

Title: The Use of Photobiomodulation to Recover Post-Thawing Trauma in Stem Cells.

Abstract: Cryopreservation is the most frequently used method for cell conservation. However, thawing makes excess free radicals oxygen species (ROS) and it induces mitochondrial permeability transition pore to open, resulting in mitochondrial membrane potential (MMP) depolarization. In our study, we used a 950 nm near-infrared (NIR) PBM device to treat post-thawing trauma in human stem cells from apical papilla (SCAP). In the post-thaw irradiated group, intercellular and mitochondrial ROS were decreased and MMP, ATP, mitochondrial mass, and cytochrome c oxidase (CcO) activity were increased compared to the thawed group. The NIR irradiation enhances electron transfer and proton pumping by NO photodissociation in CcO, which increases MMP, the driving force of ATP production. The NIR irradiation, therefore, reduced cell death by preventing MMP loss, MMP depolarization-induced ROS generation, and ATP shortage. Moreover, as mitochondrial activity is crucial to the differentiation of stem cells, the early osteogenic differentiation marker, ALP activity, was measured higher in the irradiated group. In conclusion, we identified that the 950 nm PBM recuperates pathological phenomena caused by post-thawing trauma.