

Summary

Human mesenchymal stem cells from the bone marrow, the dental pulp and the periodontal ligament are known for their high proliferation potential and the ability of self-renewal comparable to the other stem cells. They represent a promising field in the therapy due to their ability to differentiate into many cell types. On the other hand, these cells persist in the organism for a long time and a damage in their genetic material would result in mutation of cell genome. The characterization of these cells under genotoxic stress is therefore important. Ionizing radiation is one of the powerful DNA-damaging stressors causing cell cycle arrest associated with repair or apoptosis.

The aim of our work is to study the effect of ionizing radiation on mesenchymal stem cells from the bone marrow, the dental pulp and the periodontal ligament and the response of these cells to ionizing radiation after ATM kinase inhibition. ATM kinase is thought to be a key molecule reflecting DNA damage, especially double strand breaks.

We evaluated molecular mechanisms of the apoptosis induction and the reaction to DNA damage caused by ionizing radiation in mesenchymal stem cells isolated from bone marrow, dental pulp and periodontal ligament. The main result of our work is that after the irradiation these cells do not die by apoptosis, even after high doses, but only lose their proliferating ability and enter premature senescence.