CYCLE DE CONFÉRENCES DE CHIMIE

Avec le concours de : Université Clermont Auvergne
INP Clermont Auvergne

Jeudi 27 novembre à 16 h

Amphi Rémi (site des Cézeaux)

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Nanoscintillators as Next-Generation Radiotherapeutics: Expanding the Therapeutic Index of Radiotherapy

More than 50% of cancer patients undergo radiation therapy during their treatment. However, delivering therapeutically effective doses of X-rays with tolerable toxicity to surrounding healthy tissues remains a challenge. To enhance the therapeutic window of radiotherapy and lead to a better prognosis for difficult-to-treat cancers, it has been proposed to use innovative nanoscintillators that can induce multifaceted radiotherapeutic effects. Nanoscintillators down-convert ionizing radiations into visible light, hence act as internal light sources remotely activated by penetrating X-ray. When accumulated in the tumor prior to radiotherapy, nanoscintillators can induce various effects that can potentially synergize. First, when conjugated to photosensitizers, nanoscintillators can induce deep-tissue photodynamic therapy (PDT). This strategy would overcome the shallow penetration of light in tissues, one of the major limitations of PDT. Second, when nanoscintillators emit in the ultraviolet (UV)-range, and more specifically in the UVC, direct DNA-damage can be induced. Finally, because nanoscintillators can be made of high-Z element, their accumulation in the tumor prior to radiotherapy creates a physical radiation dose-enhancement effect.

While proof-of-concept studies of radiotherapeutic effects of nanoscintillators have been demonstrated by us and others, our goal is now to provide a comprehensive description of the mechanisms involved during radiotherapy. We use a multidisciplinary approach ranging from physics to biology, to preclinical trials and investigate various rare-earth based nanoscintillators. Our approach includes Monte Carlo simulations to guide the design of optimized nanoconjugates, measurements with reactive oxygen species-sensitive fluorescent probes, *in vitro* experiments performed on 3D models as well as preclinical tests. Our experiments are performed on glioblastoma and pancreatic models, two pathologies with a dismal prognosis for which combining radiotherapy with PDT is promising.

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