
Editorial

Stephen Luntz

Stem cells are perhaps the most exciting area of medical research today. The potential is there to cure some of the most unpleasant and intractable diseases in existence.

However, stem cells are also the centre of a major ethical debate that has been hampered by popular confusion around the topic.

The science and the ethical debate about stem cells are intertwined, but both are interesting in their own right.

The Science

The excitement about stem cells is based on their ability to turn into other cells. In some cases this includes cells in vital organs that the body repairs badly without assistance. Stem cells that can turn into kidneys could be the answer to the rising tide of kidney disease. Stem cells that can be persuaded to turn into nerve cells might one day see quadriplegics rising from their wheelchairs.

However, not everything you hear about stem cells is solid science. Some less scrupulous scientists and companies hype their results beyond what can be justified. Some journalists prefer to let the breathless excitement of potential applications cover up how far there is to go, and how many obstacles are in the way.

In this edition we include a number of articles explaining

the current state of stem cell science. Stem Cells Australia begins with an introduction to what stem cells are, their types, potential and the law (p.4).

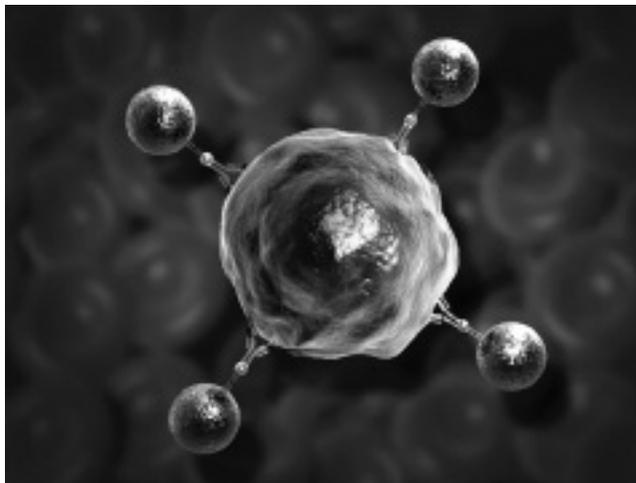
We've also included four articles based on talks given at the Australian Academy of Science symposium on stem cells earlier this year. All four authors are among the world leaders in stem cell research. The full text of these and other talks from the symposium is at www.science.org.au

Professor Martin Pera of the Monash Institute of Reproduction and Development provides an overview of recent developments in this rapidly changing field, and cites evidence that stem cells can produce improvements in rats and monkeys with Parkinson's disease (p.10).

Professor Gesine Kogler of the University of Dusseldorf showed that the umbilical cord is rich in stem cells capable of turning into a wide array of human tissues, creating the possibility that stored umbilical blood could be used to treat diseases a baby may develop as he or she grows up (p.35). This has created a proliferation in research possibilities that are unencumbered by the ethical questions and regulations that dog embryonic stem cell research.

Not long ago it was thought that the brain was very bad at repairing itself – if brain cells were killed off they did not come back. Professor Perry Bartlett of the Queensland Brain Institute discusses just how much this has changed, and the potential of new findings to provide ways to boost the brain's recovery (p.38). "When the ability of animals to make cells in the hippocampus was removed they showed some loss of memory formation. This provocative bit of evidence points to the idea that the ability to make new neurons in the hippocampus might be important in memory formation," Bartlett writes.

There is a T-shirt that reads: "The liver is evil and must be punished", but it's possible that our lifestyle is actually tougher on the kidney, with poor diets leading to increasing rates of Type 2 diabetes, which in turn can cause chronic renal failure. Melissa Little of the University of Queensland's Institute of Molecular Bioscience considers the feasibility of using stem cells to regenerate kidneys, or even grow new ones (p.42).



The Ethics

Stem cells have also created a major political and ethical controversy. There are fears that embryonic stem cell research could lead to human cloning, and many religious people believe that embryos are entitled to the rights of humans, making research that damages or destroys the embryo wrong. This includes the extraction of embryonic stem cells.

In June 2005 the Commonwealth government established the Lockhart committee to review the *Prohibition of Human Cloning Act 2002* and the *Research Involving Human Embryos Act 2002* and associated state legislation. The committee received more than 1000 submissions, with the overwhelming majority expressing opposition to either research using embryonic stem cells or to any form of cloning.

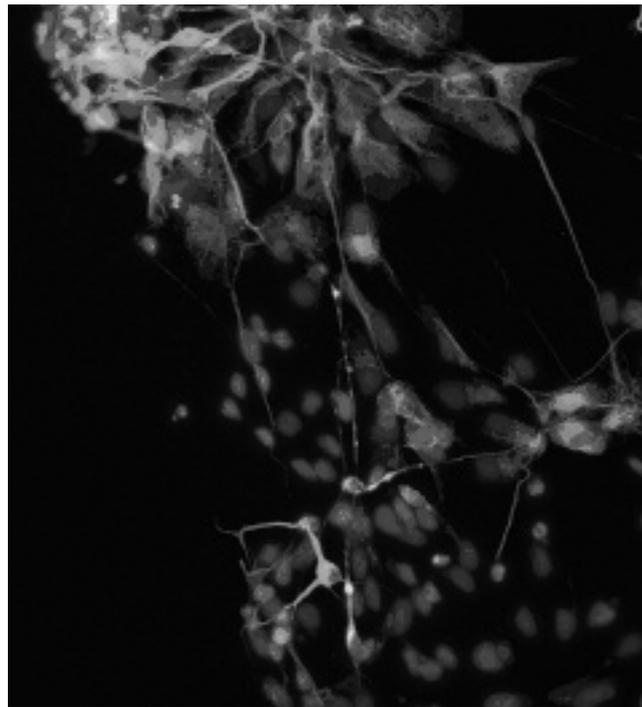
A typical submission reads: "I am against cloning because however carefully guidelines are drafted they will be interpreted differently by different people". Another submission includes the statement: "An embryo is a human being with potential – not a potential human being. The embryo should be afforded the same dignity as any other human being."

Dr Nicholas Tonti Filippini says that some opponents of using embryonic stem cells "hold that an embryonic human being possesses inherent human dignity as a member of the human family and has equal and inalienable rights" (p.20). Others, he says, "recognise that human embryos have some inherent status because of their potential to develop to human adulthood".

Tonti-Filippini notes that "all human stem cell therapy success has been with somatic stem cells because they are compatible and easier to control for differentiation," and concludes this "would indicate that there is no necessity for using human embryonic stem cells".

Elizabeth Finkel, on the other hand, argues not only for continued research on embryonic stem cells but for "therapeutic cloning", where the nucleus of an ordinary cell is inserted into an egg cell (possibly from another individual) whose nucleus has been removed (p.16). As Finkel describes it: "The data in the egg fluid reprogrammed the skin nucleus, telling it to run the program for 'embryo'." After 5 days some cells are removed, killing the embryo, but providing a source of embryonic stem cells capable of turning into tissue cells compatible with the donor.

Finkel argues that "if there is anything that the history of science teaches us, it is that we never know where the next breakthrough is coming from". She believes that to



put all our eggs in the basket of somatic (often called "adult") stem cells would risk missing out on therapies capable of helping millions..

However, the debate is more complex than a simple for-or-against. A number of much longer submissions to the Lockhart review address many technicalities involved in stem cell research and the legislation itself.

The Reverend Alan Nichols calls for a middle way on stem cell research, which he sees as "support [for] the *status quo*, which would allow further research on embryo stem cells to see what benefit it can bring, but continue the legislative ban on therapeutic cloning" (p.26).

Others are concerned at the uses the technology will be put to. Guy Rundle argues that we also need to consider the ways any research is used, whether there is an ethical question about the source of the raw materials or not (p.28). "If a society consisted of human beings who had been partly manufactured, would we think about human life in the same way?" he asks. "Would the spread of processes of the production of life give us a sense that human life is nothing other than a product?"

An uninformed community is likely to either ban research using embryonic stem cells entirely or allow an open slather approach where the only determinant on what can be done is the question of whether there is someone willing and able to pay. An understanding of the science and the ethical questions opens up the possibility of many choices in between.