亮点报道：提高光治疗效果的原位活性氮纳米反应器

DOI: 10.12086/oee.2025.251008.h02

利用纳米颗粒同时递送一氧化氮 (NO) 供体与光敏剂，并在肿瘤部位加以激光照射同时启动光热治疗 (PTT)/光动力治疗 (PDT)，可以实现 NO/活性氧 (ROS)/活性氮 (RNS) 的原位级联释放，显著提高 RNS 的产生和抗肿瘤疗效。

南京医科大学王守巨教授课题组提出了一种近红外触发的活性氮纳米反应器 (PBNO-Ce6)，在体内同时原位产生 NO/ROS/RNS 杀伤肿瘤细胞，增强局部及全身的长期抗肿瘤免疫反应，保护机体免受肿瘤的再次攻击。

这种纳米反应器是以普鲁士蓝纳米颗粒 (PB) 为基础，在 PB 的晶体结构中，掺杂硝普纳 (SNP) 作为 NO 供体首先合成了激光刺激后可以释放 NO 的 PB-NO 纳米颗粒，后又利用纳米颗粒的表面介孔结构装载了光敏剂 Ce6，实现了 PTT/PDT 联合治疗。释放的 NO 与光敏剂产生的 ROS 结合产生 RNS，大大提高了对肿瘤的光动力/光热治疗效果，同时激活机体抗肿瘤免疫反应。PBNO-Ce6 作为一种近红外光 (NIR) 触发的 RNS 纳米反应器，具有协同的光动力/光热效应和强大的免疫刺激活性。这种设计策略可以作为一个多功能平台，与免疫检查点抑制剂或化疗结合，进一步改善肿瘤治疗的预后。

Opto-Electronic Advances, 2024, **7**(6): 240013.
https://www.oejournal.org/article/doi/10.29026/oea.2024.240013

Highlights: NIR-triggered on-site NO/ROS/RNS nanoreactor: cascade-amplified photodynamic/photothermal therapy with local and systemic immune responses activation

DOI: 10.12086/oee.2025.251008.h02

The reactive nitrogen species (RNS) can suppress immunosuppressive cells and polarize tumor-associated macrophages into M1-like phenotypes. Thus, the strategy of nitric oxide (NO)/reactive oxygen species (ROS)/RNS cascade generation has great potential in activating systemic, long-term anti-tumor immune responses.

The research group of Prof. Shouju Wang at Nanjing Medical University propose a NIR trigger-activated reactive nitrogen nanoreactor (PBNO-Ce6), which can simultaneously produce NO, ROS, and RNS on-site to kill tumor cells in vivo, enhance local and systemic long-term anti-tumor immune response, and protect the tissue from the re-attack of tumors.

This nanoreactor is based on Prussian blue nanoparticles (PB). PBNO nanoparticles, which can release NO after laser stimulation, were first synthesized by doping sodium nitroprusside (SNP) in the crystal structure of PB as NO donor, and then the photosensitizer Ce6 was loaded on the surface mesopore of the nanoparticles to achieve PTT/PDT combination therapy. PBNO-Ce6 acts as an unprecedented NIR-triggered RNS nanoreactor with synergistic photodynamic/photothermal effects and potent immunostimulatory activity. This design strategy can be used as a versatile platform in combination with immune checkpoint inhibitors or chemotherapy to further improve the prognosis of malignancies.

Opto-Electronic Advances, 2024, **7**(6): 240013.
https://www.oejournal.org/article/doi/10.29026/oea.2024.240013