

Evidence suggests that children conceived using assisted reproductive technologies, have a higher risk of various pathological conditions.

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## **THE INFLUENCE OF LOW-INTENSITY LASER IRRADIATION ON THE LEVEL OF GLUCOSE IN BLOOD OF HEALTHY PEOPLE**

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The investigation of of healthy people in the applications of low-intensity laser irradiation (LILI) of different wave-lengths has been conducted in the research work.

Blood sampling was made from male research volunteers at the age of 20 – 24 in fasting state and also 10 minutes and 1 hour after the laser irradiation exposure. The level of glucose in blood was measured with the help of portable glucometer Bionime GM100 and capillary test-strips Rightest. Diode laser has been used in the research work. Dermal exposure was carried out on the bend of elbow region. The characteristics of laser exposure were as follows: wave lengths 635, 785 and 960 nm, laser power 1,1 mW, frequency 50–60 Hz.

We have found that marked impact on donors' level of glucose in blood generated irradiation with wave length 635 nm only, namely, 1 hour after LILI blood glucose level declined from 4,7 to 4,5 mmol/l ( $p < 0,01$ ). There were no differences of this indicator compared with baseline levels in all other variants of exposure.

It is known that irradiation with wave length of 635 nm corresponds to the red light. Redox enzymes, enzyme-substrate complexes, erythrocytes, hemoglobin, oxygen can play a role of primary photoreceptors of laser irradiation of the red light.

Positive influence of LILI on rheological properties of blood has been elucidated: the decrease of erythrocyte aggregation and the increase of erythrocyte capacity to deformability. Tissue microcirculation improves due to enhancement of oxygen delivery zone and activation of aerobic metabolic processes as a result.

The impact of laser on blood is accompanied by conformational alterations of hemoglobin molecules and modification of the oxygen delivery function of blood. Oxygen affinity of hemoglobin is increased which promotes better tissue oxygenation, too.

Being photoacceptor of red laser radiation oxygen goes into singlet (excited) state thus stimulating oxidation processes in tissues. Sugars and fatty acids are metabolized herewith.

Near (785 nm) and far (960) infrared laser irradiation bands didn't have an impact on the level of glucose in the blood of the donor in our experiments. Dermal infrared exposure of laser is accompanied by local reactions of superficial vascular system, namely vasodilator, anti-inflammatory, analgetic, wound healing effects.

There is no data regarding influence of this type of irradiation onto redox processes in organism in scientific literature.

Consequently, dermal LILI in the red light facilitates the decrease of the level of glucose in the blood of healthy people presumably as a result of enhancement of reduction-oxidation processes in organism induced by optimization of oxygen delivery function of hemoglobin. The technique developed by us may provides additional measure to decrease hyperglycemia in patients with diabetes mellitus type II.

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### **BYSTANDER EFFECT AS THE PHENOMENON OF THE TRANSFER OF INFORMATION**

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Bystander effect is a phenomenon of the transfer of information from irradiated cells to non-irradiated when cell damage (chromosomal aberrations, apoptosis, micronuclei, mutations, etc.) is observed in irradiated cells. This effect was reported in 1954 by Parsons, which showed that in children who were treated by irradiating of leukaemia spleen, there was damage of bone marrow. In the last 20 years a lot of information was received about "bystander" effect, but its nature and mechanisms are still not established.

In earlier work on this topic Nagasawa and Little irradiated the cells of Chinese hamster ovary with alpha particles at doses between 0,03 and 0,25 cGy, so that only about 1% of the cells were exposed to direct irradiation. However, chromosomal damage was observed in more than 30 % of the population. Thus, their data showed that DNA damage can be caused in a greater number of cells than in those which were exposed to radiation. It was unexpected and contradicted the model of direct damage.

It has been shown that exposure to 20  $\alpha$ -particles each of cell the 20% of randomly selected hybrid cells contributes to a threefold increase in the number of mutations compared with the expected. Experiments conducted by As-sama and others showed that irradiation of alpha particles suppressed genes such as p53 and p21, involved in control processes of cell cycle and induction of apoptosis, and this process can be expressed in nonlinear form after irradiation with low doses of radiation.

A lot of research of "bystander" effect became possible with the use of microbeam, allowing a small amount of charge (light ions) to enter in a single cell nucleus.

Cellular reactions caused by using this effect include the induction of chromosomal aberrations, mutations, cell death, apoptosis (or programmed cell death), malignant transformation and genetic instability. Bishai demonstrated "bystander"