantial cell-sample size. In addition, these techniques are unable to identify differentially, highly damaged or apoptotic subpopulation of cells, a characteristic result of exposure of heavy ion radiation, since the results are based on a pooled population of cells. Most of these difficulties can be overcome by using single cell gel electrophoresis assay, commonly known as comet assay. For this assay, a small cell-sample size (a few thousand cells) is required, and the results are available in a short time (5-6 hours). Since, the information on DNA damage and repair is available on individual cells, any subpopulation of cells with a different response like high/low DNA damage or apoptosis can be identified. Moreover, this assay is adept in evaluating SSBs., DSBs, alkali labile sites, adduct formation, cross-linking (DNA-DNA or DNA-protein) and base damage. Not only that, damage to specific region of chromosome may be detected using FISH in combination with comet assay. Hence, the use of comet assay may have potential in the estimation of DNA damage and repair in heavy ion radiation biology.

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