

**Project:** Multiplex immunofluorescence and deep learning analysis to study the tumour microenvironment landscape in biopsies of relapsed and non-relapsed follicular lymphoma patients

**Student:** Victoria Ngai

**Supervisor:** Professor Teresa Marafioti

My supervisor was Professor Teresa Marafioti, a consultant histopathologist and PI expert in haematopathology, and I worked with Dr Ayse Akarca who is a researcher at the UCL Cancer Institute. After the Covid restrictions prevented me from going into the lab again and again, it was eventually decided that I would contribute to a project remotely. Working on the part of the study that could be done remotely exposed me to another side of research, and it was interesting to learn about some of the tools and processes in digital pathology.

The project that I contributed to used a multiplex immunostaining technique developed by Professor Marafioti's team at UCL, using the VECTRA multispectral platform, that allows for quantitative assessment of multiple antigens on the cell surface or intracellularly. They have been using this technique to study antitumor responses in cancerous tissues by mapping changes of tumour-associated immune cells. Having only been exposed to basic immunohistochemistry before, I was interested to learn more about this.

The project looked at biopsy samples from patients with follicular lymphoma before and after treatment to identify predictors of progression/survival. An algorithm could be used to identify cells that stained positive for markers, while I segmented the follicular and interfollicular areas on the deconvoluted immunohistochemistry images. The study is still in progress—any changes in the distribution of myeloid cells, NK T cells and macrophages will be correlated to relapse or progression-free survival. Patterns in spatial colocalization of cells within or outside follicles will also be identified from image analysis. I look forward to seeing what the results may suggest, and I was delighted to share the progress of the project with other medical students and doctors in the form of a poster presentation.

It was interesting to be involved in the 'behind-the-scenes' to eventually enable the training of a deep learning model. This project has given me direct insight into how doctors and researchers can work together to harness large volumes of data to generate knowledge which can then be applied back to the bedside to inform clinical practice.

Aside from the project with Professor Marafioti and Dr Akarca, I enjoyed attending journal clubs as part of the studentship where PhD students discussed papers and invited experts for their input. Attending the journal clubs shows you how research is not just about working in the lab or writing papers, but also about critiquing and discussing the literature.

Working with pathologists as part of this project and my iBSc work has opened my eyes to the research side of pathology beyond the exposure I have had from medical school. I would like to thank The Pathological Society and Jean Shanks Foundation for generously supporting my summer attachment to make this possible.