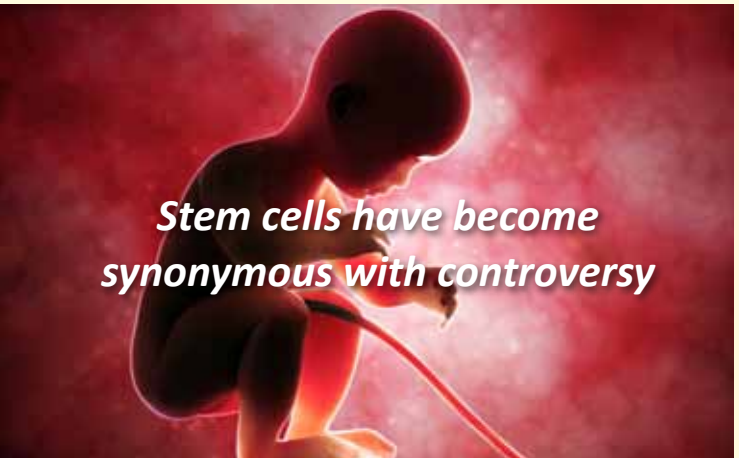
Instead, their access requires the destruction of the early embryos that harbour them. Although IVF clinics produce surplus human embryos that must be destroyed if not re-implanted, Scripture teaches us that each is an individual, made in the image of God: however beneficial, their use as a source of embryonic stem cells risks reducing human life to a utilitarian level.

Can the ethical dilemmas be resolved?

Through recent discoveries that earned Shinya Yamanaka the 2012 Nobel Prize in Physiology or Medicine, it is now possible to rewind the developmental clock of any adult cells to recreate a state of pluripotency. By taking a small sample of tissue, such as skin, from a patient suffering from degenerative disease, we may produce so-called 'induced pluripotent stem cells' (iPSC). These are almost indistinguishable from embryonic stem cells and could provide an unlimited supply of the very cell types required to treat the patient's disease. Although it will be some time before such treatments become routine, the first clinical trials using iPSC for the treatment of macular degeneration have recently been approved, paving the way for the widespread exploitation of pluripotency in medicine, without the need for human embryos. Furthermore, given that iPSC may be made direct from individual patients, there is no longer any need for human cloning, further reducing the ethical complexities.



Nevertheless, induced pluripotency may one day make it feasible to bring back from extinction species such as the woolly mammoth, from which samples of frozen tissue have been recovered. Stem cells and controversy may, it seems, remain wedded, at least for the foreseeable future!

Dr Paul Fairchild trained in biomedical sciences at both Oxford and Cambridge Universities. He is currently a Lecturer in Medicine at Oxford, a Fellow of Trinity College and founding Director of the Oxford Stem Cell Institute. He is a committed Christian and served as an Elder at Magdalen Road Church, Oxford for nine years. He is married to Jackie and they have a son, Richard.

Further information

www.cis.org.uk – Christians in Science

www.isscr.org – International Society for Stem Cell Research

Suggested reading

Hochedlinger K., *Your inner healers: A look into the potential of induced pluripotent stem cells.* Scientific American 21 April 2010 pp46-53

Slack J., Stem cells: *A very short introduction*. OUP, 2012

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Stem Cells

Should we opppose stem cell research as Christians?

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Thinking about...

Stem Cells

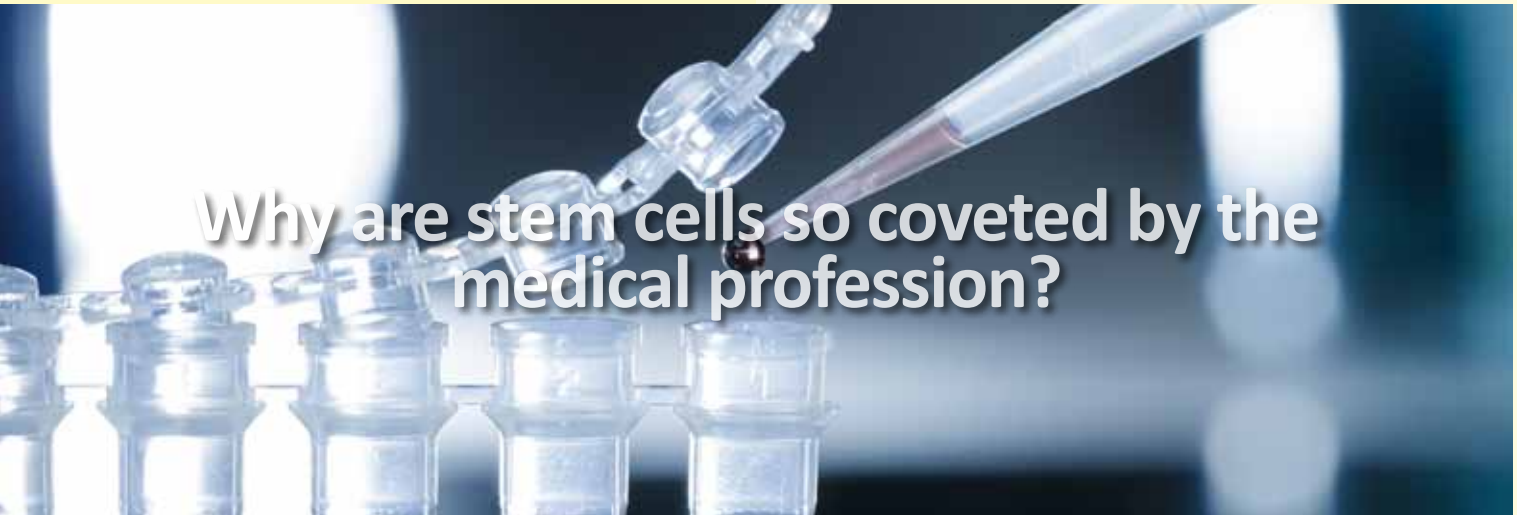
Dr Paul Fairchild

For many Christians, stem cells have become synonymous with controversy and the erosion of moral values, a suspicion frequently fuelled by the media: talk of embryo destruction, human cloning, and the resurrection of extinct species, has done little to assuage such fears. But are we in danger of throwing out the baby with the bathwater by opposing a promising technology that may also bring the alleviation of suffering from some of the most debilitating degenerative diseases? To answer this question we need to understand what properties make stem cells special and why plans for their medical use have become so contentious.

How much about stem cells that we read in the newspapers should we believe?

What are stem cells?

Stem cells play two essential roles throughout life. During the earliest stages of development, shortly after conception, stem cells are responsible for sculpting the tissues and organs of which the human body is composed. After birth, stem cells are no less important, performing routine maintenance of tissues by replacing any cells that have become damaged or are simply too old to function. Indeed, most tissues of the body harbour such 'adult stem cells' in niches that protect them from damage and preserve, throughout life, small pockets of rejuvenating activity. Bone marrow is a particularly rich source, containing *hematopoietic* stem cells, an ugly word derived from the Greek for 'making blood'. These can produce not only red blood cells but all the cell types that make up the immune system. One of the properties that defines a stem cell is, therefore, its ability to differentiate into the variety of specialised cell types that make up the surrounding tissue, a property known as 'multipotency'.



Why are stem cells so coveted by the medical profession?

Why have stem cells attracted so much interest?

The importance of stem cells lies in their suitability for regenerative medicine, which is becoming increasingly important due to the ageing of populations in the developed world. Associated with this trend is a staggering rise in chronic and degenerative diseases for which current treatments offer little more than the partial alleviation of symptoms. By harnessing the properties of stem cells, it may prove feasible to obtain a ready source of the very cell types and tissues required to repair the damage caused by diseases as diverse as Parkinson's, chronic heart disease or macular degeneration, a progressive form of blindness. Hematopoietic stem cells are, for example, widely used for the treatment of malignancies of the blood: wiping out leukaemia with chemotherapy is only effective if the patient's blood is also replaced with a new source, derived from donor bone marrow.

So where does the controversy lie?

Although regenerative medicine may alleviate many diseases, most adult stem cells are in very short supply, cannot easily be propagated in the laboratory and are restricted by their multipotency, only giving rise to cell types from the tissues from which they were extracted. While bone marrow transplantation may be an effective treatment for blood disorders, it would prove wholly ineffective for neurodegenerative diseases or diabetes. These limitations make it necessary to identify different sources of stem cells for each and every treatment. But just suppose we could access the 'master' stem cells shortly after conception, which produce every one of the ~200 cell types that make up the human body, a property known as 'pluripotency'. These so-called embryonic stem cells may be cultured indefinitely in the laboratory, could be expanded to treat unlimited numbers of patients, and might be used for the treatment of numerous diseases, since there are no restrictions on the cell types they can generate. In others words the properties of pluripotency would be perfect for regenerative medicine. But therein lies the problem: pluripotent stem cells are no longer found in adults, having been lost long before birth.

Should Christians be opposed to stem cell research on principle?