Internship Proposition
(one page max)

Master 2 GP Immunology & ImmunoIntervention (I^3)
2026-2027

Lab: CR2TI
Team: I
Name and position of the supervisor: Jerome MARTIN (PU-PH)
Email of the supervisor: jerome.martin@univ-nantes.fr
Candidate: N/A
Title of the internship: Single-Cell Characterization of Immune Remodeling During Gastric Carcinogenesis
Summary of the internship proposal:

Background

Gastric cancer remains one of the leading causes of cancer-related mortality worldwide despite a declining incidence in several regions. Most intestinal-type gastric cancers arise through a well-defined multistep process known as the Correa cascade, which involves the sequential progression from chronic gastritis to atrophic gastritis, intestinal metaplasia, dysplasia, and ultimately invasive adenocarcinoma. Although these precancerous lesions are recognized risk factors for gastric cancer, the biological determinants that drive progression remain incompletely understood. Increasing evidence suggests that the mucosal immune microenvironment plays a critical role throughout gastric carcinogenesis. Chronic inflammation contributes to epithelial remodeling and disease progression, while alterations in local immune responses may influence the transition from precancerous lesions to cancer. A better understanding of the immune mechanisms operating at different stages of gastric carcinogenesis could help identify biomarkers associated with progression risk and support the development of improved surveillance and prevention strategies.

Project Objectives

The objective of this project is to characterize the remodeling of the gastric immune microenvironment during the progression from healthy gastric mucosa to precancerous lesions and gastric cancer using single-cell transcriptomic approaches. The central hypothesis is that **gastric carcinogenesis is associated with the emergence of distinct immune cell states and molecular programs that progressively shape a permissive microenvironment for tumor development**. Identifying these immune alterations may provide new insights into mechanisms of disease progression and reveal biomarkers associated with lesions at risk of malignant transformation.

Scientific Strategy

The student will analyze single-cell RNA sequencing (scRNA-seq) datasets generated from human gastric biopsies encompassing healthy mucosa, intestinal metaplasia, dysplasia, and gastric cancer. The first objective will be to characterize changes in immune cell composition across the different stages of gastric carcinogenesis. Particular attention will be given to the identification of inflammatory, regulatory, and tissue-remodeling immune populations that emerge during disease progression. The student will then investigate transcriptional programs associated with these immune populations and identify molecular signatures enriched in advanced precancerous lesions and cancer. Cell-cell communication analyses will be performed to explore potential interactions between immune and epithelial compartments that may contribute to disease progression. Finally, the identified molecular signatures will be evaluated in independent validation cohorts, including bulk RNA sequencing datasets generated within the laboratory and publicly available transcriptomic datasets. The **project will provide training in computational immunology, single-cell transcriptomics, bioinformatic analysis, and the biological interpretation of large-scale datasets**.

Expected Outcomes

We expect to identify major alterations in the composition and functional states of immune cells during gastric carcinogenesis, together with molecular programs associated with progression from precancerous lesions to cancer. The project should improve our understanding of the immune mechanisms underlying gastric cancer development and identify candidate biomarkers associated with lesions at increased risk of progression. These findings may ultimately contribute to improved patient stratification and the development of novel strategies for gastric cancer prevention.

Option(s) linked to the project:

X Data Analyst Profile (Recherche et Analyse de Données Omiques)

Form to be sent by email to : gpi3@univ-nantes.fr