

Effect of ionising radiation on lymphocytes

Wanda Retelewska

Radiation-induced changes of lymphocytes, which belong to the most radiosensitive cells, are described. Depending on the radiation dose, conditions of irradiation and nature of the irradiated object (whole organism or isolated lymphocytes from different tissues) the radiation-induced changes may be of different character. The most frequently observed radiation-induced changes of lymphocytes consist in a partial disappearance of these cells and deterioration of immunologic capacity of irradiated animals. Among the visible morphologic changes preceding the radiation-induced lymphocyte death one should mention: pycnotic degeneration of the cell nucleus, disintegration of mitochondria and cell membranes and cytoplasmic alterations. Radiation affects, first of all, energetic metabolism of the lymphocyte. It is generally suggested that energetic metabolism of the cell nucleus belongs to the first signals of irradiation both *in vivo* and *in vitro*. Radiation-induced inhibition of nuclear and mitochondrial oxidative phosphorylation involving a decrease of ATP level precedes other detectable radiation-induced injuries of the lymphocyte. It has been shown recently that degradation of adenine nucleotides to hypoxanthine begins already in 30 min after irradiation of rat thymocytes, preceding inhibition of ATP synthesis. Oxidative phosphorylation is very sensitive to the action of radiation, however its inhibition is observed not immediately but about 60 min following irradiation of rat thymocytes with a dose of 1000 R. Restoring effect of adenine on radiation-induced damage of rat thymocytes is also reviewed. Adenine added within one hour after irradiation prevents the degradation of ATP to hypoxanthine and nucleoprotein dissociation. It affects the lymphocyte viability, too. Mechanism of the restoring effect of adenine on nucleotide degradation is not cleared up. The extraordinary sensitivity of lymphocytes to the action of radiation may be utilized in biological dosimetry. On the basis of quantitative alterations induced by radiation in chromosomes of peripheral blood lymphocytes the dose of radiation absorbed by the organism, may be evaluated.