Increased Micronucleus Induction in 170Tm-irradiated Nanogold-labeled SCL II-cells

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Photoelectric absorption of photons with energies slightly above the K shell binding energy of an appropriate element can result in the emission of a shower of low-energy Auger-electrons. It is well known that those electrons released by Auger-electron-emitting radionuclides located in the immediate vicinity of the DNA cause high-LET-type damage and induce an enhanced relative biological effectiveness when compared to low-LET radiation. Therefore, an enhanced biological effectiveness is expected after photon activation as well. To proof if photoelectric absorption leads to an increased cellular radiotoxicity we investigated in SCL II-cells whether photon activation of intracellular located nano-sized gold particles is feasible to enhance cyto- and genotoxic effects in vitro. SCL II-cells were transfected with colloidal nano-sized gold particles (40 nm) and gold-labeled DNA-triplex-forming-oligonucleotides (TFO) and irradiated with a suitable 170Tm source (micro seeds). Genotoxicity was assessed using the Micronucleus-Assay and cytotoxicity was investigated using the Colony-Forming-Assay. Preliminary results indicate that Nanogold-labeled SCL II-cells show a 2-fold increase in micronucleus formation when compared to irradiated non-labeled cells. Non-irradiated Nanogold-labeled SCL II-cells showed the same background level of micronucleated cells as non-labeled SCLII-cells. The mitotic activity was neither disturbed by the gold-labeling nor the transfection procedure. Cytotoxic effects are less prominent but still need further investigation. Photon activation might be a promising approach to increase the biological effectiveness of low-LET-radiation and might be of great value for new brachytherapy strategies.

This work is financially supported by STEP Pockau GmbH