

Induction of Adaptive Response in Yeast Cells under Influence of Extremely High Frequency Electromagnetic Field

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Abstract : Introduction: Adaptive response (AR) is a manifestation of radiation hormesis, which deal with the radiation resistance that may be increased with the pretreatment with small doses of radiation. In the current study, we evaluated the potency of radiofrequency EMF to induce the AR mechanisms and to increase a resistance to UV light. Methods: *Saccharomyces cerevisiae* yeast strains, which were created to study induction of mutagenesis and recombination, were used in the study. The strains have mutations in *rad2* and *rad54* genes, responsible for DNA repair: nucleotide excision repair (PG-61), postreplication repair (PG-80) and mitotic (crossover) recombination (T2). An induction of mutation and recombination are revealed due to the formation of red colonies on agar plates. The PG-61 and T2 are UV sensitive strains, while PG-80 is sensitive to ionizing radiation. Extremely high frequency electromagnetic field (EHF-EMF) was used. The irradiation was performed in floating mode and frequency changed during exposure from 57 GHz to 62 GHz. The power of irradiation was 100 mW, and duration of exposure was 10 and 30 min. Treatment was performed at RT and then cells were stored at 28° C during 1 h without any exposure but after that they were treated with UV light (254nm) for 20 sec (strain T2) and 120 sec (strain PG-61 and PG-80). Cell viability and quantity of red colonies were determined after 5 days of cultivation on agar plates. Results: It was determined that EHF-EMF caused 10-20% decrease of viability of T2 and PG-61 strains, while UV showed twice stronger effect (30-70%). EHF-EMF pretreatment increased T2 resistance to UV, and decreased it in PG-61. The PG-80 strain was insensitive to EHF-EMF and no AR effect was determined for this strain. It was not marked any induction of red colonies formation in T2 and PG-80 strain after EHF or UV exposure. The quantity of red colonies was 2 times more in PG-61 strain after EHF-EMF treatment and at least 300 times more after UV exposure. The pretreatment of PG-61 with EHF-EMF caused at least twice increase of viability and consequent decrease of amount of red colonies. Conclusion: EHF-EMF may induce AR in yeast cells and increase their viability under UV treatment.

Keywords : *Saccharomyces cerevisiae*, EHF-EMF, UV light, adaptive response

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