

Internship Proposition
(one page max)

Master 2 GP Immunology & ImmunolIntervention (I³)
2025-2026



Lab: Center for Research in Transplantation and Translational Immunology (CR2TI, UMR1064)

Team: 4 (Team leader: Sophie Brouard)

Name and position of the supervisor: Hoa Le Mai, researcher

Email of the supervisor: le.hoa-mai@univ-nantes.fr

Candidate (if internship filled): Not applicable

Title of the internship: Study of the immunomodulatory effects of extracellular vesicles produced by granzyme B-expressing regulatory B cells.

Summary of the internship proposal:

Although kidney transplantation is the most effective treatment for patients with end-stage kidney failure, it requires lifelong immunosuppressive therapy with many adverse effects. However, a very small number of patients develop kidney graft tolerance, defined as stable graft function despite the discontinuation of immunosuppressive treatment. We have shown that these patients have increased number of a subset of regulatory B cells expressing granzyme B (GzB+ Breg). We have developed a B cell culture protocol to obtain more than 90 percent of GzB+ Breg from total human B cells and shown that those Breg can suppress effector T cell proliferation in vitro. More interestingly, we have also found that the extracellular vesicles (EVs) isolated from the supernatant of our B cell culture (Breg-derived EVs) can effectively suppress T cell proliferation and induce T cell apoptosis. EV-based therapy may be more advantageous than adoptive cell transfer therapy because EVs are less immunogenic and can be produced and pooled from different donors. We are determining the composition of our Breg-derived EVs both at the mRNA and protein levels using several techniques including Nanostring transcriptomics and mass spectrometry in order to decipher the mechanisms of action underlying their immunoregulatory effects. In parallel, we are studying the in vivo effects of those Breg-derived EVs using a model of graft-versus-host disease (GVHD) in which immunodeficient mice receive human PBMCs. The student will participate in this ongoing project under the supervision of the supervisor and the team leader. He (she) will learn several techniques such as cell culture, flow cytometry, qPCR ... and will participate in both in vitro and in vivo experiments.

Techniques: Cell culture, flow cytometry, western-blot, qPCR, molecular biology, data analysis.

Option(s) linked to the project:

- ☐ Clinical Research Profile (Recherche Clinique)
- ☐ Data Analyst Profile (Recherche et Analyse de Données Omiques)
- ☒ Experimental Biology Profile (Recherche Expérimentale)