

# *Stem Cell Research: Questions and Answers*



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## **Stem Cell Research: Q&A**

### **Finding cures we can all live with!**

There has been a lot of publicity about the potential of stem cell therapies in curing chronic diseases and disabilities. These breakthroughs in stem cell science are exciting and heartening. Much of the coverage, however, has blurred the distinction between destructive human embryonic research and the perfectly ethical adult stem cell research. So far, all the scientific breakthroughs are in the field of adult stem cell research. Nonetheless, the campaign for public funds to allow research that destroys living human embryos continues unabated.

### **What is an embryo?**

An embryo is the earliest form of human life. It is naturally created when sperm and egg meet and unite. This fertilised ovum, known as a zygote, is the beginning, or primordium, of a human being. In 1978 the first baby was born as a result of in vitro fertilisation (IVF). This involved bringing sperm and ovum together in the laboratory and then implanting it into the mother's womb. At this stage a new genetically distinct human being existed.

### **What are stem cells?**

Stem cells are unspecialised cells that continually renew themselves through cell division. They are found in humans at all stages of life, from embryonic through to adulthood as well as in umbilical cords and placentas.

### **Why is there controversy involving stem-cell research?**

There are two different kinds of stem cells: adult stem cells (ASC) and embryonic stem cells (ESC). Adult stem cells can be found in the blood, bone marrow, skin, brain, liver, pancreas, fat, hair follicle, placenta, umbilical cord and amniotic fluid. As well as showing great scientific promise in repairing damaged organs and tissues, adult stem cell research is ethically non-problematic. However, embryonic stem cell research (ESCR) requires the destruction of an embryo, which is a human being at the beginning of life.

### **Why do some claim there are advantages to embryo research?**

Embryonic stem cells originally were thought to have an advantage because of their flexibility and capacity to generate new cell types. However the ongoing research in animals has revealed serious side effects ranging from tumour formation to immune rejection. [1]

### **Are adult stem cells beneficial?**

Yes. The main advantage is that they are already programmed for function in adult tissues and organs. Patients are already being treated with ASCs. Studies using ASCs include diabetes, heart disease, sickle cell anemia, acute myeloid leukaemia, multiple sclerosis, Parkinson's disease and Crohn's disease. ASCs have also successfully fought brain tumours, retinoblastoma, multiple myeloma, ovarian, testicular, and breast cancers. More than 30 anti-cancer uses for stem cells have been tested on humans, and many are already in therapeutic use.

Numerous recent studies document the pluripotent flexibility of certain adult stem cells (e.g. cord blood), proving that such versatility is not confined to stem cells taken from human embryos. [2] [3] [4]

### **What are induced pluripotent stem cells (iPSCs)?**

In 2007, researchers in Japan and the US discovered that they could generate pluripotent stem cells without the need to destroy human embryos. [5]

These stem cells, known as reprogrammed cells, can be generated from adult skin cells. Many scientists believe this breakthrough will mark a huge sea change in stem cell science.

Dr James Thomson, who led the US team behind the reprogramming breakthrough, says this new discovery will make the debate about the ethics of embryonic research "a funny historical footnote". Dr Robert Lanza, another expert in the field, said it marked "a new era for stem cells" and was "the biological equivalent of the Wright brothers' first airplane". Quite apart from the ethical advance achieved by this cutting edge science, reprogrammed cells or induced pluripotent stem cells (iPSCs) have a number of scientific and practical advantages over embryonic stem cells. iPSCs allow scientists to create patient-specific stem cell lines for research on human diseases.

Many scientists say that, practically speaking, iPSCs will be easier to generate than stem cells from human embryos. Also, using iPSCs does not involve human embryos or human eggs and so obtaining them doesn't require the consent of a third party.

### **How is the issue dealt with in other countries?**

Even countries that permit abortion are still very concerned about protecting the human embryo e.g. Italy, Germany, Austria, Poland, Malta and Slovakia among others. Unfortunately, the recent recommendations of the Irish Council for Bioethics blindly follow the British model, which has little or no respect for the human embryo inside or outside the womb.

## Would laws protecting the Human Embryo prevent the practice of IVF in Ireland?

These are, in fact, separate issues. Italy and Germany and other countries have introduced legislation to protect the human embryo while continuing to allow the practice of IVF.

### Irish Council for Bioethics' Report

In its recent report, the Irish Council for Bioethics recommends making destructive research on living human embryos legal in Ireland.

In doing so, the ICB passed over a unique opportunity to unite ethics and science in favour of a win-win solution that would promote Ireland as a centre of excellence for adult stem cell research, over research that involves deliberately killing human embryos.

Interestingly the ICB proposes “granting” the human embryo “significant moral value” rather than “full moral status”. The giveaway word is granting. The Irish Constitution doesn't speak of granting our humanity to us. It acknowledges, not grants, the right to life.

The unanimous decision of the ICB (13-0) in favour of the Report raises questions about the impartiality of the process undertaken by the Council. In 2007, a Millward Brown IMS poll showed that 74% of the public who expressed an opinion agreed the Dáil should legislate to protect the human embryo.

### Conclusion

Adult stem-cell research is both effective and ethical. Embryonic stem cells are obtained by killing human embryos and as things stand are too unstable to even begin clinical trials. It's no secret that large pharmaceutical and biotech companies are refusing to fund embryonic research themselves given its very uncertain potential. They have, nonetheless, waged an extremely successful public relations campaign to secure taxpayers' funded research. This in part explains the media hype promoting destructive embryonic research. Whether or not pharmaceutical companies make exaggerated claims or blur important ethical distinctions, legislators have a responsibility not to flout empirical standards.

If the law lacks clarity regarding that most basic right, namely the right to life, it undermines the basis for all the other self-evident rights we cherish. In our democracy, based on equality before the law, the Government has a duty to vindicate the right to life, particularly at its most fragile and vulnerable beginnings. That is why any future legislation in this area should protect the human embryo.

The embryo is not potential human life - it is human life with potential. We should not destroy life to prolong life. Rather we should strive for cures we can all live with.

[1] Bloom S. Stem Cell Division. J Clin Invest 2005;115:1676-7

[2] Krause DS, Theise ND, Collector MI, et al. Multi-organ, multi lineage engraftment by a single bone marrow derived stem cell. Cell 2001;105:369-77

[3] Yoon Y-S, Wecker A, Heyd L, et al. Clonally Expanded multipotent stem cells from human bone marrow regenerate myocardium after myocardial infarction. J Clin Invest 2005;115:326-38

[4] Mc Guckin CP, Forraz N, Baradez N-O, et al. Production of stem cells with embryonic characteristics from human umbilical cord blood. Cell Prolif 2005;38:245-255

[5] Kyoto University, Japan and University of Wisconsin, USA, 2007