



Lung Stem Cell Biology **Bertoncello Lab**

The broad interest of the Lung Stem Cell Biology Laboratory is to characterize epithelial and mesenchymal stem cells in the normal and diseased lung, including chronic obstructive pulmonary disease, asthma, pulmonary fibrosis and cancer. Our long-term goal is to investigate the role of stem cells in lung homeostasis, and identify factors regulating their regenerative potential as a prerequisite to the development of therapeutic strategies to attenuate lung disease and regenerate the injured lung.

Our group is a member of the Adult Stem Cell Program funded by the Australian Stem Cell Centre Collaborative Stream Initiative which comprises a national network of high calibre scientists with internationally recognised leadership in adult stem cell biology focused on working collaboratively to address key areas that will allow significant acceleration of stem cell research.

The laboratory performs cutting edge research using flow cytometry-based cell separative strategies, novel three-dimensional cell culture assays and *in vivo* transplantation to identify and characterize stem/progenitor cells in the adult lung. Current projects offered in the laboratory aim to elucidate the mechanisms by which epithelial and mesenchymal stem/progenitor cells contribute to homeostasis in the lung and how they are regulated by the microenvironmental niche in which they reside.

Honours Projects commencing in 2010:

1. Defining the lineage specificity of adult lung epithelial stem/progenitor cells.

Supervisors: Dr. Jonathan McQualter, Prof Gary Anderson and A/Prof. Ivan Bertoncello

Contacts

Ivan.Bertoncello@stemcellcentre.edu.au

(at U Melb) gpa@unimelb.edu.au

We have developed a novel 3D culture assay based on the epithelial-mesenchymal-matrix interactions in the lung which enables the identification of lung epithelial stem/progenitor cells by their colony-forming potential *in vitro*. We have identified a population of epithelial stem/progenitor cells which generate colonies comprising airway, alveolar, or mixed lung epithelial cell lineages *in vitro*, suggesting for the first time that an epithelial stem/progenitor cell hierarchy exists in the adult lung. This project will advance on these cell culture techniques to identify the cues that regulate the survival, self-renewal and lineage specificity of different stem/progenitor cell subsets.

2. The response of lung epithelial stem cells in animal models of lung injury.

Supervisors: Dr. Jonathan McQualter, Prof Gary Anderson and A/Prof. Ivan Bertoncello

This project will analyze the temporal pattern of depletion and recovery of lung epithelial stem/progenitor cells following lung injury by exploiting the selective toxicity of drugs which impair lung function. Cell culture analysis of the proliferation, self-renewal and lineage specificity of lung epithelial stem/progenitor cells at various stages of injury and repair will provide valuable insights into the role in endogenous epithelial stem cells in regeneration and repair of the adult lung.

Contacts

Ivan.Bertoncello@stemcellcentre.edu.au

(at U Melb) gpa@unimelb.edu.au

3. The role of lung stromal cells in the regulation of lung epithelial stem cell proliferation and differentiation

Supervisors: A/Prof Ivan Bertoncello, Prof Gary Anderson and Dr Rosa McCarty

This project will analyse the different lung stromal cell populations which comprise lung epithelial stem cell niches and compare their ability to regulate lung epithelial stem/progenitor cell proliferation and differentiation. Cell culture assays will be used to determine how lung stromal cells alone, or together with growth factors and matrix proteins affect the lung epithelial regeneration.

Contacts

Ivan.Bertoncello@stemcellcentre.edu.au

(at U Melb) gpa@unimelb.edu.au

PhD Projects commencing in 2010:

1. The role of adult lung epithelial stem/progenitor cells in lung homeostasis and disease.

Supervisors: Dr. Jonathan McQualter and A/Prof. Ivan Bertoncello

This project will broadly focus on refining cell culture techniques and developing in vivo lineage tracing and transplantation models for elucidating the role of adult lung epithelial stem/progenitor cells in lung homeostasis and disease. PhD projects will be designed collaboratively with students to capture individual interests.

Contacts

Ivan.Bertoncello@stemcellcentre.edu.au

(at U Melb) gpa@unimelb.edu.au