

## Generation and Action of Reactive Species

### LOW-TEMPERATURE ATMOSPHERIC-PRESSURE PLASMAS AS A SOURCE OF REACTIVE OXYGEN AND NITROGEN SPECIES FOR CHRONIC WOUND DISINFECTION.

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Reactive oxygen and nitrogen species play important roles in regulation of pathophysiological processes in mammalian organisms. Chemical compounds releasing reactive species were shown to be effective for the chronic wound treatment. However, uncontrolled kinetic of the reactive species release and wound contamination with byproducts of this reaction represent a problem for using such compounds for topical applications. The goal of our group is developing plasma devices for the controlled production of pharmacologically appropriate doses of reactive species for topical biomedical applications. An electric discharge generated by these devices causes dissociation of the feed gas molecules into electrons, ions, and free radicals. In other words, gases are converted to plasma, the fourth state of matter. The composition of plasmas depends on the composition of feed gases, electric parameters of the discharge, and distance between the treatment area and the electrodes. Plasmas tested for the chronic wound treatment contain physiological (micromolar) concentrations of NO, NO<sub>2</sub>, OH, H<sub>2</sub>O<sub>2</sub>, and other reactive oxygen species. The results of our *in vitro* experiments showed that these plasmas have significant bactericidal and bacteriostatic properties. Plasma irradiation has dosage-dependant effects on human cells including either induction or inhibition of cell proliferation and apoptosis. Our clinical studies showed a significant reduction of the bacterial load in the plasma-treated wounds in comparison with the untreated control wounds.