Institute of Aerospace Medicine
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Complex DNA damage as the triggering mechanism for radiation systemic effects

Cellular effects of ionizing radiation (IR) especially of high-LET radiations, are mainly damaging due to severe alterations of different cellular biological molecules ranging from lipids to proteins and DNA. All current theoretical and experimental knowledge indicates that IR-induced DNA damage is always more complex than the corresponding Endogenous oxidative damage. Specifically, it is expected that IR will create clusters of damage comprised of a diversity of DNA lesions like double strand breaks (DSBs), single strand breaks (SSBs) and base lesions within a short DNA region of up to 15–20 bp. Recent data from our group and others support two main notions, that these damaged clusters are:

(1) repair resistant, increase genomic instability (GI) and malignant transformation and (2) can be considered as persistent "danger" signals promoting chronic inflammation and immune response, triggering a variety of detrimental effects to the organism (like radiation toxicity).

In this seminar, the main findings of our group and others will be presented and emphasis will be given to the role of high-LET radiations like protons, carbons and space heavy charged particles.