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Application of the Comet (SCGE) and Micronucleus (MN) Assay to Estimate Health Risk due to Exposure at Low and High Doses of 131I

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Iodine-131 is used in nuclear medicine both diagnostically and therapeutically to improve health conditions by early disease detection and restore health by slowing an overactive thyroid or even killing cancer cells. An emerge of the 131I among emission of various radioactive isotopes, might be one of the first sign of misfortunate accidental exposures from various radiation sources, including nuclear power plants, that even if infrequently, continue to occur.

The aim of our study was to investigate the influence Iodine-131, from the diagnostic and therapeutic treatment exposures, on cellular DNA repair efficiency at molecular (SCGE) and cellular (MN) levels, in order to estimate a potentially associated health risk at low and high dose regions.

Study group consisted of 41 individuals diagnostically exposed to low dose of the 131I (in the range 1.85~4.45 MBq, Aśr = 2.96 ± 0.82 MBq) and 37 persons therapeutically exposed to high dose of the 131I (in the range 300~650 MBq, Aśr = 497.3 ± 88.1 MBq). A reference group consisted of 30 healthy individuals. Blood samples that were collected for cellular studies underwent immediately cytogenetic procedures according to standard protocols. For the DNA damage detection the alkaline version of the single cell gel electrophoresis (SCGE) assay was applied in cells before irradiation, immediately after, and again after a one hour of post irradiation repair incubation.

Strong variation between cellular responses of thyroid diseases patients to both low and high doses of 131I was observed. A diagnostic (very low) dose of 131I caused in 84% of the patients a visible decrease of the micronuclei formation in the cells, below the mean level of the control. Results of the DNA repair competence assay also have shown higher level of residual damage in control group when compared to patients diagnosed with the low 131I dose. There was a significant increase in baseline level of DNA damage, which suggests that not all DNA damages caused by radioisotope had been repaired during 5 weeks from a therapeutic applications of Iodine-131. Variability in the observed responses in both situation after low and high doses of 131I, implies a strong necessity of personalized investigation of the individual susceptibility to IR exposure.

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