

Upper-critical solution temperature (UCST) polymer functionalized nanomedicine for controlled drug release and hypoxia alleviation in tumor therapy

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Abstract

Recently, nanomedicine have been successfully applied in the cancer therapy. However, how to precisely control the drug release from nanomedicine in tumor tissue and overcome the hypoxic microenvironment of tumor tissue is still an important challenge in the development of nanomedicine. In this work, a new type of drug-loaded nanoparticles P(AAm-co-AN)-AuNRs@CeO₂-DOX (PA-DOX) was prepared by combining high-efficiency photothermal reagents, critical up-conversion temperature polymer layer and anti-cancer drug doxorubicin (DOX) for the treatment of liver cancer. In this system, CeO₂ can decompose hydrogen peroxide to H₂O₂ and O₂ alleviate the anaerobic microenvironment of liver cancer cells. As a photothermal reagent, AuNRs@CeO₂ can convert near-infrared light into heat energy to achieve local heat to kill cancer cells and ablate solid tumors. In addition, the elevated temperature would enable the polymer layer to undergo a phase transition to release more DOX to achieve a controlled release mechanism, which will open up a new horizon for clinical cancer treatment

Dear editor:

We would like to submit the enclosed manuscript, entitled “**Upper-critical solution temperature (UCST) polymer functionalized nanomedicine for controlled drug release and hypoxia alleviation in tumor therapy**”

” for your consideration. No conflict of interest exists in the submission of this manuscript, and manuscript is approved by all authors for publication. I would like to declare on behalf of my co-authors that the work described was original research that has not been published previously, and not under consideration for publication elsewhere, in whole or in part. I outline briefly below the significant findings reported in this manuscript and reasons why this manuscript deserves serious consideration for publication as a Original research (article) for “**Biotechnology Journal**”.

This manuscript displayed a new type of drug-loaded nanoparticles P(AAm-co-AN)-AuNRs@CeO₂-DOX (PA-DOX) for the treatment of liver tumors. Among them, CeO₂ can decompose hydrogen peroxide to alleviate the anaerobic microenvironment of liver cancer cells. As a photothermal reagent, AuNRs@CeO₂ can convert near-infrared light into heat energy to achieve local heating to kill cancer cells and ablate solid tumors. What’s more, P(AAm-co-AN) was used as the ucst polymer layer. Under low temperature conditions, the polymer layer protects the DOX. When the laser irradiation achieves a local temperature rise, the polymer layer undergoes a phase transition to release more drugs to achieve a controlled release mechanism, which will open up new horizons for clinical treatment. Animal experiments have proved the possibility of nano drug delivery system and good tumor treatment effect. I hope this paper is suitable for “**Biotechnology Journal**”.

We deeply appreciate your consideration of our manuscript, and we look forward to receiving comments from the reviewers. If you have any queries, please don't hesitate to contact me at the address below. Thank you and best regards. Yours sincerely,

Zhen You

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