King’s College London Health Schools Studentships 2015

Division: Randall Division of Cell and Molecular Biophysics

**PROJECT DETAILS**

**Title of project**
When Cells Collide: Analysing the Molecular Mechanisms and Biomechanics of Contact Inhibition

**Supervisor 1**
Brian Stramer

**Supervisor 2**
Susan Cox

**Project description (max 500 words)**

Contact inhibition of locomotion (CIL), a process whereby migrating cells collide and repel each other, was discovered over 60 years ago by the pioneering cell biologist Michael Abercrombie. This process is clinically relevant as malignant cancer cells are defective in CIL, which has been hypothesised to contribute to their metastatic potential. However, since its initial discovery, we have learned little about the physiological roles of CIL in vivo, or its molecular mechanisms.

Our group has been exploiting the embryonic migration of *Drosophila* macrophages (hemocytes) to investigate the function and regulation of CIL within an in vivo, physiologically relevant setting. This work has revealed that CIL is absolutely essential for the developmental dispersal of hemocytes and that CIL is even capable of driving the patterned movement of cells.

Computer models developed in the laboratory show that CIL is capable of generating patterns only when cellular collisions are precisely regulated. Indeed, high-resolution analysis of collisions revealed that the response is tightly controlled and synchronised in colliding partners. Preliminary analysis suggests that the physical stresses of the collision are controlling the choreography of the response; it is the mechanics of the collision that allow CIL to behave with such mathematical precision.

The goal of this project is to examine the mechanical forces present during cell collisions, and determine how they change over the timecourse of the response. An in vitro model will also be developed to provide a more controllable environment than the developing embryo. The coordination between the mechanical forces and the cellular signals during the contact inhibition response will be investigated and results extrapolated to our in vivo system.

The student will develop assays to examine CIL both in vivo and in vitro in various primary cells and cell lines. Timelapse imaging techniques, using a spinning disk microscope, will be used to examine cytoskeletal dynamics during cellular
collisions, which will involve image analysis techniques such as particle image velocimetry to accurately track cytoskeletal movement. The student will also develop collision assays on an atomic force microscope, which will allow accurate measurements of the physical properties of the cell during the response.

The student involved with this project will gain experience in molecular biology, cell culture, and microscopy techniques. They will also liaise with biophysicists, and gain experience in image processing and analytical techniques.

References


Please indicate the type of programme
4 years