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## Application of the FISH technique to estimate individual susceptibility to radiation

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Radiotherapy plays an important role in the treatment of many cancers. Therefore, there are many approaches and strong needs to establish the most appropriate method that would maximize efficiency of therapy and minimize the side effects and late health risk. It should also allow rapid and reliable screening of individuals and stratifications due to lower or upper radiosensitivity for modeling and optimizing a therapeutic procedure and eliminating the highest risk.

The aim of this study was to compare variability in the individual susceptibility to the induction by challenging dose of the aberrations in chromosome 1 in prostate cancer patients (PC) in comparison with benign prostatic hyperplasia (BPH) persons.

Whole blood samples were irradiated with a challenging dose of X-rays, cultured for 3 days, harvested in a metaphase and referred to the FISH procedure using probes for chromosome 1.

Results of our studies have shown differences in susceptibility to radiation, expressed in significantly elevated or lowered frequency of aberrations for chromosome 1 for cancer patients when compared to BPH group. After irradiation significantly higher levels of all the studied chromosome 1 aberrations, except for deletions, in the case of PC patients were revealed (% AB.C(1)  $5.09 \pm 1.44$  vs  $2.70 \pm 1.21$ ;  $p < 0.001$ ). Additionally, almost five times higher frequencies of acentric fragments were observed in lymphocytes of cancer patients in comparison to BPH group (on average  $2.29 \pm 0.96$  vs  $0.48 \pm 0.27$ ,  $p < 0.001$ ). Lymphocytes of the same patients before irradiation (in vivo level) showed significantly higher levels of all studied chromosome 1 aberrations, except for translocations. To estimate individual radiosensitivities after subtracting in vivo levels, the same trends were observed as for the cells after irradiation. In the case of PC patients significantly higher levels of all the studied chromosome 1 aberrations were observed, except for deletions with the most prominent differences for frequencies of acentric fragments ( $2.27 \pm 1.16$  vs  $0.46 \pm 0.24$ ;  $p < 0.001$ ) in comparison to BPH group.

Our results demonstrate that the frequency of acentric fragments detected as the response to a challenging treatment can be proposed as a very efficient predictor of susceptibility to planned treatment. Limitation of analysis of acentric fragments only after challenging irradiation may greatly speed up the diagnosis.

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