



Title: Ozone therapy and stem cells: viewpoint in regeneration, repair, replacement of damaged components, and recovery mechanisms of immune regulation.

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Abstract

Both differentiation and migration of neural stem cells (NSCs) are the backbone of many pathological conditions. Recently, positive outcomes of ozone on conditions affecting nervous tissue have been observed. The proliferation, migration, cytokine release and cell survival, as well as suggested potential molecular and novel electromagnetic mechanisms have been hypothesized.

In fact, ozone can greatly influence pro-inflammatory cytokine production. This can have both beneficial and negative effects, depending on ozone concentration impacting, to a large extent, the distance of cell migration. Moreover, increased migration and proliferation, alongside proven protection against oxidative stress, might serve as a specific mechanism by which ozone improves regeneration of the nervous tissue.

Stepping away from molecular mechanisms of ozone action upon NSCs, another interesting aspect of this interaction is the electrical one. Ozone, with its inherent electric field, causes either an increased electrical or electrochemical gradient, impacting the rates and the distances of neural stem cells migration.

In other words, ozone has the ability to not only impact the molecular pathways for pro- or anti-inflammatory response or disrupt the cell's cytoplasmic membrane integrity through oxidation of phospholipids and lipoproteins, but also it has the ability to modify the external surface charge distribution of cells, as well as their lipid structure organisation and ion channel distribution. This can lead to a change in the embedded membrane components kinetics as well as modification of the opening and closing of voltage gated channels.

The aim of this lecture is to update how ozone can positively influence neural stem cells, which at least partly explains observed beneficial effects of ozone administration in vivo and is an important starting point for future research on stem cell therapy optimisation as well as recovery mechanisms of immune regulation.