CHARACTERIZATION OF CELL CYCLE PERTURBANCES IN SCL-II CELLS AFTER EXPOSURE TO THE AUGER ELECTRON EMITTER I-125

Oskamp, Dominik, Jaeger, Alexandra, Pomplun, Ekkehard, Kriehuber, Ralf

Department of Safety and Radiation Protection, Forschungszentrum Jülich, 52425 Jülich, Germany

Introduction: Theoretical calculations and experimental findings suggest that DNA-incorporated Auger electron emitter (AEE) cause primarily complex DNA lesions. Recent cell cycle analysis revealed, that 5-(125)iodine-2'-deoxyuridine (I-125-UdR)-exposed SCL-II cells display a pronounced and rather long-lasting G2/M cell cycle arrest. We studied therefore in more detail whether the observed G2/M arrest is of permanent or temporary nature and thereby examined the average number of decay per cell necessary to induce a long-lasting cell cycle arrest in SCL-II cells.

Methods: SCL-II cells were synchronized in G1-phase and incubated with 0.1, 1, 4 and 8 kBq/ml of I-125-UdR during S-phase so that approximately 90 % of the cells were subsequently labeled. Cell cycle analysis was performed by flow cytometry (Click-iT EdU cell proliferation assay and Sytox Green nucleic acid stain) up to 4 d post-labeling with a constant sampling every 8 h post-labeling.

Results: DNA-incorporated I-125-UdR decelerated SCL-II cell cycle progression. Cell cycle perturbances were observed and a pronounced and prolonged G2/M-phase arrest was detected at activity concentration of 4 kBq/ml I-125-UdR. Up to 70 % of the cells were arrested in G2/M-phase up to 38 h post-labeling with 8 kBq/ml I-125-UdR. Moreover, a distinct population of G2/M-arrested cells was detectable up to 94 h post-labeling. As shown by parallel EdU staining these cells were permanently caught in the first G2/M cell cycle phase post-labeling. On average one decay every 90 s per DNA/cell was calculated to induce a permanent G2/M arrest in SCL-II cells.

Conclusions: Incorporated I-125-UdR induces major cell cycle perturbances in SCL-II cells. The observed permanent G2/M arrest suggests a threshold in terms of decays per time per cell and hence persisting DNA damage beyond no G2/M release seems to occur. This implies different levels of DNA damage for the induction and the release of the G2/M arrest in SCL-II cells.

Funded by Bundesministerium für Umwelt, Natur und Reaktorsicherheit (BMU), Bundesamt für Strahlenschutz; Project No.: 3608S03002

Kontakt: Kriehuber, Ralf
Telefon: ++49 (0)2461 61-4054
e-mail: r.kriehuber@fz-juelich.de