P75

The role of light irradiance on methylene blue photodegradation dynamics: Is all light equal?

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Methylene blue (MB) is a well-known photosensitizer (Ps) commonly used for antimicrobial photodynamic therapy (aPDT). Usually aPDT paramenters evaluation involves Ps concentration, its quantum yield for singlet oxygen production (Type II reaction) and the Ps photobleaching rate as a function of the deliveried fluence plus oxygen concentration and consumption on the medium. The role of power density is not often consider.The aim of this study is to evaluate the role of power density over MB photobleaching dynamcs evaluating the dimer/monomer ratio as well as the leuco MB formation under discrete changes in power density keeping the same light fluence. The MB was irradiated using a λ = 660nm diode laser (TwinLaser, MMOptics, São Carlos, Brazil), 40mW adjustable from 10 to 10mW, 0.04cm^2. The powers of 10mW, 20mW, 30mW and 40mW were used for 300s, 150s, 100s and 75s respectively. The irradiations were carried out directly in a cover quartz cuvette with an optical path of 1 cm. An acrylic mask was made to ensure the coincidence between the irradiation and the reading points. The readings were made from λ = 200nm to λ = 700nm and analyzed in appropriate software. The DA (dimer absorption) /MA (monomer absorption) was calculated and the ratio between visible and ultraviolet absorption was also calculated. Figure 1 show the result of DA/MA for the different irradiances.

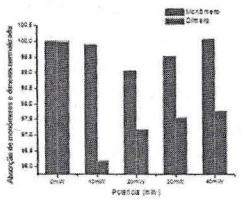

Figura 1 – MB dimer / monomer normalized absorption rate as a function of the irradiance with same fluence (

Our results demonstrated that discrete changes in light irradiance leads to different dinamiccs in terms of photobleaching and DA/MA ratio.

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