International governments hold back stem cell research

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Governments across the world are holding back stem cell research and its promise of revolutionising healthcare. Pressure from religious organisations and anti-abortion campaigners has forced many governments to introduce legislation to limit vital research.

Stem cells are the undeveloped cells that grow into all the body's tissues and organs, naturally replenishing the millions of cells that die every day in the blood, gut lining and skin. This ability has enabled doctors to use some adult stem cells in medical treatment. Bone marrow stem cells, for example, are used in transplants to regenerate healthy blood cells in diseases like leukaemia.

However, the proof in 1998 that the stem cells that make up the earliest stage of an embryo known as a blastocyst have the potential to grow into any of the body's 220 different cell types has opened up previously unimaginable possibilities. The discovery not only opens the door to a greater understanding of one of life's most marvellous mysteries—how a single cell can develop into such a complex organism as a human being—but also raises the possibility that stem cell injections could repair the tissues and even organs damaged or destroyed in a whole host of human diseases such as stoke, heart attack, diabetes and Parkinson's disease.

Since the 1998 discovery, scientists have made great advances despite the attempts to limit their research. They have injected human embryonic stem cells into paralysed rats, allowing them to walk again, and discovered a master gene called the nanog gene that seems to control what type of tissue or organ the stem cells will grow into and when. Research is also continuing into finding productive sources of stem cells that are not grown from embryos.

Because the blastocyst is destroyed during the harvesting of stem cells, the technique has enraged religious organisations, anti-abortionists and their political representatives. Typical is Maria Louise Flemming, Austrian Christian Democrat member of the European Parliament, who has called for a ban on all embryonic stem cell research, claiming that "From the moment of conception, you create all the characteristics of a person."

The fact that such misconceptions have an inordinate influence on government decision-making is a sign of the times. In a previous period, campaigners were able to gain the right to abortion, where an embryo up to several months old can be destroyed, and the right to in-vitro fertilisation (IVF) for infertile couples—involving the production of excess embryos that are eventually discarded. Having lost these battles, religious organisations and anti-abortionists are now trying to claim that a week-old ball of undifferentiated cells, unable to survive outside a woman's body, has more rights than the millions of living beings who suffer from incurable diseases.

For those suffering such diseases, embryonic stem cells do have one major disadvantage. They carry the genes of the embryo they come from, making them susceptible to attack by the immune system of the patient, who consequently is faced with the possibility of having to take immunosuppressant drugs for life.

To overcome this, scientists believe it will one day be possible to inject the DNA from healthy cells of a patient into stem cells and grow tissue that identically matches the genetic makeup of the patient, thus preventing rejection. This process—known as therapeutic cloning or somatic cell nuclear transfer—would allow doctors to produce a perfectly compatible bone marrow using a leukaemia patients own skin cells, for example, and prevent the exhausting and often unsuccessful search for a suitable bone marrow donor that occurs now.

(Note that therapeutic cloning is different from reproductive cloning. Reproductive cloning involves the removal of DNA from an embryo and replacing it with DNA from adult cells and allowing it to develop inside a woman's uterus. When it is born it will be a virtually identical copy of the donor. Although scientists used this technique to produce Dolly the sheep it has not yet been used to produce a living human being. There are unpublished reports that South Korean scientists have grown a four-cell human clone and US scientists allowed a leg skin cell to grow for about 14 days to form a 400-cell clone before it was destroyed. However the technique is not reliable and may not be for several decades.)

Human reproductive cloning is banned in countries that have introduced regulations or legislation restricting it. However, many countries have also introduced legislation banning or limiting the use or creation of stem cells and therapeutic cloning.

The most notorious example is that of the Bush administration. One of its first acts on stealing office was to placate the Christian fundamentalists that form a large part of its narrow social base by cutting off federal funding for all stem cell research except that carried out on 78 existing stem cell colonies (or lines). Bush also appointed bioethicist Leon Kass as chairman of the presidential committee on stem cell research. Kass opposes stem cell research and in-vitro fertilisation (IVF)—the main source of embryos used to extract stem cells.

Since Bush's decision in August 2001 it has emerged that all 78 stem cell lines have been grown on mouse cells and are unusable for human research. According to the National Institute of Health, only 11 of the 78 lines are available for distribution in any case.

Donald Kennedy, editor of *Science* magazine, writes that "much of the scientific community remains unconvinced that the cell lines now available meet research needs." Scientists in the US have founded the International Society for Stem Cell Research that Kevin Davies, editor of Bio-IT World, says "must engage in a political discourse to salvage the extraordinary promise of embryonic stem cell research."

The federal government finances the vast majority of basic scientific research in the US. Bush's decision on stem cell research means this area is propped up by the private sector and charitable institutions. The Howard Hughes Medical Institute has funded nine new stem cell lines using frozen human embryos from the Boston IVF clinic, but this is just a drop in the ocean.

Actor Christopher Reeve's Paralysis Foundation has been forced to fund research in Europe. Reeve himself has campaigned for individual states to support research, saying, "We're going to the state legislators and getting state laws passed that allow stem cell research. The first success was in California. Now we're working on Massachusetts, Ohio, Wisconsin and New York." However, with most states on the verge of bankruptcy the future is not bright.

US pharmaceutical companies are also concerned that the Bush decision will limit their ability to profit from the new technology. The *Washington Post* lamented, "Embryo cell research is speeding ahead in several other countries threatening US dominance in a realm of biology that many believe is poised to revolutionise medicine." Meanwhile, some 400,000 frozen embryos sit in 430 US fertility clinics waiting to be discarded.

The countries threatening US dominance include the European Union, Australia and Singapore.

At present the European Union has a ban on financing the use of stem cells from frozen human embryos left over from IVF treatment, but the ban is set for review by the end of this year. The 20-member European Commission is attempting to set up a European-wide regulatory framework in the face of the widely differing attitudes of the 15 national governments. For Commissioner Phillippe Busquin the "key objective" was to stop scientists leaving Europe for work elsewhere. "Europe is in a relatively weak position. Obviously there are ethical concerns [but] the real question is 'Are we able to have excellence in this field in Europe?'"

It appears the commission will reach a compromise that bans European Union funding to any scientist who uses embryos created after June 27, 2002—the day that the current European research programme started. No funding will be provided to scientists who work in countries where research is still illegal—mainly those where the Vatican has most influence, such as France, Ireland, Portugal and Austria. Spain, however, has recently allowed the use of spare IVF embryos for embryonic stem cell research provided parental consent is given. Germany only allows stem cell research on imported cells and ones existing before January 1, 2002.

The United Kingdom is the only European country that allows therapeutic cloning research. The British Parliament amended the 1990 Human Fertilisation and Embryology Act in 2001 to allow the creation of embryos for harvesting of stem cells provided they were less than 14 days old. The Blair government has provided over US$60 million in public funding to ensure British-based companies can exploit the new technology.

In Australia, the Howard government introduced the Research Involving Embryos and Prohibition of Human Cloning Bill last year. The bill planned to restrict research to the existing 10 embryonic stem cell lines in Australia and ban therapeutic cloning. The Australian Academy of Science denounced the proposed ban as having "the potential to impact adversely on Australia's competitiveness and scientific contributions." In the end, the ban was made subject to review after three years.

Australia has become a leader in the new cell technology. A National Stem Cell Centre has been set up in Melbourne headed by Dr. Stephen Livesey from the Life Cell Corporation in the United States.

Australian companies have also been active in the Pacific region, exploiting countries with few or no regulations such as Singapore, where stem cells can be used from adults, aborted foetuses and surplus IVF embryos less than 14 days old and therapeutic cloning is allowed. Dolly the sheep scientist Doctor Alan Coleman is working in Singapore for the Australian-based ES Cell International whose CEO, Robert Klupacs advised the government, "For Singapore to become a biotech leader it needs to focus on a discrete number of major biotech projects and support them in reaching a scale to compete globally." The government supplied US$35 million last year to fund 150 biotech jobs.

Another Australian company, Stem Cell Sciences, established Japan's first stem cell company in June 2002 with US$150 million worth of Japanese government credits.

There are genuine ethical problems in scientific research, requiring careful supervision and monitoring. To unlock the potential of stem cells and therapeutic cloning, however, requires a vast, coordinated international effort, free from superstitious prejudices to advance scientific knowledge and alleviate the suffering endured by millions.

As to concerns that such potential will be abused as simply another opportunity for big business to make a profit, the pernicious influence of profit over scientific research cannot be countered by suppressing research but by placing the biotech industry under public ownership and democratic control.