AbstractID: 5541 Title: The use of Fricke solutions to assess light dose in photodynamic therapy

Purpose: To study the response of a Fricke solution doped with Photogem® to laser beams and light emitting diodes due to reactive radicals produced in Photodynamic Therapy (PDT).

Method and Materials: The Fricke solution was prepared with 0.392 g of ferrous ammonium sulphate, 0.060 g of sodium chloride, 22 mL of sulphuric acid and made up to a volumetric flask of 1,000 mL with Milli-Q water. The Photogem®-doped Fricke solution was prepared by adding 0.0015 g of Photogem® to 1 liter of Fricke solution obtaining a concentration equivalent to what is employed for photodynamic therapy of tumors (4 mg/l). The solution was irradiated with laser beams and light emitting diode using radiant exposures up to 1300 Jcm^{-2}. The effect of laser irradiation on the solutions was evaluated by spectrophotometric technique.

Results: Examination of spectrometric data have shown that Fricke solutions doped with Photogem® present a linear increase in their optical density at 304 nm as a function of the radiant exposure of light sources which ranged between 514 and 640 nm. The efficiency of producing Fe^{3+} is dependent on the wavelength of the laser, being higher at 514 nm where this photosensitizer has the highest absorbance.

Conclusions: The results obtained in this work indicate that Photogem®-doped Fricke solution may be used in PDT quality assurance to verify the consistency of the light sources and the photosensitizer solution used in a given treatment. The use of this method to quantify the combined effect of the interaction of light beams with photosensitizers in different protocols is discussed. It is hypothesized that a possible relation exists between the efficacy of PDT to the concentration of ferric ions formed in the Fricke system.