NWS14-2014-000175

Abstract for an Invited Paper
for the NWS14 Meeting of
the American Physical Society

Antimicrobial Photodynamic Therapy - a Decade of Development

NICOLAS LOEBEL, Ondine Biomedical

For every human cell in our bodies, approximately 9 microbes live within us, colonizing our digestive tracts, our eyes, teeth, skin and hair. We co-evolved with specific microbes–on the order of 1,000 different species–in order to provide us with a host of symbiotic advantages. However, the delicate balance between human and microbe can be upset by injury, stress, disease or even normal aging. When that happens, commensal microbes can turn into killers. As we learn more about normal and dysbiotic microbiomes, our ability to wipe out marauding microbes is paradoxically waning fast, as antibiotic resistance rises from rampant overuse. At Ondine, we've been developing a novel approach to infection control, by capitalizing on the ability of certain dyes to selectively stain microbes over human cells, and produce a potent killing flux of oxygen-derived free radicals (OFDR) when illuminated by light. Efficient ODFR generation from this system depends on the existence of a long-lived triplet state in the dye, spin-matched to the ground state of molecular oxygen. One such dye is methylene blue. In my talk, I will describe a decade of product development based on methylene blue, and the numerous applications of the approach to human and animal infection control.