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Synephrine as Antioxidant: Application in Quenching of Photo Induced Radical of Anthraquinone and Naphthoquinone

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Photosensitive molecules such as quinones in drugs may become activated by exposure to UV-A light (320–400 nm) of the solar spectrum and cause damages to biological materials such as amino acids, nucleic acids, lipids, etc.. 9,10-anthraquinone (AQ) and 1,4-naphthoquinone (NQ), based drugs are commonly used as antibacterial, antifungal, antiviral, antitumor and antimalarial. Synephrine (SY) is used in traditional Chinese medicine, mainly for anti-hypotensive, nasal and ophthalmic decongestant. Currently it has been used in treatment of digestive disorders, in emergency treatment of asthma, and more importantly used as anti-depressant. The study of photo induced interactions of the excited quinones and drug molecules having electron donating ability is expected to have some relevance in physical pharmacy. In this in-vitro study, our aim is to understand the photo induced reaction when the quinones AQ and NQ coexisted with SY in an organic medium and exposed to UVA light. The photo induced interaction between SY and above quinones in their triplet states has been studied using nanosecond laser flash photolysis in organic medium, ethanol. The triplet excited states of the above quinones, AQT and NQT were produced by excitation with 355 nm, 5 ns laser pulse, in the presence of SY and under both deoxygenated and oxygenated conditions. In this wavelength only the quinones can be excited to triplets but not the SY, leaving it always in its ground state. Transient absorbance of the products formed was monitored in the 300–700 nm wavelength range. Both quinones, in their triplet excited state have revealed similar reactivity towards the ground state SY. Kinetics probed at the characteristic wavelengths of the triplets and ion radicals show that the formation of the quinone radical anion and the decay of the corresponding triplet are synchronous. This confirms that the photo-induced excited triplets, AQT and NQT have been quenched by SY through electron transfer process forming AQ●–, SY●+ ion pair. The lifetime of the decay of the triplets of the quinones and the growth lifetime of the radical anion of the same quinones are about 3 µs under deoxygenated condition. The presence of oxygen in the medium influences the decay of the triplet and anion radicals of the AQ, but does not affect the decay of the triplet or anion of NQ. In the presence

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of oxygen, AQ●– radical anion interacts with oxygen and forms superoxide anion radicals, O2●–. The overall result from the current investigation is an evidence for the controversial role of SY in oxidative stress. The ability of SY to quench the photo excited quinones could give some insight to mitigate the drug induced photosensitivity and also could broaden the clinical usage of SY in other therapeutic areas.