Biomedical Vacation Scholarship – Undergraduate Placements 2023

Supervisor	Project Title (further details below)
Dr Joan Chang	Understanding how immune cells and fibroblasts regulate the extracellular matrix
Professor Kevin Couper	Studying the immune response in brain tumours
Professor Tracy Hussell	Inflammation in the lung

Project details

Supervisor Details	***Dr Joan Chang*** **Enquiries:** joan.chang@manchester.ac.uk
Project Title	**Understanding how immune cells and fibroblasts regulate the extracellular matrix**
Project Outline	The extracellular matrix (ECM) makes up 70% of the human body in terms of wet weight, and is fundamental in providing structure as well as correct cues for cellular behaviour, from embryonic development through to healthy ageing. Collagen-I is a major component of this ECM and counts for approximately 25% of the protein mass, and dysregulation leads to pathologies such as fibrosis, cancer metastasis, and genetic disorders such as osteogenesis imperfecta. Fibroblasts are traditionally seen as the major cell type that deposits and modifies collagen-I, and immune cells such as macrophages are seen to remove the ECM. Previous research in our lab has discovered that the circadian rhythm governs this process in fibroblasts, and identified that macrophages also contributes to collagen-I deposition. This project aims to further expand on these findings, by investigating how macrophages and monocytes interact with fibroblasts to regulate the deposition and removal of collagen-I. We will use a combination of molecular and imaging techniques (CRISPR, qPCR, flow cytometry, fluorescence imaging) as well as primary cell models to study this process, in health and disease.

Supervisor Details	***Professor Kevin Couper*** **Enquiries:** kevin.couper@manchester.ac.uk https://research.manchester.ac.uk/en/persons/kevin.couper
Project Title	**Studying the immune response in brain tumours**
Project Outline	Our immune response is designed to protect us from infection and disease, including cancer. However, it is clear that in many different types of cancer, the immune response becomes defective, allowing the tumour to grow. This is particularly true in brain tumours, which are particularly hard to treat. Glioblastoma, the most common malignant form of brain tumours, has a dismal prognosis, with most patients surviving only 14 months after diagnosis. This project will involve learning cutting-edge immunological techniques that are now used to analyse and map the immune response within brain tumours, to examine how immune cells compartmentalise and engage with tumour and brain cells, to influence tumour growth. The project will involve learning histology, immunofluorescence and high dimensional imaging assays, as well as in depth immunophenotyping using mass cytometry. The project will also involve learning cell culture models. Overall, the project will show how to analyse the immune response during brain tumours to identify new treatments.

Supervisor Details	***Professor Tracy Hussell*** **Enquiries:** tracy.hussell@manchester.ac.uk https://www.research.manchester.ac.uk/portal/tracy.hussell.html
Project Title	**Inflammation in the lung**
Project Outline	The lungs are necessary to transport oxygen into the body. This is difficult, however, when they are inflamed as inflammatory cells prevent the normal contraction and relaxation process required to inhale air. In our laboratory we are studying ways to reduce inflammation, which involves studying which immune cells are there and what they are doing. The student will join a fun and lively team at the University of Manchester and gain experience of sterile cell culture, how to identify different immune cells and measurement of inflammatory products they produce. Full supervision will be provided. Students will be encouraged to appreciate the wider implications of the research by spending time with clinicians whose patients experience respiratory diseases such as asthma, Chronic obstructive Pulmonary Disease or infection.