A New Rapid Diagnostic Method for Detecting Free-Radical Pathologies

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The free-radical pathologies (FRP), including cardiovascular diseases, diabetes and cancer, were the leading causes of population mortality in 2014 according to the WHO data. The grade of DNA damage in individual cells by measuring the diffusion of the tail of a comet (known as Comet assay) can be used as FRP indicator. At present the main bottleneck for wide application of this method in clinical study is the use of hi-tech equipment utilizing gamma radiation. The use of ozone with concentration 200 to 1000 μg/l in ozone-oxygen mixture presented in the Project is an alternative to gamma radiation. The level of the diffusion of the tails of a comets were about 12.43±0.79% when exposed to ozone at a concentration of 900 μg/l for 10 minutes. It is comparable to the exposition to Co-60 gamma radiation at a dose of 3 Gy (12.1±0.81%). In addition to gamma radiation elimination the exposure of sample is reduced by 3 hours. This fact makes this method the rapid tool for detection of activity of free-radical processes and, consequently, free-radical pathologies. It was also found in the experiment with rats carrying a tumor strain of cholangioma PC1 that the level of the diffusion of the tails of a comets of blood cells is 3.66±0.27% at early stage of tumor growth and 11.80±1.26% at a late stage. Thereby we developed a new method of creating DNA damage for comet tests allowing its wide implementation in screening programs to detect risk groups with FRP. Rapid procedure and simplified requirements to the equipment and personnel allow using this method in local hospitals analyzing millions samples per year. Early revealing of malignant tumors can introduce individual treatment programs and relieve suffering from chemotherapy for more than 400 thousand people a year.

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