

interaction lumière-molécule pour la biologie



Niveau
d'étude
BAC +5 /
master



ECTS
1 crédits



Composante
Faculté des
sciences

En bref

- › Langue(s) d'enseignement: Français
- › Ouvert aux étudiants en échange: Oui

Présentation

Description

i. Optical bioimaging

1. Stakes
 2. Design of luminescent labels and probes
 - molecular agents,
 - photoactive nanoparticles,
 - probing the biological surroundings.
 3. Two-photon microscopy for improved sensitivity
 - fundamentals,
 - optical setup,
 - nonlinear optical labels.
 4. Photoacoustic microscopy for improved depth detection
 - principles,
 - main endogenous and exogenous tracers.
- #### ii. Photobiology
1. Photodynamic therapy
 - principles,
 - structural evolution of photosensitizers,
 - in the clinics.
 2. Photopharmacology
 - structural requirements
 - drug photo-uncaging,
 - photoswitches for structural and functional photoregulation.



Objectifs

Light has become a key tool in biology to image and study living matter, probe specific locations in tissues and cells, and very recently trigger biological events. In a broader sense, biophotonics, coupling light and life, can be regarded as a strongly interdisciplinary topic at the interface of chemistry, biology and physics. Chemistry therefore plays a major role to provide specifically designed chemicals as a function of the biological issues to be addressed and the resorted detection optical setups, especially optical microscopes. In this course, two main aspects will be interrogated. The first part will be devoted to the stakes of optical bioimaging with respect to the current diagnostic technologies and tackle the in vitro-in vivo continuum through the presentation of appropriate luminescent molecules and nanomaterials. The challenge for deep light penetration and high sensitivity in tissues will be addressed through the introduction of more established (two-photon microscopy) or emerging (photoacoustics) techniques and the targeted labels or probes thereof. The second part will rely on the photoactivation of photophysical and chemical processes in a controlled and remote manner to either induce damaged cell apoptosis (photodynamic therapy), or photoswitch the activity of drugs, enzymes, cell attachment or ion transporters (photopharmacology).

Heures d'enseignement

CM

Cours magistral

13h

Pré-requis obligatoires

Thorough knowledge of the fundamental concepts of organic chemistry (main functions and reactivities, #-conjugated structures, inductive and mesomeric effects), physical chemistry (intermolecular forces, acido-basicity, photophysics) at the bachelor and master I chemistry level.

Compétences visées

- # The students can master the bases of optical bioimaging with regard to the main detection technologies in terms of sensitivity, spatial resolution, and detection rate.
- # The students can delineate the complexity and constraints of biological media and propose the design of biocompatible emissive labels.
- # The students can identify the main functional components of a photoactive label and anticipate the most adequate bioimaging technique and responses.
- # The students can propose photochemical or photophysical explanations to support the observed phototriggered biological.

Infos pratiques

Lieu(x)

➤ Angers

Campus

➤ Campus Belle-beille

