DESIGN CONSIDERATIONS OF COLD ATMOSPHERIC PLASMA SOURCES FOR TREATMENT OF LIVING TISSUES

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This presentation provides a summary of current options of cold atmospheric plasma sources as intended for medical applications, in particular treatment of large infected skins. The summary is based on a common base of plasma-cell interactions but addressing the challenge of uneven and complex structures that are commonly found in human chronic wounds. Appropriate cold atmospheric plasma sources must satisfy simultaneous needs for efficacy (effective against microorganisms), accessibility (delivering plasma agents to infected sites specifically), and selectivity (causing little or no damages to health cells and tissues). The impact of plasma-generated reactive oxygen species (ROS), reactive nitrogen species (RNS), electrons and ions, and photons on living cells and tissues triggers a complex sequence of cellular responses, which in turn trigger cellular and intracellular release of ROS and RNS. What happens when plasma molecules meet biomolecules of the cells (e.g. proteins, DNA)? How do they manifest in clinical symptoms? And what science could help to make the meeting between plasma-generated molecules and biomolecules a beneficial one? The exponentially rapid development of plasma-based therapies offers an exciting prospect, but also heightens the urgency for an hitherto unavailable scientific underpinning at a molecular level. We will review lessons from free radical biology and radiation biology, and will evaluate plasma chemistry in an attempt to find ways that could be used to influence plasma-cell interactions in an informed fashion. This will be used to discuss possible requirements for future plasma source designs.

References:

1. Fridman G *et al*, *Plasma Processes and Polymers* 5 (2008) 503.
2. Kong MG *et al*, *New J Phys* 11 (2009) 115012.