

HEALTH RISK ASSESSMENT

RESPONSE TO THE CHALLENGING DOSE OF X-RAYS IN LYMPHOCYTES OF PROSTATE CANCER PATIENTS AND HEALTHY DONORS

Cebulska-Wasilewska A¹, Dobrowolski Z², Rudek Z¹, Panek A¹, Krzysiek M¹

¹*Department of Radiation and Environmental Biology, INP PAN, Cracow, Poland*

²*Department and Clinic of Urology CM UJ, Cracow, Poland*

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Introduction: An individual's genetic constitution and lifestyle, e.g., diet and levels of physical activity, can affect the body's response to various exogenous agents including therapeutic treatment. There is a strong need to combine studies on variability in a cellular response to the challenging dose of x-rays with predisposition of the patient to diseases development and healing.

Objective: In this research study on the variation in a response to challenging dose of X-rays in lymphocytes from healthy donors and prostate cancer patients before the treatment on the molecular and mitotic level was performed.

Methods: Blood was collected from healthy male donors (the average age 55 years), and patients with cancer and benign prostate stage (BPS) diseases (average age 62 years). Among cancer patients 33% were never smoking males, 46.7% were former smokers. Immediately after collecting the blood samples a challenging treatment followed by culturing procedures were performed with two techniques, a classic cytogenetics and fluorescence *in situ* hybridisation (FISH) with the whole chromosome 1 probe. For the DNA damage investigations, lymphocytes were isolated and cryopreserved at -70 °C for subsequent challenging and repair studies. Before DNA studies *in vitro*, cryopreserved lymphocytes were thawed and their viability examined. To evaluate individual susceptibility to the induction of the DNA damage defrosted lymphocytes were exposed to 4 Gy dose of X-rays and the extent of DNA damage was studied right after irradiation with the alkaline version of the single cell gel electrophoresis (SCGE) assay. To assess variability in the DNA repair competency the residual (unrepaired) DNA damage was detected again with SCGE assay after one hour of incubation, during which irradiated cells had the condition allowing to complete the repair process.

Results: No significant difference between susceptibilities to the challenging dose of radiation between investigated groups was observed. However, repair efficiency of the DNA damage induced by the challenging treatment was significantly lower in lymphocytes of prostate cancer patients (60.4%) and benign prostate stage (BPS) patients (65.5%) than that observed for healthy donors (70% $p < 0.05$). Results show a stronger variation in capacity to repair of the X-ray induced DNA damage between cancer patients (range 29%–80%) than that observed between BPS donors (50.2%–78.5%). That finding was confirmed by results from cytogenetic studies. In lymphocytes of prostate cancer patients, after challenging cells with radiation a significantly higher amount of cytogenetic damage was detected than in BPS (aberrant cells frequency 22% versus 19% respectively in BPS patients). Preliminary results from FISH techniques also confirm those findings.

Conclusions: Our results clearly suggest a possible predictive value of the repair competence assays applied.