Designing "Plasma Cocktail" for Chronic Wound Disinfection.

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Low temperature atmospheric-pressure plasma is a multi-component system that includes charged particles, reactive nitrogen and oxygen species, and UV light. Bactericidal properties of these agents make plasma a promising tool for chronic wound disinfection. To be applicable for this purpose, "plasma cocktail" should satisfy the following requirements: (a) it should cause significant reduction of bacterial density and (b) long-term inhibition of bacterial growth in the wound area, (c) without any negative effect on the human cell viability, proliferation, and motility.

Using *in vitro* approach, we investigated relative contributions of different plasma components to the bactericidal properties of plasma irradiation and identified the dosages of these components that can be tolerated by human skin cells. In this study, we used a microwave plasma torch developed by our group. Bacteria and human cells were submerged in liquids during plasma irradiation.

The results of our experiments show that non-UV plasma components represent major bactericidal factor of plasma irradiation that contribute to the continuous post-irradiation reduction of bacterial density and long-term inhibition of bacterial growth. The rate of bacterial reduction in plasma-irradiated liquids has positive correlation with the duration of irradiation. Similar doses of non-UV plasma products do not alter viability, proliferation, and migration of human skin fibroblasts and keratinocites.

The effect of plasma-generated UV on bacteria submerged in liquids is restricted to the time of irradiation and depends on physical characteristics of these liquids. We show that the spectral composition and intensity of plasma-generated UV are crucial parameters for determining the limits of plasma irradiation intensity and duration in application to human tissues. In order to increase the flexibility of plasma-therapy regime, we are re-designing our plasma toward minimizing the UVC content and increasing the density of reactive species.