**[Microreview: A Catalase-Like Metal-Organic Framework Nanohybrid for O2-Evolving Synergistic Chemoradiotherapy]**

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**Key Words:**

catalase-like activity • tumour hypoxia • radiosensitizer • controlled drug release • chemoradiation therapy

**[Abstract: It is a microreview of an article about** **a catalase-like Metal-Organic Framework nanohybrid Tumour, the one of the worst outcomes of cancer, is anaerobic. And tumour hypoxia cause problems including drug resistance and weaken the power of radiotherapy. This article focuses on an nano-compound of metal-organic framework (MOF). The nanoparticles, AuNPs, nanohybrid as a therapeutic platform to achieve O2-evolving chemoradiotherapy. Both in vitro and vivo studies verify that the nano-compound serve as radiosensitizers and effective stabilizer. This study opens a brand-new horizon for future of theranostic nanomedicines.]**

**Introduction**

Due to the aberrant and tortuous tumour vasculature, O2 supple usually comes into an insufficient condition, which is usually called hypoxia. And that is considered as the cause of tumour migration, invasion, metastasis, and resistance to different therapies. [1] According to an amount of studies, hypoxia cells are suffering less damage from radiation than normal cells. [2] So improving the O2 level in tumour is highly expected to benefit radiotherapy.

**Recent Progress**

The common idea is using the diffusion effect, delivering O2 to tumour by creating a high pressure environment. However, this therapy has been confirmed to be unsafe to humans and not actually useful. [3] One of the solutions deliver oxygen by Nano carriers like MnO2, and trigger the O2 releasing reaction by external light. And authors call these carriers Smart Nanomedicines. The smart nanomedicines provide a strong strategy to promote radiotherapy. Or, using high-Z materials like gold nanoparticles (AuNPs) will be able to maximum the deposition of irradiation energy within the tumour, leading to better outcome of treatment.

The authors decided to combine the . They discovered that Porphyrin based metal-organic framework (MOF) NPs are capable of generating O2 in situ, magnifying radiation signals and regulating drug release on command. The MOF NPs poses advantages of high storage capacities, compositions tailorability, biodegradability and feasible modifiability or functionality and can be used as delivers of photodynamic therapy and theranostic agents

**Discussion**

**1** Dox@MOF-AuPEG (+)

The authors carried out their study in various ways in both vitro and vivo. They integrated the radiosensitization effect of AuNPs with the anticancer effect of Dox for combined radiochemotherapy. 3-(4',5'-Dimethylthiazol-2'-yl)-2,5diphenyltetrazoliumbromide (MTT) assay was utilized to assess the synergistic anticancer efficacy against U87MG cells. And confirming its efficiency by Dox@MOF-AuPEG (+) treated cells emitted the most intense γH2AX fluorescence attributing to the severe DNA damage.

2 Detection

Positron emission tomography (PET) imaging was used prior to in vivo therapy. About O2level in tumour, hypoxia-inducible factor 1α (HIF1-α) immunofluorescence staining of tumour section was then employed.

3 Outcomes

It comes out that a PEGylated MOF-Au nanohybridpossesses of excellent anti-tumour performance.

The Dox@MOF-AuPEG increases absorption of radiation, creates O2 by catalysis decomposing of H2O2, and is capable of combining with therapies. It inspires us that nano-level combination is a possible way to optimize solutions.

4 More

But there are still problems remained to be discovered. For example, the nano-material’s metabolic toxicology is not very clear which is very important for a potential pharmaceutical molecule. And because the outcome of this nano-material on mice is pretty effective, so the ceiling of safe doze is still unknown.

There are two interesting and inspiring point in this discovery. The first is there are always more than one way to the result we want. For example, to increase O2 level in tumour, oxygen can be released from a compound or the decomposing of H2O2, rather than pump in O2 of free state with high pressure. One more thing is that the combination of nanomaterial is an efficient way to achieve injection of cell-level. And nanohybrid can be programmed as we want them to be. The different frameworks carrying different particles to place we want them to go, that is an amazing future awaiting us ahead.

**References**

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