

Low Dose Ionizing Radiation (LDIR) and the immune system: a review

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Background: Ionizing radiation (IR) is unavoidable in medicine, whether it is in cancer treatment, through radiotherapy with high doses, or in imaging with low doses. While the effects of high dose ionizing radiation (HDIR) are well known, low dose effects are still shrouded in controversy. IR will act on cells either directly, altering DNA and protein structure, or through the creation of free radicals, affecting a cell's functionality and ultimately, viability [1]. This will affect the immune system, as IR not only induces an immune response, but also targets immune cells, which according to the law of Bergonie and Tribondeau are radiosensitive. While not consensual, it is theorized that IR might have an hormesis effect [2]. LDIR has been defined in 2012 as any dose lower than 100 mGy. Despite this, multiple articles have different definitions of LDIR, and as a result, knowledge about the effects might be somewhat skewed. **Objective:** Through article and data analysis, our aim was to assess the knowledge of LDIR effects on the immune system and present a possible mechanism for their interaction. **Methods:** A literature review using a combination of keywords with Boolean search terms on the search engine of Web of Science™ was implemented. 100 articles were obtained and, after selection and filtering through inclusion and exclusion criteria, 45 articles had their data collected and compiled for complete analysis. **Results:** LDIR showed activation of pathways that induce immune activity. Acute LDIR was shown to increase pro-inflammatory and decrease anti-inflammatory cytokine production, macrophage and natural killer cells' proliferation and activity, while having a negative effect in splenocyte and T cell counts. Chronic LDIR showed reverse effects on cytokines, joined with a reduction of enzymes responsible for antioxidant defenses. **Conclusions:** Results seem to show that acute LDIR induces a pro-inflammatory response and has anti-tumoral activity, whereas chronic LDIR has anti-inflammatory properties.

Keywords: Immune system; ionizing radiation, low dose; radiobiology;

References

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