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PAR

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Discipline : *Chimie*

Lanthanide Based Dendrimers for Photodynamic Therapy and Biological Optical Imaging

Soutenue à **huis clos**
Le 17 décembre 2015 à 9h30
Amphithéâtre Charles Sadron

MEMBRES DU JURY :

- **M. Stéphane Petoud** Directeur de recherche, Inserm – Directeur de thèse
- **M. Matthieu Réfrégiers** Dr, Synchrotron Soleil - Directeur de thèse
- **M. Georges Wagnières** Dr MER, École Polytechnique Fédérale de Lausanne - Rapporteur
- **M. Gilles Quéléver** Maître de conférences, Aix-Marseille Université – Rapporteur
- **M. Franck Suzenet** Pr, Université d'Orléans – Membre du Jury
- **M. Richard Daniellou** Pr, Université d'Orléans – Membre du Jury

Abstract

PDT is a cancer treatment that uses the combination of a nontoxic photoactivated molecule (photosensitizer), an appropriate source of light excitation and molecular oxygen to generate reactive oxygen species (ROS) leading to the decrease of the size or to the destruction of tumors.

The main goal of this work is to create multifunctional agents which combines PDT activity, tumor targeting and near-infrared (NIR) optical imaging. The use of reporters that absorb at low energy is justified by low tissue autofluorescence and important tissue penetration depth in the NIR spectral window.

For this purpose, we have chosen the generation-3 poly(amidoamine) dendrimer as a versatile platform. Such macromolecules can incorporate eight NIR emitting lanthanide ions inside their branches forming species with thirty-two end groups at the periphery that can be substituted by suitable photosensitizers.

Four new dendrimer ligands were synthesized with different photosensitizers: derivatives of naphthalimide, anthraquinone, and porphyrin. In addition the naphthalimide photosensitizer was functionalized with a targeting molecule, based on folic acid, to induce selectivity of the molecule towards cancer tissues. The corresponding NIR emitting lanthanide complexes were prepared for each dendrimer.

Four Yb(III)-dendrimer complexes were characterized for their photophysical and ROS production properties. All complexes demonstrated their abilities to produce ROS. The dendrimer functionalized with anthraquinone and tetraphenylporphyrin photosensitizers show strong NIR emission in living cells.

Key words: photodynamic therapy – near-infrared imaging – dendrimer – lanthanide – photosensitizer – reactive oxygen species.

LABORATOIRE:

Centre de Biophysique Moléculaire

Project Deep PDT