[O90] PHOTODYNAMIC THERAPY AS AN ANTIMICROBIAL TECHNIQUE TARGETING BACTERIAL STRAINS COMMON TO ORTHOPAEDIC INFECTIONS

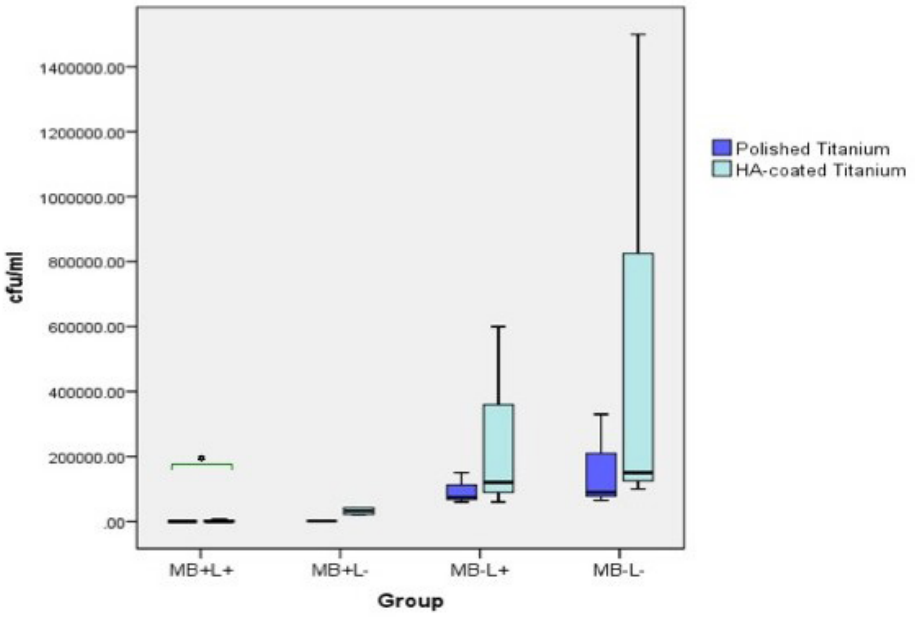
Simon Hislop[1], David McKenna[1], Melaine J Coathup[2], Gordon Blunn[2], Tim Briggs[1]

[1]Royal National Orthopaedic Hospital, London, United Kingdom
[2]John Scales Centre for Biomedical Engineering, University College London, Middlesex, United Kingdom

Aim: Photodynamic therapy (PDT) requires a photosensitiser, a light source of an appropriate wavelength, and the presence of molecular oxygen. Once stimulated to its excited phase by the light, the photosensitiser reacts with oxygen to form free radicals of 'singlet oxygen' which is cytotoxic to microorganisms.
We aim to demonstrate the effectiveness of PDT as an ***in-vitro*** antimicrobial technique against S***taphylococcus aureus***, ***Methicillin resistant Staphylococcus aureus***, ***Staphylococcus epidermidis, Pseudomonas aeruginosa*** and ***Acinetobacter bauminii***. This will form the scientific basis for further animal and human studies assessing PDT for treatment of periprosthetic infections, septic arthritis, and open fractures.

Method: A PDT treatment protocol was devised using lawns of bacteria on agar plates. PDT was targeted towards the bacteria and the remaining microorganisms were quantified using a serial dilution technique. In order to assess the ability of photodynamic therapy to target biofilms on metallic implants, biofilms were cultured on polished titanium and hydroxyapatite-coated titanium discs and subjected to PDT.

Results: Reductions in bacterial colony forming units of up to 7 log were achieved using PDT. The figure is a box plot representing a comparison of the amount of biofilm ***Pseudomonas aeruginosa*** (cfu/ml) remaining on the polished titanium disc and hydroxyapatite-coated titanium disc following treatment with photodynamic therapy. (MB+/-: photosensitizer present/absent; L+/-: laser present/absent).



Conclusions: PDT has long been used in dermatology and dentistry as an antimicrobial technique. Its potential for treating orthopaedic infections has not yet been investigated. This study demonstrates potential for PDT as an antimicrobial technique in the treatment of bacteria commonly found in periprosthetic infections, septic arthritis, and open fractures.
This *in-vitro* work lays the foundations for future animal and clinical studies. We envision PDT being used as an adjunct to antibiotics in treatment of these conditions, helping prevent ongoing infection, and the development of resistance.