

**Master 2 internship project
Year 2024-2025**

Laboratory/Institute: Institute for Advanced Biosciences

Director: Dr Hainaut

Team: Targeted therapies, early diagnosis and cancer imaging

Head of the team: Dr Coll

Name and status of the scientist in charge of the project: Dr Faure, assistant professor

HDR: yes no

Address: Site santé- allée des Alpes- 38700 La Tronche

Phone: 04 76 54 95 54

e-mail: virginie.faure@univ-grenoble-alpes.fr

Program of the Master's degree in Biology:

Microbiology, Infectious Diseases and Immunology Structural Biology of Pathogens
 Physiology, Epigenetics, Differentiation, Cancer Neurosciences and Neurobiology

Title of the project: Innovative Nanostructures to Overcome phototherapy resistance in lung cancer

Objectives (up to 3 lines):

The project aims to analyze the synergistic effect of reducing defense mechanism activated by cancer cells during phototherapy and of enhancing locally the cellular temperature and reactive oxygen species (ROS) production using smart nanotherapeutic system activable by light.

Abstract (up to 10 lines):

Photothermal therapy (PTT) uses light-activable molecules that are able to generate either heat or ROS capable of causing cancer cell death. However, PTT often suffers from the cellular defense mechanism of heat shock response (HSR) which leads to therapeutic resistance of cancer cells and reduces the therapeutic efficacy. Recently our laboratory has developed promising photothermal gold nanoparticles able to complex with siRNA targeting the HSR and to protect siRNA against degradation.

The M2 project will focus on 2 axes:

- 1- Evaluation of the ability of gold nanoparticles to deliver siRNA in lung cancer cells and to inhibit the defense mechanism based on the heat shock response
- 2- Analysis of PTT induced by gold nanoparticles on cellular temperature, ROS production and cellular proliferation after irradiation on lung cancer cells.

Methods (up to 3 lines):

Cell culture, fluorescence microscopy, cellular transfection, FACS, electrophoresis gel, western blot, RT-qPCR.

Up to 3 relevant publications of the team:

- Porret E, Fleury JB, Sancey L, Pezet M, Coll JL, Le Guével X., Augmented interaction of multivalent arginine coated gold nanoclusters with lipid membranes and cells., RSC Adv. 2020 Feb 11;10(11):6436-6443. doi: 10.1039/c9ra10047d.

- Porret E, Le Guével X, Coll JL., Gold nanoclusters for biomedical applications: toward in vivo studies, J Mater Chem B. 2020 Mar 18;8(11):2216-2232. doi: 10.1039/c9tb02767j.
- Koskas S, Decottignies A, Dufour S, Pezet M, Verdel A, Vourc'h C, Faure V. Heat shock factor 1 promotes TERRA transcription and telomere protection upon heat stress. Nucleic Acids Res. 2017 Jun 20;45(11):6321-6333. doi: 10.1093/nar/gkx208

Requested domains of expertise (up to 5 keywords):

Cellular and molecular biology / RNA-targeted therapies/ cancer