

Company/laboratory/public institution: Laboratory for Vascular Translational Science - INSERM U1148

Address: CHU X. Bichat – 46, rue Henri Huchard 75018 Paris

Supervision of trainee: Cédric Chauvierre

Name of tutor:

Position: Head of Nanotechnologies for Vascular Medicine and Imaging Team

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Internship period: 20 January - 18 July 2025

Title of the project: Functionalized polymer echogenic microbubbles for an efficient targeted treatment of thrombotic diseases

Project description:

Cardiovascular diseases, the major global health threat, are associated with high morbidity and mortality that account for an estimated 17.9 million lives each year (31% of all deaths worldwide), and this figure is expected to rise to >23.6 million annual deaths by 2030. Among all deaths from cardiovascular diseases 85% are caused by heart attacks and strokes. The leading drawbacks of fibrinolytic therapy include treatment failures such as ineffectiveness, re-thrombosis resulting from a persistent vascular lesion and plasma hypercoagulability, and a high risk of bleeding complications, with intracerebral hemorrhages occurring in 1 to 7% of treated patients. To improve human survival and quality of life, effective treatments are important strategies.

The objective of this project is to destroy thrombi by sonothrombolysis thanks to targeted P-selectin-specific polymer microbubbles loaded with Perfluorobutane and thrombolytics.

The proposed specific aims of this project are the following ones:

The trainee will be involved in the PhD project of Louise Fournier (third year). The microbubbles are already functionalized with Fucoïdan and loaded with Perfluorobutane and their targeting and echogenic properties have been validated. The trainee will be in charge to i) determine the best conditions to freeze dry and resuspend the microbubbles without modifying their physico-chemical and biological properties to optimize the future clinical use, and ii) to load the thrombolytics onto the microbubbles and evaluate their thrombolytic properties *in vitro* and by measuring the fibrinolytic and amidolytic activities *ex vivo* on static blood clot.

The trainee will integrate an International Team with 2 Engineers, 2 Post-Doc and 5 PhD students, and during the internship, she or he will participate in weekly meetings of the Team, as well as in journal clubs to present scientific articles, and seminars with the other teams in the laboratory.

This project will focus on medical innovations and will address the following scientific/technical areas: Biomaterials; Polysaccharides; Polymers; Microbubbles; Ultrasound; Light Scattering; Freeze drying; Sonothrombolysis; Targeted treatment; Thrombotic diseases.