CHILD HEALTH RESEARCH CHARITABLE INCORPORATED ORGANISATION (CHR CIO) PROGRESS FORM – VACATION STUDENTS

Student's name:	Christoforos Efstathiou
Academic Programme:	Developmental Biology and Cancer
Project title(s):	Identifying force-generating cellular events controlling neural tube closure in vertebrates

1. Lay Summary

What are you trying to do in this studentship?

The embryonic precursor of the central nervous system is a hollow tube-like structure called the neural tube (NT). Development of the NT happens in a process known as neurulation, during which the NT transitions from an open to a closed shape. Closure begins in the middle of the embryo, consequently creating two openings known as the anterior and posterior neuropore (PNP). If closure of the neuropores is incomplete, the central nervous system will be malformed, resulting in a neural tube defect (NTD) such as spina bifida. Previous work demonstrated that an enzyme primarily known for its role in regulating cell shape, the Rho-associated protein kinase (Rock), is necessary for successful PNP closure. Changes in cell shape generate mechanical forces which promote PNP closure. This studentship aims to identify and understand the roles of Rock in coordinating different force-generating mechanisms in embryonic cells.

Why is this research important?

Approximately 1 in every 1000 pregnancies are affected by NTDs, making them one of the most common birth defects. Identifying the force-generating mechanisms required for NT closure will provide insight into how NTDs develop. The mechanisms I investigated during this project will also help us understand potential genetic and environmental factors that contribute to NTDs. This will then allow better interpretation of genome-wide screens, which will hopefully lead to improved genetic testing and potentially new preventative strategies.

2. Value of Your Experience

Working at the Institute of Child Health has been a significantly valuable experience that came with a set of rewarding challenges and opportunities to develop my hands-on skills. Throughout my 8-week studentship I experienced working in a dedicated research team within a professional laboratory setting. Consequently, I now have a realistic understanding of the running of novel research projects leading to new discoveries. Furthermore, by attending seminars and group meetings, I have seen first-hand the importance of collaborating and communicating with different academics to facilitate progression of the group's projects.

I have gained extensive knowledge on the fundamentals of mouse and chick embryogenesis with a specific focus on neurulation. I also learned to apply various laboratory techniques including embryo microdissection and culture, whole-mount immunofluorescence staining and image analysis. Alongside these techniques I observed confocal microscopy, time-lapse live imaging and learned about the use of mouse and chick models of NTDs.

Additionally, I received training in transferable skills including statistical analysis, data recording and organisation, reading scientific manuscripts, report writing and communicating science effectively. Most importantly, I learned to troubleshoot and adapt experimental protocols to enhance validity.

This studentship has undeniably provided me with an insight in the daily routine of an academic researcher, and ultimately what an academic career path offers. Having strengthened my experimental design and analytical capabilities, I now feel prepared for my fourth-year laboratory project of my integrated Master's degree. Throughout this project I have experienced working with *in vivo/ex vivo* embryo models, which complements my previous experience of cell-based *in vitro* assays, hence expanding my skillset as a scientist. Accordingly, this studentship has increased my critical thinking and overall confidence; thus, honing essential skills that are required for the PhD that could follow.