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Molecular genetic markers for assessment of individual radiosensitivity of cancer patients

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Ionizing radiation (IR) is used for radiotherapy of different cancer diseases including lung cancer. This pathology extends to considerable part of working men decreasing quality of life.
Modern cancer treatments include the exposure at significant dose of IR. It's focused on local body area. Dose size depends on disease severity and health status of the patient. But medical regimen is very strict, therefor individual differences between patients are obliterated.
The important task is to find balance between irradiation load for organism and irradiation sufficiency for tumor destruction. Monitoring analyses give information about tumor size, degradation rate of tumor and hematopoiesis suppression.
The obtaining of information is faster with usage of molecular markers. It makes it possible to decide about a continuation of the treatment and its total amount correctly. As the markers we used the ratio of nuclear and mitochondrial DNA amounts in plasma of cancer patients.
Resent study have demonstrated the existent of a considerable amounts of DNA in the plasma after different type of influences on human organism including IR. The presence of one or the other DNA type may show the predominant process that causes this DNA in the plasma (nuclear or mitochondrial). We suggest the irradiation of IR during radiotherapy is prevalent. The process is the main reason of free DNA presence in plasma.
Method. During the study we analyzed plasma samples from 9 patients with lung cancer. Plasma was derived from whole blood with centrifugation. DNA isolation was performed from 500 mkl. Ratio of nuclear and mitochondrial DNA copies was assessed with Real-Time PCR. Plasma DNA was used as a template. The copies number of mitochondrial gene ND1 coding first subunit of NADH-dehydrogenase was compared with the copies number of nuclear fragment of beta-actin gene. Beta-actin is highly conserved protein and its gene is usually used as a loading control.
Results. The results of Real-Time PCR were obtained for moments "before"and "after 1 course"of treatment for each patient. Comparison of data revealed several reactions on radiotherapy. It was shown the increasing both mitochondrial and nuclear DNA. The degradation rate of tumor may be estimated with these data.
Conclusions. There is a probability of normal tissue irradiation so we suppose the free DNA level in blood is the complex answer on genotoxic factor. That may reflect the individual radiosensitivity of the patient.

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