THREE LATE PROJECTS AVAILABLE FOR MEDICINE (RMH) HONOURS 2013

The Contribution of Endothelial Progenitor Cells to Retinal Vascular Regeneration

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Aim: To determine the role of endothelial progenitor cells in retinal revascularization in the oxygen induced retinopathy model of retinopathy of prematurity

Retinal vasculopathies are some of the most important causes of blindness. Diabetic retinopathy is the most significant cause of visual disability in working adults in the developed world. Retinopathy of prematurity is one of the most significant causes of childhood blindness. It is unknown how important vascular regeneration is to delaying development of diabetic retinopathy, and it is unknown to what extent the arrest of vascular development that precedes the development of retinopathy of prematurity may be modulated by modifying angiogenic processes. Treatments that optimize vascular regeneration may potentially have an enormous impact on reducing visual loss in these diseases.

Our previous work has found a gene that controls numbers of endothelial progenitor cells in the bone marrow, and also the number of endothelial progenitor cells being recruited to the retina during vascular regeneration after hyperoxic vaso-obliteration. The number of retinal endothelial progenitor cells appears to control the rate of revascularization and the severity of the pathological angiogenesis in the oxygen induced retinopathy model of retinopathy of prematurity.

This project involves the use of reporter mice expressing green fluorescent protein under the control of the Id1 allele to identify endothelial progenitor cells in the retina. Mice homozygous for this allele will be used to determine whether endothelial progenitor cell deficiency leads to a deficit in retinal vascular regeneration.

Future work on this project may lead to development of therapeutic strategies to reduce the severity of retinopathy of prematurity and diabetic retinopathy.

Skills: Animal handling skills, design of mouse breeding strategies, retinal fluorescein-dextran perfusions, immunofluorescence microscopy, flow cytometry, data analysis.
Dietary Quality in Bipolar Disorder versus a Healthy Control  
Supervisors: Dr Jerome Sarris, A/Professor Felice Jacka, Dr Olivia Dean  
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A relationship has been established between dietary quality and depression and anxiety symptoms, in that a better quality diet is associated with lower depressive and anxious symptoms. While the relationship between bipolar disorder and more of a “western” dietary pattern has been shown in a small sample of women, further exploration is now required. This project will assess the relationship between dietary quality and mental health variables between a sample of patients with bipolar disorder and a healthy cohort.

Reliability of Novel Brain Computer Interface Microsensor array  
Supervisors: Dr Tom Oxley, Mr Nick Opie  
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Aim: This research will involve planning and conducting rigorous evaluation of Novel Brain Computer Interface Microsensor array. You will design and construct a test bed for future testing of microsensors for use during experiments with neural prostheses. You will demonstrate mechanical reliability of the microsensor array and quantify the signal quality in a saline filled artificial vessel model.

Skills: The ideal candidate will have a background in engineering (biomedical/electrical/mechanical), and will have an interest in medical bionics research. Strong skills in Labview (and/or matlab) are essential.