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Combination of photodynamic therapy and chemotherapy for cancer treatment by using paclitaxel loaded porphyrin-shelled nanoemulsions

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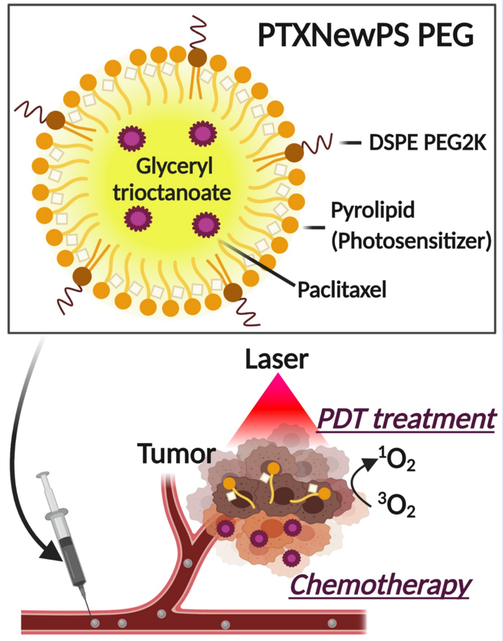
1. Introduction

- The benefits of combination of photodynamic therapy (PDT) and chemotherapy for tumor treatment [1], includes:

(1) Local PDT and systematic chemotherapy can eliminate tumors more efficiently

(2) Reduced chemo-drugs can be applied to minimize side effects

- The paclitaxel (PTX)-loaded, porphyrin-shelled nanoemulsion (PTXNewPS PEG) was created for ideal PDT/chemo combination treatment
- The oil core can be stabilized by pyrolipid shell, and provide efficient PTX encapsulation



2.1 Characterization of PTXNewPS PEG

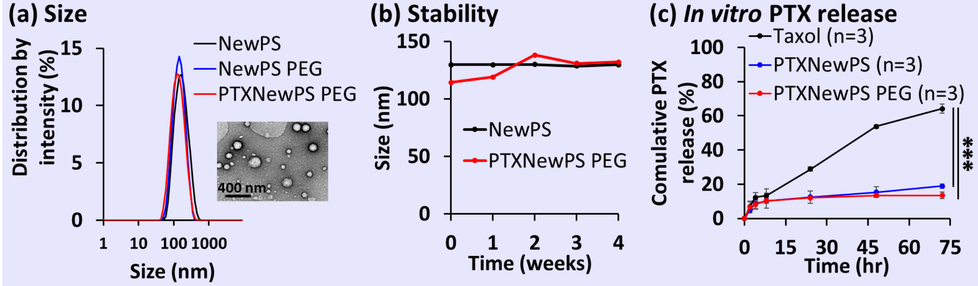


Figure 1. PTXNewPS PEG was a ~120 nm, stable and monodisperse droplet (16.6 w/w % pyrolipid loading efficiency and ~3.1 w/w % PTX loading efficiency)

2.2 Drug delivery efficiency

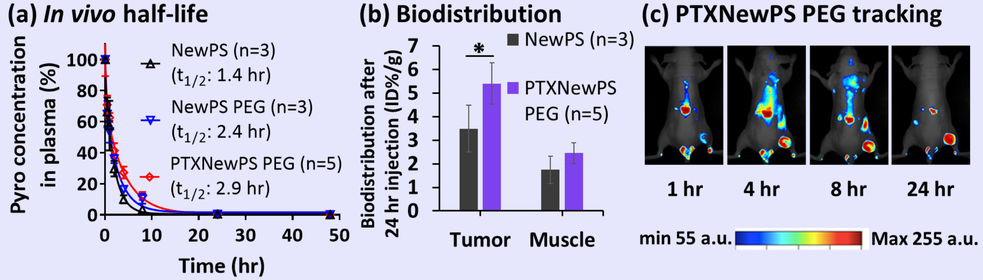


Figure 2. With the benefit of PEGylation, the *in vivo* half-life and tumor accumulation of PTXNewPS PEG could be increased in mice

2.3 *In vivo* PDT/chemo combination treatment

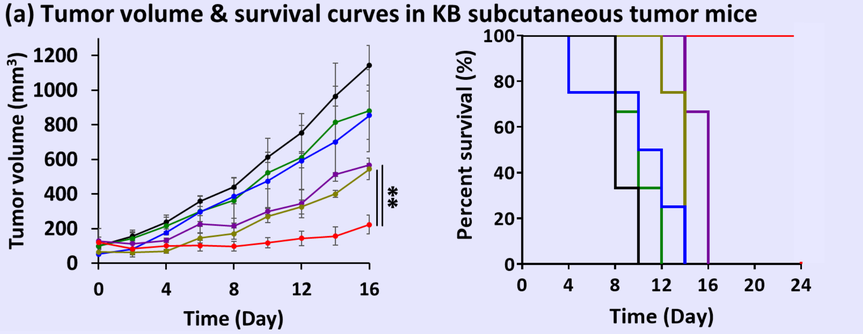


Figure 3. The anti-tumor efficacy of *in vivo* tumor treatment:
The PDT/chemo combination therapy > single chemotherapy or single PDT
Also, PTXNewPS PEG showed no significant side effects of liver damage

3. Conclusions

- A stable co-delivery of porphyrin and paclitaxel nanoemulsion system, PTXNewPS PEG, was successfully created for PDT/chemo combination treatment
- After PEGylation, the drug delivery efficiency of PTXNewPS PEG can be improved
- This nanosystem provides a novel tumor-killing tool for inhibiting tumor growth and prolonging the survival while overcoming the chemotherapy side effects

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[1] Luo D, Carter KA, Miranda D, Lovell JF. Chemophototherapy: An Emerging Treatment Option for Solid Tumors. Adv Sci (Weinh). 2016;4(1):1600106-.