Tissue models in plasma medicine research

Endre Szili [1], Jun-Seok Oh[2], Akimitsu Hatta[3], Masafumi Ito[4], Hideo Fukuhara[5], Keiji Inoue[5], Sung-Ha Hong[1], Nishtha Gaur[1], Rob Short[6]

University of South Australia [1], Osaka City University[2], Kochi University of Technology[3], Meijo University[4], Kochi Medical School[5], University of Lancaster[6]

E-mail: endre.szili@unisa.edu.au

Plasma medicine is a highly interdisciplinary field where the potential of cold atmospheric plasma is being investigated for a wide range of medical indications. Promising outcomes from in vitro and in vivo experiments, as well as clinical trials, show that plasma might one day have an impact in general clinical practice. However, there is still a major gap in our knowledge of what reactive agents plasma generates in tissue and how to control their delivery in order to achieve a beneficial medical outcome. It is not a trivial task to assess the plasma delivery of the reactive agents into three-dimensional biological tissue. Added to this there are growing ethical concerns in the use of animals even for medical-related research. In order to circumvent these issues, we developed simple models to study the plasma delivery of the reactive agents in tissue. In these studies we have discovered that plasma can potentially deliver reactive molecules deep to millimetre depths within tissue, and also obtained insights into the mechanisms of their delivery. I will discuss the outcomes from our research to date and the implications of the results to the development of plasma-based therapies.