LAGEPP

PhD project "New delivery approach targeting macrophages for active anti-tumor immunotherapy".

- **Laboratory:** LAGEPP (Laboratory of Automatic Control, Chemical and Pharmaceutical Engineering). Team: Pharmaceutical Engineering. University of Lyon, France.
- **Supervisors**: Pr. Stéphanie BRIANCON, Dr. Eyad ALMOUAZEN and Dr. Eloïse THOMAS.
- **Keywords**: cancer, macrophages, formulation, functionalization, evaluation *in vitro* and *in vivo*.
- **Grant**: competitive exam (EDISS, Doctoral School, http://ediss.universite-lyon.fr). After a first selection based on a written application, an oral presentation will take place. If successful, the candidate is expected to start the PhD in October 2021.

Project: Anti-tumor immunotherapy presents a promising new therapeutic strategy that can complement and enhance existing chemotherapeutic strategies. Tumor-infiltrating macrophages (TAMs) play an important role in the progression, angiogenesis and invasion of several types of tumor. Studies on the interaction between immunity and nanovectors highlight the interest of nanovectors to target immune cells and thus improve or initiate therapeutic strategies in oncology.

This thesis project will focus on the development of nanovectors capable of specifically targeting TAMs and delivering active compounds capable of reversing tumor-induced immunosuppression. The project will be articulated in 4 parts. **(1)** Formulation studies will be carried out on the encapsulation of immunomodulating active compounds, followed by physicochemical characterization of the nanovectors. **(2)** Functionnalization with appropriate ligands will be performed in order to improve the targeting of macrophages and more precisely their sub-populations involved in tumors. **(3)** *In vitro* studies will be used to evaluate targeting properties and to analyze the response induced by the vectorized active compounds. A co-culture model (macrophages - cancer cells) will be used. **(4)** *In vivo* studies will be performed on mice model to evaluate targeting efficiency, biodistribution of the nanovectors and their effect on tumor.

Skills required: Master 2 level in pharmaceutical, biological or chemical sciences. Previous experience: **(1)** in formulation, functionalization (nanovectors, antibodies,…) and characterization of nano-vectors, and/or **(2)** in biological evaluation of therapeutic compounds (*in vitro* models,…). Good oral and written skills in English. Good knowledge in tumor immunology or experience in *in vivo* experiments would be a plus.

Laboratory: The team develops research at the interface of engineering and health sciences and has a strong expertise in drug delivery and development and validation of new theranostic probes (oncology, autoimmune diseases…). The team is composed of chemists, biologists and pharmacists whose research ranges from formulation of active compounds, to physico-chemical characterization and *in vitro* and *in vivo* evaluation on small animals. Besides, the laboratory has initiated several collaborations with teams known for their strong expertise in the field of immunology and oncology.

Application procedure: send a detailed CV (including rank and grade in your Master degree if possible) with a motivation letter and details of 2 academic referees to the PhD supervisors (Dr. Eyad ALMOUAZEN eyad.al-mouazen@univ-lyon1.fr and Dr. Eloïse THOMAS eloise.thomas@univ-lyon1.fr)**.**