



Australian Stem Cell Science

Australia's Strengths

- Research in Stem cells is essential to accelerate advances in horticulture, the livestock industry and human health.
- Many different types of stem cells are being used by researchers, including bone marrow, umbilical cord blood, fat, bone, cartilage, skin, breast, cornea, teeth, cancer, embryonic and induced pluripotent stem (iPS) cells.
- It is important to note that no one type of stem cell will be suitable for all applications. Ongoing research is required into all facets of this important and fast moving field.
- Bone marrow transplants involving haematopoietic (blood forming) stem cells are routinely used to treat conditions such as leukaemia. Australian scientists have internationally recognised expertise in haematopoietic stem cell identification, isolation and understanding of the environment in which these stem cells live which has contributed to advances in stem cell treatments.
- Mesenchymal (fat, bone and cartilage forming) stem cells are found in many tissues of the adult body, including bone marrow and placenta. They show promise for treatment for a number of diseases involving the repair and replacement of bone and cartilage with Australian researchers leading these advances.
- Since 2002, Australian researchers have been able to create human embryonic stem cells (hESC) under licence to investigate how these versatile cells become tissues such as kidney, blood, heart and brain. More recently Sydney IVF has generated hESC that carry the genetic code for diseases such as cystic fibrosis, muscular dystrophy, Huntington's disease and Down syndrome.
- The use of hESC contributes to a greater understanding of development and disease and can be used for the testing of new drugs and treatments. hESC cells may also one day provide a source of replacement cells for diseased or damaged tissue in the human body.
- Australian researchers are also at the forefront of the emerging technologies such as iPS cells that allow the generation of stem cells directly from patients and the possibility to then study that patients disease. iPS cells have been created from patients with schizophrenia, cancer and Friedreich's ataxia.

International Profile

- Four Australian stem cell researchers from the ASCC, CSIRO, Monash University (Monash) and the Florey Neuroscience Institutes were funded under the International Alliance between the State of Victoria and the California Institute of Regenerative Medicine (CIRM) for leading projects in hESC research.
- Australia has successfully bid and won the rights to host the International Society for Haematology and Stem Cells Annual Meeting in September 2010. This meeting will attract approximately 700 scientists from around the world. Previously the ASCC successfully bid and won the rights to host the International Society of Stem Cell Research Annual Meeting attracting close to 2000 stem cell scientists to Australia in 2007.
- In 2008, stem cell researchers established the Australasian Society for Stem Cell Research to promote the discipline of stem cell biology and provide opportunities for junior researchers
- Australia is one of the founding members of the International Consortium of Stem Cell Networks. There are currently 11 other member countries, including the USA, UK, Canada and Japan.

Clinical Application

- Stem cells have been used clinically in the form of bone marrow transplants since the 1950s. For example researchers at the Walter and Eliza Hall Institute in Melbourne were the first to recognise and purify G-CSF a hormone that causes stem cells to be released from the bone marrow and is routinely used in cancer treatment.
- Melbourne based Mesoblast have successfully treated patients with non-healing bones fractures with their adult stem cell technology. Non-union long bone fractures can be debilitating, sometimes leading to amputation, and costly to the health system. Mesoblast have recently been granted a US patent for the technology.
- Researchers from the University of NSW have recently pioneered technique to treat corneal blindness with a clinical trial underway. Corneal blindness affects approximately 10 million people worldwide.
- Nearly one if every five people in Australia have arthritis. Sydney based veterinary medicine company Regeneus has successfully treated arthritis in dogs with stem cells derived from the animals own fat. Due to the success in the technique, they have now partnered with Sydney University to run a clinical trial for humans with knee arthritis.

Informing the Public

- In 2010 the ASCC is partnering with CSIRO's Scientists in Schools to teach the basics of stem cell biology and ethics to secondary school students. This follows a successful launch in 2009 whereby stem cell scientists visited over 1600 students and discussed the potential of stem cells.
- Critically ill patients are increasingly turning to experimental, unproven and expensive therapies overseas in their hunt for cures, often referred to as stem cell tourism. To assist patients in making fully informed decisions the ASCC in conjunction with patient groups has developed a Patient Handbook which can be downloaded from www.stemcellcentre.edu.au

Legislation Governing the Use of Embryos in Research

- Within Australia, there is both Commonwealth and State legislation governing the use of embryos in research including using embryos to create human embryonic stem cells. This national legislative framework allows each state to debate the topic separately, and to date all states except WA have legislation that mirrors the federal legislation. The current legislation allows valid scientific inquiry while at the same time ensuring research is conducted under the highest ethical standards.
- During 2010, the Commonwealth legislation will be reviewed. The stem cell community strongly support the continuation of a permissive regulatory framework and welcomes the opportunity to engage with the public in this important matter.

