SYMMETRICAL EXCHANGES BETWEEN CHROMOSOMES INDUCED BY IRRADIATION OF HUMAN LYMPHOCYTES WITH FAST NEUTRONS AND DETECTED BY REPEATED FLUORESCENCE *IN SITU* HYBRIDISATION

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Symmetrical exchanges between chromosomes represent the most frequent and the most important chromosomal aberrations induced by all types of ionizing radiation. These aberrations are stable passing from one generation of cell to another. If the aberration damages the function of some gene having the principal importance in the regulation of the cell cycle, it can lead to a malignant transformation of the cell. The origin of exchange aberration consists of the illegitimate joining of ends of two different chromosomes, formed by two or more double-strand breaks induced by ionizing radiation. The cause of these exchanges is not elucidated, however, it is clear that two ends of the same or different chromosomes can be rejoined only in the case if they are close together in the interphase nucleus. From this point of view it can be expected, that the frequency of exchange aberration between chromosomes will depend on the localisation of individual chromosomes in interphase nucleus even if the induction of double-strand breaks by ionizing radiation is accidental. It means that the exchange of genetic material can be realised only between chromosomes that are localised in a close vicinity.

We have studied the frequency of exchange aberrations between chromosomes number 1, 2, 3, 4, 6, 8, 9, 11, 12, 14, 18 and 22 in the first postirradiation mitosis of human lymphocytes irradiated with different doses of neutrons of the mean energy of 7 MeV. It was realised 7 repeated hybridizations. In one of them, the centromeres of all chromosomes were visualised. In each of other hybridisation's, two differently modified DNA probes specific for visualisation of two different chromosomes were used. The positions of mitoses on microscopic slide were automatically recorded by the computer so that it was possible to return to them after the successive hybridisation. By this manner it was obtained 7 different images for each mitosis, in which two specific chromosomes were distinguished from the others by red and green fluorescence. The successive images were compared mutually enabling to found out the frequencies of exchange aberrations between visualised chromosomes.

The results show the higher frequency of exchanges between chromosomes 14/8, 14/18, 14/3, 8/3, 8/1 and 8/18. There were not exchange aberrations between the upper mentioned chromosomes and chromosomes 9, 22, 4 and 12. On the basis of these results we can suppose that chromosomes 1,3, 8, 14, and 18 are located in the mutual vicinity in the interphase nucleus of lymphocytes. The vicinity of these chromosomes is probably one of the reasons of spontaneous reciprocal exchanges between chromosome 14 and the other mentioned chromosomes (1,3, 8, 18) that are characteristic for the malignancy of B-lymphocytes in different types of non-Hodgkin's lymphomas.