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Role of 2-deoxy-D-ribose modified HSA in diabetes mellitus

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Diabetes mellitus is a group of disease characterized by high level of blood glucose, resulting due to insulin production, insulin action or both. As diabetes mellitus (DM) becomes epidemic its prevalence increases day by day, so there is a need to find out the actual cause of DM. Existing literature and research describe that glycation of protein is very important as well as a harmful process, which may lead to development of DM in human body. Human Serum Albumin (HSA) is the most abundant protein in blood and it is highly prone to glycation by the reducing sugars. 2-deoxy-D-ribose (dRib) is a highly reactive reducing sugar which is produced in cells as a product of the enzyme thymidine phosphorylase. It is generated during the degradation of DNA in human body. It may cause glycation in HSA rapidly and is involved in the development of DM. In present study, we did an *in vitro* glycation of HSA with 2-deoxy-D-ribose and found that dRib glycated HSA rapidly within 24 hours at certain concentration. UV Spectroscopy, Flourescence spectroscopy, Fourier transform infrared spectroscopy (FTIR) and Circular Dichroism (CD) technique have been done to determine the structural changes in HSA upon glycation. dRib modified HSA was also used to detect the autoantibodies in diabetes patients. Enhanced binding of dRib modified HSA with autoantibodies was observed compared to the native HSA. Thus it may be concluded that dRib is a potent enough to cause structural changes as well as generation of neoepitopes on the protein which may induce autoantibodies in diabetic patients and might play a role in the onset and progression of diabetes.

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Altered efficacy of electrochemotherapy after exposure to mobile phone radiations

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Statement of the Problem: Electrochemotherapy as a powerful treatment of solid tumors, using electric pulse permeabilised the cells to chemotherapy drug reversibly and in addition to destruction of primary tumor, it is capable of triggering immune antitumor responses and of thus facilitating deletion of tumor cells at metastatic tumor sites. However, the efficacy of such a treatment could be influenced by confounders like mobile phones waves through phenomena such as adaptive response resulted in decreasing of genotoxic agents effects. This study examines alteration in the antitumor effectiveness of electrochemotherapy treatment when tumor cells were pre-exposed to 900 MHz modulated by 217Hz or 217 Hz fields similar to those generated by mobile phones.

Methodology: The 4T-1 cells were exposed to ELF magnetic fields at 93, 120 or 159 μT intensities generated by Helmholtz coils or the radiofrequency (RF) signals modulated by rectangular pulses with a repetition frequency of 217 Hz (pulse width 0.576 ms) at 17, 162 or 349 $\mu W/cm^2$ power densities generated by GSM900 simulator. Then, the cells were treated by different protocols of electrochemotherapy. After 24 hours, the cell viability was evaluated by MTT assay.

Findings: The data indicated that although it was not observed any alteration in cell viability as a result of ELF magnetic fields or RF radiations exposure alone, exposure of cells to ELF fields at some flux density before electrochemotherapy to different protocols increases cell viability and thus decrease treatment efficacy. Also, the similar results to that of ELF magnetic fields on treatment efficacy were observed for modulated radiofrequency signals.

Conclusion & Significance: Based on the results of this ***in vitro*** study, fields emitted by mobile phones can develop an adaptive response for some electrochemotherapy protocols. Therefore, these results should be extended to ***in vivo*** studies and be investigated the other mechanism of electrochemotherapy like stimulation of immune response influenced by mobile phone radiations.

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