BIOLOGICAL DOSIMETRY OF ABSORBED RADIATION BASED ON THE FREQUENCIES OF CHROMOSOMAL ABERRATIONS IN HUMAN LYMPHOCYTES

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Introduction

In the investigation of radiation accidents, it is important to estimate the dose absorbed by exposed persons in order to plan their therapy For this task information such as magnitude of dose received, as external or internal radiation exposure, or partial or whole body irradiation are necessary For example following exposure to high doses (> 5 Gy) of low LET radiation the victim may need bone marrow transplantation and in case of partial body exposure to high doses the victim may be isolated and kept under very hygienic conditions in order to allow repopulation from surviving stem cells in the bone marrow

Methods to estimate radiation doses

Usually in accidents the victims do not carry a physical dosemeter unless the accident happens in a nuclear facility. In the absence of any physical dosimetry one has to resort to biological methods. Even if physical dosimetric information is available, it is better to confirm this estimate with a biological dosimetry. Currently the fully developed biological indicator for exposure to ionizing radiation is the study of chromosomal aberrations in peripheral blood lymphocytes. Other techniques such as ESR measurements of tooth enamel are available but not yet well validated.

Chromosomal Aberrations

Most of the circulating lymphocytes are in a presynthetic stage of the cell cycle (G0) in the body Immediately following radiation exposure the chromosomal aberrations are formed. Lymphocytes with aberrations can circulate in the body for months to years. Lymphocytes are usually stimulated in culture for about 48 h with a mitogen whereby they enter the cell cycle and undergo mitoses. The mitotic cells are arrested by colcemid and fixed. Air dried preparations are stained and chromosomal aberrations are analyzed in the first mitosis in culture (IAEA, 1986)