DSV SL-DSV-10-0355

Research field:

Radiobiology / Life Sciences

Radiation-matter interactions / Solid state physics, chemistry and nanosciences

Title:

Characterisation of the early and long term bystander effects induced by micro beam on human cells

Abstract:

The risk linked to ionizing radiation (IR) exposure has been determined, in most of the cases, by using high doses delivered on the DNA of irradiated cells. Nevertheless, an increasing amount of experimental data shows that non irradiated neighbouring cells, located near to the cells that have been directly hit by IR, may be also affected [1]. Indeed, even at low doses cells that are in the neighbourhood of directly irradiated cells may be also stressed. This phenomenon, called ?bystander effect? (BE) is in part due to signals transmitted through intracellular junctions in confluent cultures. Alternatively, IR may stress cellular membranes leading to the formation of oxidative species in directly irradiated cells (also named "targeted cells"). These oxidative species may create a signal transmitted to neighbouring cells. The question of whether this BE at low doses is advantageous or noxious remains to be determined as well as the eventual impact on genetic instability. The research project proposed here deals with the identification and characterization of the molecular modifications that are the basis of the BE by using the nuclear micro beam developed in the "laboratory of light elements characterization" (DSM/IRAMIS/SIS2M & UMR 9956 CEA-CNRS, CEA-Saclay). This device allows us to monitor the effects induced in cells hit by a given number of alpha particles (from one particle per cell to several dozens of particles per cell) [2]. We will evaluate the consequences of irradiation at low or high doses using the micro beam device by monitoring different fluorescent markers. Microscopy approaches will allow us to determine morphological and physic-chemical modifications of human cells and will allow us to analyse in real-time the effects on targeted cells and on their neighbourhood. The microsonde will be optimized in order to characterize the cellular response to an increasing number of alpha particles per cell [3, 4].. We will determine the relationship of the transactions activated immediately after irradiation, the repair IR-induced DNA lesions, clonogenic cell survival and the genetic stability of the offspring. A particular interest will be given to systems involved in the repair of broken DNA ends and to those that recognize double helix distortions. Our previous results indicate that these systems may prevent long-term undesirable effects [5, 6].

Location:

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Service de Radiobiologie et Oncologie
Laboratoire de Génétique de la Radiosensibilité
Starting date: 01/10/2010
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More about:

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