MONASH University

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miscl monash immunology and stem cell laboratories

Germ stem cells

Prof. Alan Trounson and Dr's David Cram, Gayle Jones, Orly Lacham-Kaplan and colleagues
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Embryonic stem cells and genes involved in hematopoietic and pancreatic lineage commitment

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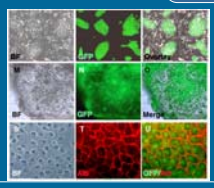
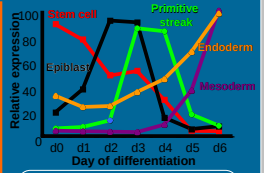
ES Cells



Genetically modified human ES cells expressing GFP differentiate into mesoderm (Blood - m-o) and endoderm (s-u)
-collaboration with Martin Pera & Sue Hawes (MIMR)

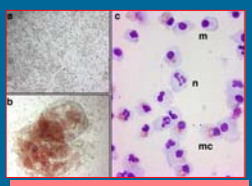


Affymetrix gene profiling examines global changes in gene expression during ES differentiation

Mesendoderm

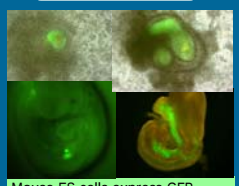
Directed differentiation

Blood Stem Cells



Generation of blood cells from human ES cells. White (a) and Red (b) blood cells. (c) shows macrophages (m), mast cells (mc) and neutrophils (n).

Pancreatic Islet Cells



Mouse ES cells express GFP when they differentiate into pancreatic endoderm and when they form pancreas in chimeric embryos (lower)

Neuroimmunology Research Group

Prof. Claude CA Bernard
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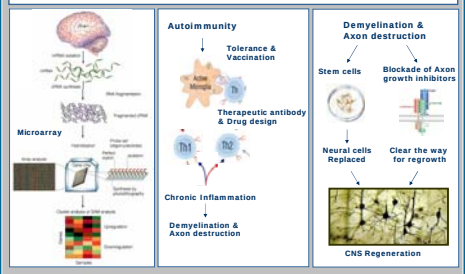
AUTOIMMUNITY, INFLAMMATION & CNS REPAIR



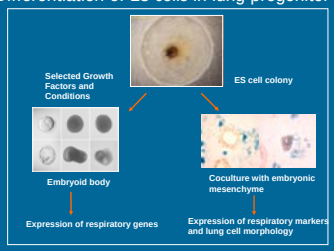
❖ **Our major focus is to study various facets of immunology, genetics, biochemistry, microbiology and behaviour pertaining to the causation of Multiple Sclerosis (MS) and other acute, progressive and destructive neurological disorders.**

❖ **The major objective of our research is to understand the basic underpinnings of MS and attempt to translate these findings to develop new therapeutic strategies aimed at inhibiting inflammation as well as promoting regeneration of the damaged brain tissue.**

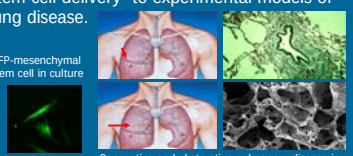
Respiratory Stem Cell Research

Prof. Alan Trounson and Colleagues

❖ Differentiation of ES cells in lung progenitor cells



❖ Research is also directed at mesenchymal stem cell delivery to experimental models of lung disease.



Congestive and obstructive pulmonary disease is an increasing problem worldwide.

Adult Stem Cell-Based Renal Regeneration & Repair

Dr Sharon Ricardo and colleagues

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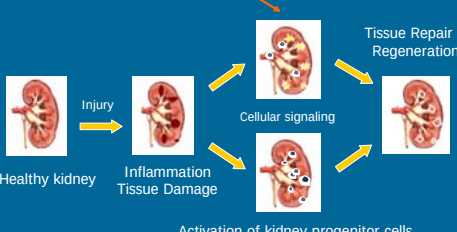
Bone marrow cells can engraft and differentiate into endothelial, epithelial, and interstitial cells.



❖ **Renal regenerative medicine includes the development of new stem cell-based therapies that may offer alternatives for renal transplantation and long-term dialysis therapy.**

Ovarian and fetal physiology and stem cells

Prof. Graham Jenkin and colleagues

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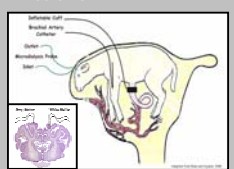
Fetal Wellbeing

- Markers of fetal compromise/hypoxia
- Activin A in pregnancy: chronic vs acute hypoxia
- Neuroprotective strategies in pregnancy
- Blood flow in IUGR fetuses/effects of corticosteroids
- Effect of hypoxia on cognitive function

Stem and Germ Cell Biology

- Cellular/molecular characteristics, maintenance & growth of human embryonic stem and germ cells
- Ovarian germ cell & follicle differentiation, development & ovarian grafting
- Stem cell differentiation *in vivo* and *in vitro*
- Biomimetic Matrices and Regenerative Medicine



Fetal monitoring in sheep *in utero*

Re-educating the immune system for transplantation tolerance and autoimmunity

Prof. Richard Boyd and colleagues

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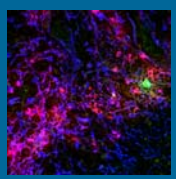
❖ The thymus is where cells of the immune system learn the difference between self and non-self.

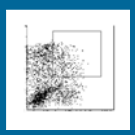
❖ Thymic atrophy following puberty has a negative impact on the immune system

❖ Rare thymic progenitor cells have the potential to rebuild a thymus to:

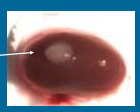
- re-educate the immune system to accept tissues or stem cells from unrelated donors,
- restore thymic function in patients with immune deficiencies.



The green cell represents a thymic progenitor labeled with the MTS-24 antibody.

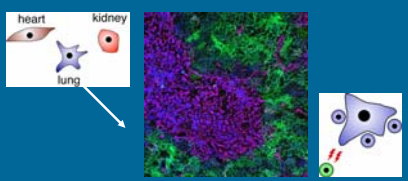


Purification of these cells allows their grafting and the establishment of a new thymus



Thymic tissue derived from low numbers of thymic progenitor cells grafted onto the kidney

❖ This new thymus could incorporate stem cells from other tissues to re-instruct the immune system as it develops.



Such approaches provide a platform for inducing immunological tolerance to stem cell transplants, even in adults lacking a functional thymus.