Project title:

Investigating cytoskeletal dynamics in circulating tumour cells from breast cancer patients

Project Summary:

The spreading of cancer cells from one part of the body to another, called metastasis, is one of the main causes of cancer death. To metastasise, tumour cells must move through tissues, cross tissue boundaries, survive in circulation and later at secondary sites. In our lab we are studying how the cytoskeleton can control all these processes that are crucial for metastatic cells to succeed at growing in a distant tissue, with a focus on these processes in the context of breast cancer.

On the other hand, circulating tumour cells (CTCs) are cancer cells that detach from a primary tumour and enter the bloodstream. They are a critical component of the metastatic cascade, playing a role in the spread of cancer to other parts of the body. While most CTCs die in circulation, a small fraction can survive and seed distant metastatic disease.

In this project, we have access to CTCs from patients enrolled in different studies and clinical trials. This will allow us to profile CTC cytoskeletal dynamics and cell survival in different conditions.

In this project, the student will:

1. Isolate CTCs from patients with advanced metastatic disease. Different breast cancer subtypes will be studied and compared.
2. Using state of the art imaging, the cytoskeleton of CTCs of different breast cancer subtypes will be characterised at high resolution. We will pay special attention to cell blebbing and actomyosin dynamics, as key features of metastatic amoeboid cancer cells.
3. CTCs will be cultured in organ-on-a-chip platforms to study their survival capacity.

Since CTCs are responsible for metastatic seeding, we will investigate if manipulating the cytoskeleton of CTCs has an impact in their survival. The overall goal is to kill these dangerous cells as a strategy to prevent metastasis.

Supervisory Team:

1st supervisor: Professor Victoria Sanz-Moreno
2nd supervisor: Professor Andrew Tutt
3rd supervisor: Dr Stephen-John Sammut

Clinical Specialities:

Surgery, Oncology