Examining the Antibacterial Action Spectrum in vitro of The Noveon® Dual Wavelength Laser System through Photo-Inactivation of E.coli at Physiologic Temperatures†

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Category: Basic Science

Background:
We investigated the antibacterial action spectrum of a Noveon® laser. Noveon employs 870 nm and 930 nm, which are known to cause cellular photo-damage via endogenous reactive oxygen species (Neuman, et al. Biophys J. 1999 Nov; 77(5):2856-63). After reproducing the photobiological response in E. Coli observed by Neuman with the Noveon, at 40.5 C (104.9 F) and a Threshold Energy Density of 4413 J/cm^2, we undertook experiments with E. Coli at 5 different wavelength combinations, to define the Noveon's action spectrum.

Methods:
Escherichia coli (*E. coli*) K12 were grown in Luria Bertani medium (25g/L). Isolates were seeded in five different 24-well plates in 2 ml of Phosphate-buffered saline for treatment with a 1.5 cm flat-top lens using the following combinations: 810/870 nm, 870/885 nm, 810/930 nm, 830/930 nm, and 885/930 nm, all at identical energy densities of 4482 J/cm^2. The Noveon (870/930 nm) was employed at the lower energy threshold of 4413 J/cm^2. Following treatment, 100uL from each well (with controls) was serially diluted to 1:12x10^5 and plated in triplicate for manual blinded counting of CFU's.

Results:
870/930 nm produced 99 % kill
830/930 nm produced 87 % kill
810/930 nm produced 39% kill
885/930 nm produced 22 % kill
810/870 nm produced 3.4% growth
870/885 nm produced 9.6% growth

Conclusions:
99% near infrared photo-inactivation of E-coli was accomplished using the Noveon, at a lower energy density than 5 other wavelength combinations in identical experiments. This suggests novel near infrared photodamage effects in bacteria are possible at physiologic temperatures.

†*To be presented at the American Society for Laser Medicine and Surgery Conference April 1-5, 2009.*