

CREATINE KINASE AS BIOMARKER OF OXIDATIVE STRESS INDUCED BY LOW-INTENSITY RADIOFREQUENCY ELECTROMAGNETIC RADIATION

Background. As is known, electromagnetic irradiation (EMI), including radiofrequency irradiation, emitted by mobile phones, induces in the cells the oxidative stress, which causes in cells macromolecules and, particularly enzymes injuries.

Objectives. The objective of this work is to study: 1) some indices of the rats' blood lipid peroxidation (LPO) and antioxidant activities and 2) liver and blood serum creatine kinase (CK), alaninaminotransferase (ALT), aspartataminotransferase (AST) post-radiation activity level changes, caused by 900MHz low-intensity EMF.

Materials and methods. The X1-42 generator's system has served as a radiation source that irradiated 900 MHz intensity EMF. White male rats were divided into two experimental groups and two appropriated control groups. The rats of the first group were subjected to two hours of single radiation, the second group rats was exposed to fractional radiation. The post-radiation effects were studied after 1, 5, 10, 20 days. The LPO activity and the activity of low-molecular non-enzymatic water-soluble blood antioxidants were evaluated by malondialdehyde concentration and using photo chemiluminescent detection of antiradical activity respectively. The enzyme activities were determined: CK – by accumulation of creatine, ALT and AST – based on the decreasing levels of NADH in coupled reactions with lactate dehydrogenase and malate dehydrogenase respectively. The SPSS programming package was applied for data processing.

Results and Discussion. The significant increase of LPO intensity in irradiated rats' erythrocytes membranes is registreted. After the single prolonged exposure the inhibition of the activity of low-molecular non-enzymatic water-soluble blood antioxidants and enhancement LPO processes of blood plasma is observed. At the same time in the case of the fractional irradiation the stimulation of the antioxidant activity with the abrupt decrease in the LPO activity takes place. As single both fractional radiation induce moderate changes of all studied enzyme activity levels, which differ by quantity and direction in different post-radiation terms. The comparative analysis of the investigated enzyme activity level changes dynamics show: 1) under the analyzed regimens of radiation, there take place adaptive changes of hepatocytes and serum enzymes activity; 2) liver CK is the most sensitive enzyme to both regimens of influence; 3) both single and fractional radiation of rats do not affect the hepatocytes cell membrane permeability, but cause changes in their energetic metabolism.

Conclusion. 900MHz electromagnetic radiation moderately affects the energetic metabolism of hepatocytes without causing changes of their cell permeability. The most radiosensitive enzyme is the liver CK.

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КРЕАТИНКИНАЗА КАК БИОМАРКЕР ОКИСЛИТЕЛЬНОГО СТРЕССА, ИНДУЦИРОВАННОГО НИЗКОИНТЕНСИВНЫМ РАДИОЧАСТОТНЫМ ЭЛЕКТРОМАГНИТНЫМ ИЗЛУЧЕНИЕМ

Низкоинтенсивное электромагнитное излучение с частотой 900 МГц индуцирует в мембранах эритроцитов и в плазме крови крыс повышение активности перекисного окисления липидов. В то же время, как свидетельствует сравнительный анализ динамики изменений уровней активности ферментов энергетического обмена гепатоцитов и сыворотки крови, указанный режим облучения умеренно влияет на энергетический обмен гепатоцитов, но не влияет на проницаемость их клеточных мембран. Наиболее радиочувствительным ферментом оказалось печеночная креатинкиназа.