within 3 hr did not affect their viability, but intracellular ROS accumulation measured by the fluorescent probe was increased after the irradiation and attained a maximum value at 30-45 min and then decreased with time. Medium ROS was also increased in 1 hr and thereafter the concentration remained almost unchanged untill 2 hr. Next, we tried to measure the intracellular ROS accumulation in the cells decreased intracellular glutathione (GSH) by addition of 1-chloro-2,4-dinitrobenzen(CDNB). It is cleary showed that abrupt increase in the cellular ROS earlier than control cells. These accumulation of intracellular ROS were also confirmed by an electroparamagnetic resonance(EPR) spin trapping technique. The EPR signal in the presence of 2,2,5,5-tetramethyl-3-pyrroline-3-carboxamide(TPC) in medium increased with irradiation time but was suppressed by addition of L-histidine. Also, typical signal of 5,5-dimethyl-1-pyrroline-N-oxyde(DMPO) was increased with irradiation time in the medium. Moreover, in cell sample, EPR spectrum was obtained after the irradiation to a solution containing GSH and DMPO. This spectrum consists of DMPO-glutathionyl and DMPO-hydroxyl radical adducts. These results suggest that intra- and extracellular ROS induced by 385 nm light is mainly singlet oxygen($^1O_2$), and intracellualr GSH plays an important role of scavenging ROS induced by the UV-A light irradiation in cells.

PB-128 [14:00]

What is the primary target of the action millimeter waves on biological objects?

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It has been experimentally shown that the low-intensity electromagnetic fields (EMFs) do not act directly on DNA molecules, and the influence takes place through a mediated influence of the EMFs on the water, stimulating structural change of the water shell surrounding the DNA. Thereby, we may conclude that the primary targets of the influence of the electromagnetic fields on the DNA water solutions are the water molecules.

The assumption that changes in the DNA melting parameters under the influence of low intensity non-ionizing millimeter (MM) waves stipulated by the structure of water, is based on the fact that the resonant absorption frequencies of DNA are in the region of 2 to 9 GHz [1]. Hence, we assume that at a frequency of 64.5 GHz the changes in the values of temperature melting T_m and melting interval ΔT can not be due to the resonance absorption of DNA, i.e. the radiation not directly influences on the DNA. Consequently, the increase in the thermostability of DNA during the irradiation by MM-waves with a frequency 64.5 GHz can be caused by their mediated influence through the water.DNA-samples were prepared in the irradiated only water-salt solution (buffer) for the confirmation of the mentioned fact. Melting curves obtained for them do not practically differ from the curves obtained by irradiation of DNA solutions within the experimental error. Therefore, it can be assumed that the observed changes in the parameters of DNA-denaturation are caused just by changes in the structure of water arising due to exposure. This is also indicated by the results on the measurement of the density of aqueous salt solutions of DNA in the case of irradiating by MM-waves. For a control the densities of bidistilled water and water-salt solution were also measured before and after irradiation. The studies have shown that in the case of irradiation by pure water with a frequency of 64.5 GHz, its density does not practically change, while the density of the buffer and the DNA-solution increases. This indicates that the structural state of pure water does not change due to irradiation, since under these medium conditions the water molecules form a most stable, from a thermodynamic point of view, structure, and an increase in ordering after exposure becomes thermodynamically non-profit. Therefore, the density of water under these conditions should not be changed. In contrast, in the case of irradiation of the buffer and the DNA-solution by non-ionizing millimeter electromagnetic waves the dehydration of DNA and being present in solution ions of Na^+ occurs. Moreover, most probably, the water molecules are involved in the formation of additional bonds with the salt ions or

with functional and atomic groups of macromolecules, which leads to an increase in size of the ions or macromolecules, and the latter is the cause of density increase.The results of measurements of the density buffer and the DNA-solution are summarized in Table 1. As it can be seen from the table, there is almost the same dynamics of changing of the buffer and the DNA-solution densities. And the obtained data are in a good agreement with the results of DNA-melting. For irradiation G4-142 generator (Russian made) was used [2], the incident power density (IPD) at the location of object was about 50 $\mu W/cm^2$.

References

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Figures

Time of irradiation, min	Buffer	Buffer + DNA
0	0.999201 ± 0.000005	0.999232 ± 0.000004
30	0.999220 ± 0.000005	0.999242 ± 0.000005
60	0.999241 ± 0.000004	0.999269 ± 0.000004
90	0.999253 ± 0.000004	0.999291 ± 0.000005

Figure 1. Table 1. Magnitude of solution density (g/cm3) before and after exposure of MM-radiation at 64.5 GHz

PB-130 [14:00]

Thermostability of the Mitoxantrone-tumor DNA complexes irradiated by low power electromagnetic waves

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Thermostability of mitoxantrone (MTX) complexes with DNA of sarcoma 45 (tDNA) and healthy rat liver (hDNA) earlier irradiated by resonant and non-resonant frequencies of oscillations of water structures has been studied. It is shown that due to irradiation of DNA complexes by resonant frequencies, dehydration of nucleotides and Na^+ions, present in solution, occurs. As a result of this fact at relatively low concentrations of MTX, when 100 base pairs of DNA corresponds to one of MTX molecules the thermostability of complexes decreases, moreover, the change is more pronounced (~0.8^0C) at complex-formation with tDNA. The results of the work may be applied for treatment of new schemes of anti-tumor preparations in clinics.

We have investigated the thermal stability of the complexes antitumor drug Mitoxantron (MTX) with DNA of the liver normal rats (hDNA) and sarcoma 45 (tDNA), irradiated by low power and non ionizing millimeter electromagnetic waves (MEWs) resonant (64.5 and 50.3 GHz) and non-resonant (48.3 GHz) frequencies of water molecular structures [1].

Table 1 shows the melting parameters of hDNA and tDNA irradiated by resonance frequency of 64.5 GHz,