Conjugation of sulfonated aluminum phthalocyanine to doxorubicine can improve the efficacy of photodynamic cancer therapy

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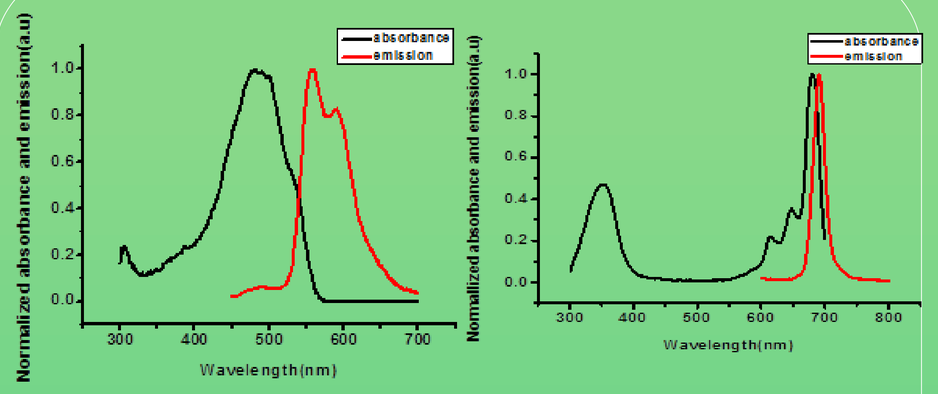
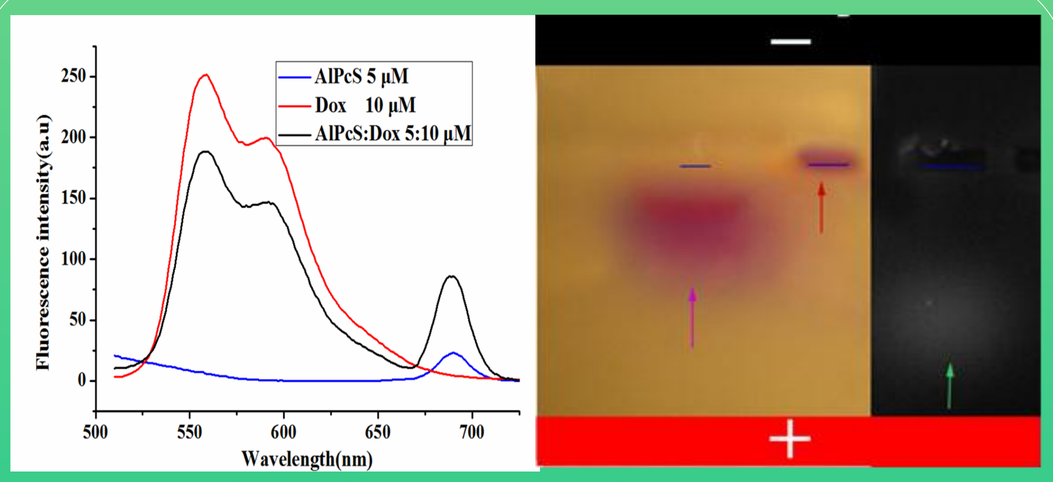
Abstract: AlPcS, a widely used photosensitiser for photodynamic therapy (PDT) of cancer, was conjugated to doxorubicine (Dox), a chemotherapy drug, via the electrostatic binding. AlPcS-Dox conjugation was confirmed by electrophoresis. The AlPcS-Dox conjugates enhanced the cellular uptake of AlPcS three times more than un-conjugated AlPcS in both QGY and RBL cell lines. Moreover, the photodynamic killing effect of the conjugates was remarkably increased as compared to that of AlPcS alone or cytotoxicity of Dox alone, demonstrating an enhanced effect of the AlPcS-Dox conjugates.

one



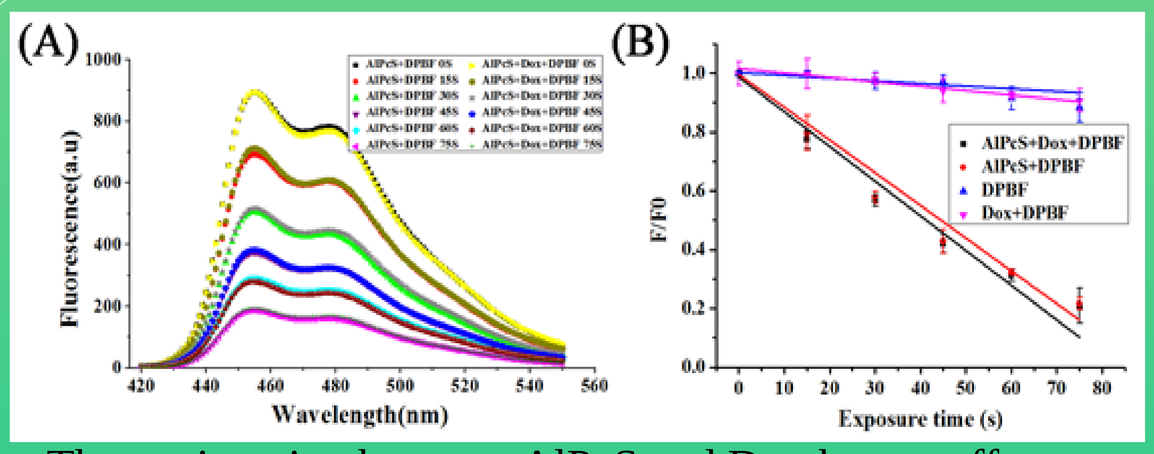
Dox (positive) AlPcS (negative)

two



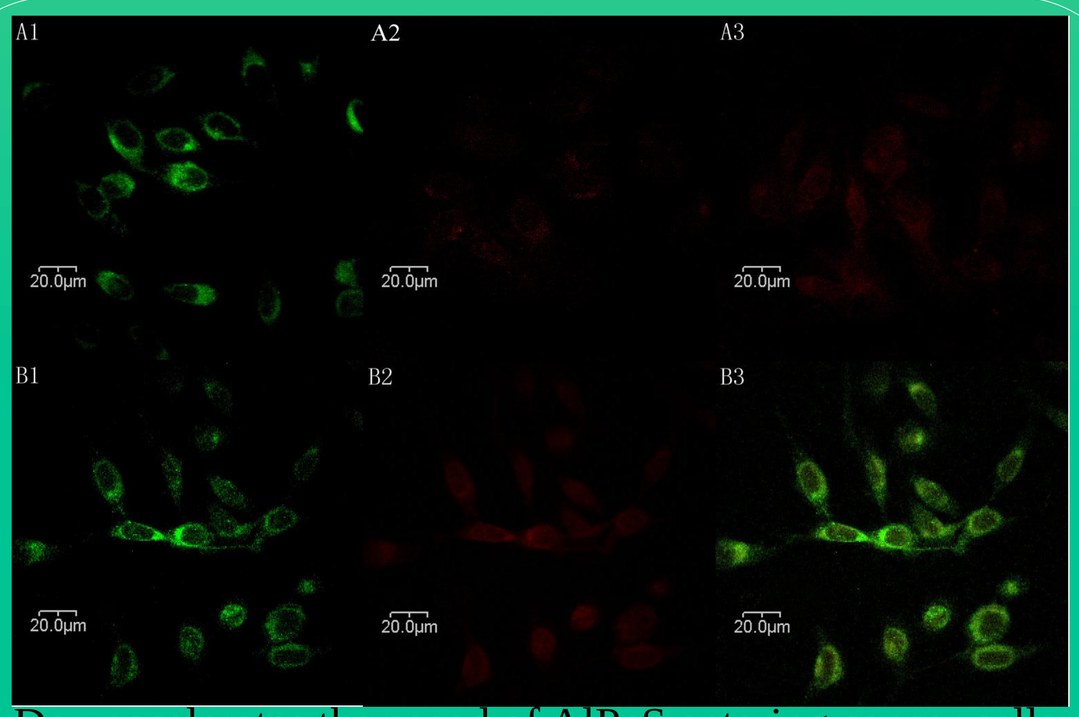
AlPcS and Dox have connected together with each other

three



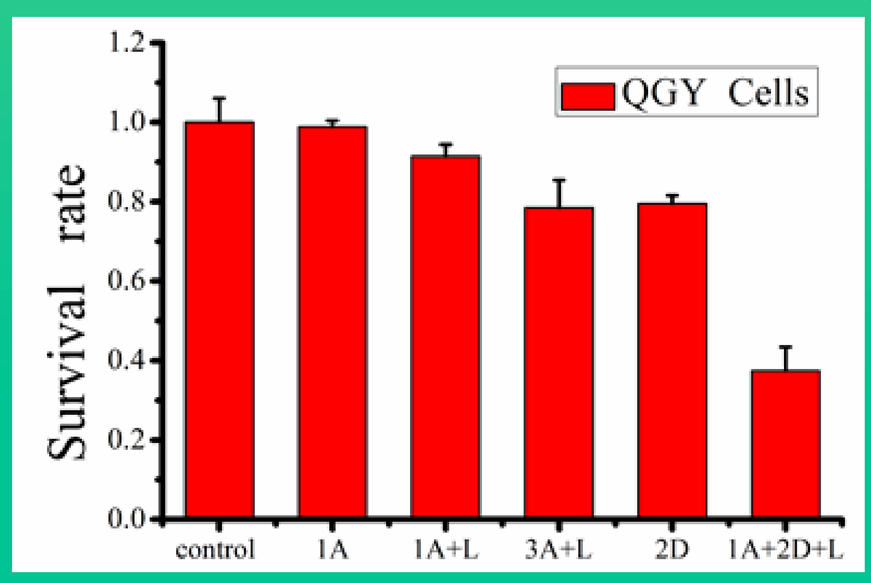
The conjugation between AlPcS and Dox has no effect on the single oxygen yield of AlPcS

four



Dox accelerates the speed of AlPcS entering cancer cells

five



The conjugates of AlPcS-Dox get a better effect of killing cancer cells

Conclusions: The conjugates of AlPcS-Dox can be simply prepared by the electrostatic binding. Such conjugates are taken up by the QGY and RBL cell lines more easily than un-conjugated AlPcS, thus enhancing an intracellular delivery of AlPcS. The increased cellular delivery of AlPcS leads more efficient to cell killing due to a synergistic effect of the AlPcS-PDT and Dox-mediated cytotoxicity. This finding suggests that the conjugation of a photosensitizer to a chemotherapeutic compound can improve photodynamic cancer therapy.

References:
(1) Philips MA, Gran ML, Peppas NA. Targeted nanodelivery of drugs and diagnostics. Nano Today 2010; 5:143–159.
(2) Oku1 M, Sakai Y. Assessment of physiological redox state with novel FRET protein probes. ANTIOXIDANTS & REDOX SIGNALING 2012; 16:698-704.