

Cold atmospheric plasma for clinical purposes – promising results in patients and future applications

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Résumé

Infected chronic wounds are both socioeconomic and medical problem. Cold atmospheric plasma (CAP) has already proven its efficacy in killing bacteria on agar plates but also in a first prospective randomized controlled trial in patients. As an add-on therapy CAPs proofed a highly significant decrease in bacterial load in 5 min plasma-treated wounds (34%, $p < 10^{-6}$, $n = 291$, 36 patients) in comparison with wounds that received only standard wound care. This reduction is found in all kinds of germs, even multiresistant ones. Just as 2 min as well (40%, $p < 0.016$, $n = 70$, 14 patients). The treatment is very well tolerated and no side effects occurred until now (in total more than 2000 treatments in over 220 patients). The results of this study revealed the potential of atmospheric argon plasma treatment as a new approach to kill bacteria in terms of mutiresistancy.

The observed bactericidal effect of plasma therapy relies on the synergy of reactive oxygen and nitrogen species, charged particles, electric fields, and UVR. The combination of these biologically active components makes plasma an efficient tool for fighting bacteria.

With the same CAP device other dermatologic diseases were treated successfully, e.g. Hailey-Hailey disease. Otherwise CAPs failed in some diseases and revealed their limitations.

New plasma devices using surrounding ambient air have not only greater bactericidal but also virucidal properties. These devices may herald a new era in public, personal, pet, and food hygiene, same as in decontamination. Investigations of human compatibility are promising.

