

Studying the response to ionizing radiation (IR): An experimental and theoretical approach

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Exposure to ionizing radiation (IR) as a genuine exogenous stress induces a variety of responses in the cell initiated by the DNA damage response (DDR) and DNA repair, apoptosis and inflammatory or immune response¹. Therefore, stimulation of this IR-response mega system especially at the organism level consists of several subsystems and submechanisms and exerts a variety of systemic effects². Our group focuses on the study of the induction and processing of complex DNA lesions applying different methodologies. At the same, we are interested on the effects of low doses in the case of diagnostic examinations (<0.1 Gy). In this presentation, I will first present experimental evidence on how the mammalian cell or organism is expected to respond to complex DNA damage induction i.e. the signature of IR and primary ‘danger signal’. At second, I will discuss the extremities of this response i.e. the phenomena of radiosensitivity and radioresistance in bacteria and human cells and insights gained by applying bioinformatics³. Last but not least and in the light of our recent work, I will present novel findings in the case of IR-low doses and expected levels of complex DNA damage calculated using Monte Carlo damage simulation (MCDS 3.10A) for DNA double strand break (DSB) induction and the general purpose Monte Carlo N-particle (MCNPX) radiation transport code system.

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