Handheld cold atmospheric air plasma pen and in vitro studies of M.R.S.A, C. difficile and A. baumannii decontamination

Niall O’Connor1,2, Orla J. Cahill1, Sandra Galvin3, Cormac McDonnell3, Niall Stevens3, Neil O Hare2, Hilary Humphreys3,4 and Stephen Daniels1,

1 National Centre for Plasma Science and Technology (NCPST), Glasnevin, Dublin 9, Ireland
2 Medical Physics and Bioengineering Department, St. James’s Hospital, Dublin 8, Ireland
3 Department of Clinical Microbiology, Royal College of Surgeons in Ireland
4 Department of Microbiology, Beaumont Hospital, Dublin, Ireland
E-mail: nialloconnor0@gmail.com

The current drive in atmospheric pressure plasma technology for biomedical applications demands systems which are versatile, portable and obviate the risk of shock or damage to sensitive substrates such as tissue whilst retaining the plasma produced physicochemical benefits [1]. Here we report the design, characterisation and application of a cold hand held plasma pen device. The device is driven by a sinusoidal high voltage in the kHz range and utilises compressed air (5-20 L/min) as the working gas with a plume temperature, 1 cm downstream of the active volume, below 45°C. The characterisation consists of electrical, optical and acoustic diagnostics [2]. Results demonstrate effective decontamination, with treatment times of the order of 10s of seconds, of substrates inoculated with M.R.S.A, C. difficile and A. baumannii in vegetative, spore and biofilm forms.

References